FINAL

UPDATED
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
(INRMP)

2019 - 2024

FOR THE

CAMP BUTNER TRAINING SITE

DURHAM AND GRANVILLE COUNTIES, NORTH CAROLINA

NORTH CAROLINA NATIONAL GUARD

2018

PREPARED BY:

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SIGNATURE PAGE

This Integrated Natural Resources Management Plan (INRMP) is an update of the 2010 Camp Butner Training Center (CBTC) INRMP that has been reviewed for operation and effect and recommended for update and continued implementation. It meets the requirements for INRMPs as specified in the Sikes Act, as amended (16 USC §670a *et seq.*). It has set appropriate and adequate guidelines for conserving and protecting the natural resources of the CBTC.

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EXECUTIVE SUMMARY

The Integrated Natural Resources Plan (INRMP) is the primary guidance document and tool for managing natural resources at Camp Butner Training Center (CBTC). CBTC must provide a variety of environmental conditions and ecosystems in which to train soldiers. This objective must be met in a way that provides for sustainable, healthy ecosystems, complies with applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. INRMPs help installation commanders manage natural resources more effectively to ensure that installation lands remain available and in good condition to support the installation's military mission.

This INRMP is an update and reorganization of the 2010 CBTC INRMP, developed for the planning period from fiscal year (FY) 2019 through 2024, and is the result of a review for operation and effect done by the U.S. Fish and Wildlife Service (USFWS), the North Carolina Department of Environmental Quality (NCDEQ), and the North Carolina National Guard (NCNG). The review resulted in the desire of the cooperating agencies to update and to continue implementing the existing INRMP. The details of this review process are described in **Section 1.1** of the INRMP. As part of the update, the INRMP was reorganized to ensure the plan content would meet Army National Guard (ARNG) requirements. No substantive changes were made to the management programs and philosophies or the goals, objectives, and implementation projects. The INRMP has been updated and reorganized as follows.

- An INRMP Implementation Analysis to determine what projects and programs have been implemented has been developed and included is included in Section 1.5.2 (see Table 1).
- Geographic Information System (GIS) data has been generated and mapping updated.
- Management goals and objectives have been more clearly stated.
- The list of implementation projects has been updated and includes a column that compares the projects to the 2010 INRMP.
- Natural resources data and species lists have been updated to include new data and to include changes in the status of rare species.
- The text has been updated to include a discussion of the Sustainable Range Program (SRP), to incorporate the NCNG Environmental Management System (EMS), and to include a discussion of the Status Tool for Environmental Programs (STEP).
- An Environmental Check List and Record of Environmental Consideration (REC) have been developed and included in Appendix C.

CBTC includes approximately 4,880-acres of state owned land under the command of the NCNG. The installation is located in Durham and Granville Counties in the north-central Piedmont section of North Carolina and is approximately 35 miles northwest of Raleigh, 15 miles northeast of the city of Durham, and 4 miles northwest of the town of Butner and Interstate 85.

The following references are used to guide the management of Natural Resources at Camp Butner: 1. The Sikes Act, as amended by The National Defense Authorization Act of 2012, codified at 16 USC 670a et seq. 2. The Endangered Species Act (ESA), as amended by the National Defense Authorization Act of 2004, codified at 16 USC 1533(b)(2) and 1533 (a)(3)(b). 3. AR 200-1, Environmental Protection and Enhancement, 13 December 2007. 4. Department of Defense Instruction (DoDI) 4715.03, Natural Resources Conservation Program, 18 Mar 2011. 5. Department of Defense Manuel (DoDm) 4715.03, Integrated Natural Resources Management Plan Implementation Manuel, 25 November 2013 6. Department of the Army Memorandum, Guidance for Implementation of the Sikes Act Improvement Act, 25 May 2006. 7. The updated INRMP is intended to be consistent with the SAIA.

The primary purpose of CBTC is to support the military missions of the NCNG. The INRMP is designed to support and accommodate accomplishment of the military missions by enabling sustained use of training lands in perpetuity through natural resources stewardship and management. Specific goals identified by the INRMP are:

GOAL 1: Manage natural resources in a manner that is compatible with and supports the military mission while complying with applicable Federal and State laws and Army regulations and policies.

GOAL 2: Monitor the condition of the natural resources and the implied impacts from training and the natural resources management program on the natural resources at CBTC.

GOAL 3: Protect, Restore and Maintain Populations of Rare Plant and Animal Species on CBTC in Compliance with Federal and State Laws and Regulations.

GOAL 4: Manage Game and Nongame Fish and Wildlife Species

GOAL 5: Sustain usable training lands and native natural resources by managing non-native and invasive species, vegetation and plant communities, and nuisance wildlife species.

GOAL 6: Protect and maintain the terrestrial habitat at CBTC for the purposes of military training, soil stabilization, vegetative cover, and wildlife habitat.

GOAL 7: Manage forest resources to the benefit of the military mission, to perpetuate the ecosystem functions, to support regional ecosystem needs, and for the production of forest products.

GOAL 8: Protect, maintain, and improve soil and water quality on CBTC in accordance with applicable Federal, State, and local regulations.

GOAL 9: Manage soils, surface waters and wetlands on CBTC in accordance with applicable Federal, State, and local regulations.

GOAL 10: Provide Recreational Opportunities within the Constraints of the Military Mission and Consistent with Sound Ecological Principles while Maintaining the Security of CBTC.

GOAL 11: Continue current partnerships and seek new partners interested in the stewardship of CBTC's natural resources.

GOAL 12: Develop, maintain, and manage data regarding natural resources at CBTC through the use of Geographic Information System (GIS) for efficient data storage, retrieval, analysis, and presentation.

GOAL 13: Identify and evaluate land impacts from training, and prioritize and assess land management activities in order to maximize the capability, accessibility, and availability of CBTC land to meet the training mission by implementing the Range and Training Land Assessment (RTLA) program.

GOAL 14: Provide military trainers and land managers with the necessary technical and analytical data (1) to integrate doctrinally based training with land constraints; (2) to quantify training land carrying capacity; and (3) to ensure sustained accessibility to adequate training lands by implementing the Training Requirement Integration (TRI) program.

GOAL 15: Apply Best Management Practices (BMP) to ensure rehabilitation, repair and maintenance results are commensurate with the applied resources and to ensure long-term sustainability of installation lands, training and testing missions by implementing the Land Rehabilitation and Maintenance (LRAM) program.

GOAL 16: Educate CBTC land users on how their activities impact the environment and their responsibilities as stewards of the environment by implementing the Sustainable Range Awareness (SRA) program.

These goals are supported in the INRMP by objectives and projects, which provide management strategies and specific actions to achieve these goals. Goals and objectives are listed in Section 7.0 of the INRMP, and projects are listed in **Table 10** of **Section 8.0**.

These goals will ensure the success of the military mission and conservation of natural resources. The general philosophies and methodologies used throughout the CBTC natural resources management program are focused on conducting doctrinally required military training while maintaining ecosystem viability and sustainability.

This updated INRMP provides a description of the installation (e.g., location, history and mission), information regarding the on-site and adjacent physical and biotic environment, and specific natural resource management programs designed for successful and sustainable military training. Additionally, this INRMP presents methods that will increase the environmental awareness of NCNG personnel, guest units using CBTC for training, and the general public. The implementation of this INRMP at CBTC will ensure the successful accomplishment of the NCNG's military missions while promoting adaptive stewardship practices that sustain ecosystem and biological integrity and by providing for multiple uses of natural resources.

Existing cultural resources at CBTC are referenced within the context of established management protocols as a means of ensuring the compatibility of the INRMP and the

cultural and historic resources included in the NCNG's Integrated Cultural Resource Management Plan (ICRMP).

An Environmental Assessment (EA) of the 2001 CBTC INRMP was completed to fulfill the requirements of the National Environmental Policy Act (NEPA). The EA presented the *Preferred Alternative* (implementation of the INRMP) and other alternatives, summarized the affected environment, and assessed the environmental consequences of implementation. The EA concluded that implementation of the INRMP under the *Preferred Alternative* was expected to result in net positive effects by sustaining and enhancing the natural resources while providing for no let loss in training lands. A Finding of No Significant Impact (FNSI) was signed by NGB and the CBTC INRMP was implemented.

Implementation will be a continuation of the *Preferred Alternative* identified in the EA for the 2001 CBTC INRMP. As such, the 2001 INRMP EA and the FNSI are valid for the updated INRMP and a new NEPA has not been conducted. An Environmental Checklist and a REC citing the 2001 INMRP EA are included in **Appendix C**.

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APPENDICES

ABBREVIATIONS AND ACRONYMS

ACHP	Advisory Council on Historic Preservation
ADP	Advanced Data Processing
AEDB-EQ	Army Environmental Database Environmental Quality
AERO	Army Environmental Reporting Online
AMEC	AMEC Earth & Environmental, Inc.
APFT	Army Physical Fitness Test
AR	Army Regulation
ARNG	Army National Guard
BMP	Best Management Practice
°C	degrees Celsius
CBTC	Camp Butner Training Center
CFMO	Construction and Facilities Management Office
CFR	Code of Federal Regulations
CTRE	Center for Transportation Research and Education
CWA	Clean Water Act
CWMTF	Clean Water Management Trust Fund
DA	Department of the Army
DENIX	Defense Environmental Information Network Exchange
DoD	Department of Defense
DoDI	DoD Instruction
DUSD	Deputy Under Secretary of Defense
EA	Environmental Assessment
EMS	Environmental Management System
EO	Executive Order
EPRWeb	Environmental Program Requirements
EQR	Environmental Quality Report
ESA	Endangered Species Act
ES&OH	Environment, Safety & Occupational Health
EST	Engagement Skills Trainer
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FIRM	Federal Insurance Rate Map
FMP	Forest Management Plan
FNSI	Finding of No Significant Impact
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
I	Interstate
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
ISO	International Standards Organization
ITAM	Integrated Training Area Management
IVC	International Vegetation Classification
IWFMP	Integrated Wildland Fire Management Plan
JFHQ	Joint Forces Headquarters
JFHQ-NC	Joint Force Headquarters, North Carolina
KD	Known Distance
LCTA	Land Condition Trend Analysis
LRAM	Land Rehabilitation and Maintenance
LWSC	Low Water Stream Crossing
MBTA	Migratory Bird Treaty Act
METL	Mission Essential Task List
MFR	Memorandum for Record
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPB	Multi-Purpose Building
MSC	Major Subordinate Commands
NCAC	North Carolina Administrative Code

NCNG	North Carolina National Guard
NCDEQ	North Carolina Department of Environmental Quality
NCDFR	North Carolina Division of Forest Resources
NCDWQ	North Carolina Division of Water Quality
NCGS	North Carolina General Statutes
NCNHP	North Carolina Natural Heritage Program
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NGB-IEZ	NGB Chief of Environmental Programs
NHPA	National Historic Preservation Act
NRBRC	Neuse River Basin Regional Council
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSW	Nutrient-Sensitive Waters
ODCSOPS	Office of the Deputy Chief of Staff for Operations
PAO	Public Affairs Officer
PEM	Palustrine Emergent
PFO	Palustrine Forested
PL	Public Law
PLS	Planning Level Survey
POW	Prisoners-of-war
PSS	Palustrine Scrub-Shrub
REC	Record of Environmental Consideration
	Support System
RTLA	Range and Training Land Assessment
RTLP	Range and Training Land Assessment
SAIA	Sikes Act Improvement Act
SCO	State Climate Office
SDSFIE	Spatial Data Standard for Facilities, Infrastructure, and Environment
SDZ	Surface Danger Zone
SERCC	Southeast Regional Climate Center
SMZ	Streamside Management Zone
SOP	Standing Operating Procedures
SR	State Route
SRA	Sustainable Range Awareness
SRM	Sustainment, Restoration, and Maintenance
SRP	Sustainable Range Program
STEP	Status Tool for Environmental Programs
TNC	The Nature Conservancy
TRI	Training Requirement Integration
TSM	Training Site Manager
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WES	Waterways Experiment Station
WS	Water Supply
WWTP	Waste Water Treatment Plant

1.0 INRMP OVERVIEW AND POLICIES

1.1 Purpose

The Integrated Natural Resources Plan (INRMP) is the primary guidance document and tool for managing natural resources at North Carolina National Guard's (NCNG) Camp Butner Training Center (CBTC). CBTC must provide a variety of environmental conditions and ecosystems in which to train soldiers. This objective must be met in a way that provides for sustainable, healthy ecosystems, complies with applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. INRMPs help installation commanders manage natural resources more effectively to ensure that installation lands remain available and in good condition to support the installation's military mission.

CBTC includes approximately 4,880 acres of state owned land under the command of the NCNG. The installation is located in Durham and Granville Counties in the north-central Piedmont section of North Carolina and is approximately 35 miles northwest of Raleigh, 15 miles northeast of the city of Durham, and 4 miles northwest of the town of Butner and Interstate 85.

The Sikes Act Improvement Act (SAIA) of 1997, (most recently amended through Public Law 113-291, December 19, 2014 and codified at 16 U.S.C. §670 - 670f) requires Federal military installations with significant natural resources to develop an INRMP and implement cooperative agreements with other agencies. All of CBTC land is state owned. However, a 2012 amendment to the Sikes Act authorizes the preparation of INRMPs for State-owned National Guard installations used for training pursuant to Chapter 5 of Title 32 of the United States Code. The updated INRMP is intended to be consistent with the SAIA.

The Department of Defense (DoD), Office of the Deputy Under Secretary of Defense (DUSD), Integrated Natural Resources Management Plan (INRMP) Implementation Manual, dated 25 November 2013, identifies the DoD policy concerning INRMP reviews, public comment, and endangered species consultation. INRMPs are required to be jointly reviewed by the United States Fish and Wildlife Service (USFWS), State conservation agency, and military proponent for operation and effect on a regular basis, but not less often than every five years. Public review and comment are required in accordance with the level of National Environmental Policy Act (NEPA) analysis required. Minor updates and continued implementation of an existing INRMP do not require additional NEPA analysis or opportunity for public comment. Major revisions to an INRMP do require additional NEPA analysis and an opportunity for public review. The degree of endangered species consultation when updating or revising an INRMP depends upon the management strategies identified in the INRMP and the amount of past consultation. Most updates and revisions will not require formal consultation. Section 7 consultation is required for INRMPs that contain management strategies that may affect federally listed species or critical habitat. The need for such consultation should become apparent during the review for operation and effect and implemented if necessary as part of a revision.

Department of the Army (DA), Memorandum, DAIM-ED, 25 May 2006 provides guidance on how the Army implements the SAIA. This guidance addresses what an INRMP is, its purpose, who prepares it, the criteria for determining which installations require an INRMP, coordination requirements, reporting requirements, review requirements, Endangered Species Act (ESA) consultation requirements, public access policies, the requirement for no net loss of capability to support military training, and a few other topics. This is a general guidance document on the purpose, development, implementation, and update/ revision of INRMPs. It requires INRMPs to be developed jointly with the USFWS and State conservation agency. It requires INRMPs to support the military mission and details the review process with emphasis on joint annual reviews and review for operation and effect no less than every five years. The guidance also indicates that the review for operation and effect will determine if a revision is required. A revision is not required if the cooperating agencies agree that an INRMP is meeting the intent of the Sikes Act. Instead, the INRMP can be updated as necessary and implementation continued.

This INRMP is an update and reorganization of the 2010 CBTC INRMP, developed for the planning period from 2019 through 2024, and is the result of a review for operation and effect done by the USFWS, North Carolina Department of Environmental Quality (NCDEQ), and NCNG. Both the NCNG environmental office and military trainers were included in the review.

Based on the desire to update the INRMP, the NCNG took on the task to update and reorganize to incorporate updated natural resources data. The INRMP has been updated and reorganized as follows.

- An INRMP Implementation Analysis to determine what projects and programs have been implemented has been developed and included is included in **Section 1.5.2** (see **Table 1**).
- Geographic Information System (GIS) data has been generated and mapping updated.
- Management goals and objectives have been more clearly stated.
- The list of implementation projects has been updated and includes a column that compares the projects to the 2010 INRMP.
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- The text has been updated to include a discussion of the Sustainable Range Program (SRP), to incorporate the NCNG Environmental Management System (EMS), and to include a discussion of the Status Tool for Environmental Programs (STEP).

- An Environmental Check List and Record of Environmental Consideration (REC) have been developed and included in **Appendix C**.

1.2 Authority

This revised INRMP has been prepared pursuant to the following laws, regulations, and directives:

- The Sikes Act, as amended by The National Defense Authorization Act of 2012, codified at 16 USC 670a et seq
- The Endangered Species Act (ESA), as amended by the National Defense Authorization Act of 2004, codified at 16 USC 1533(b)(2) and 1533 (a)(3)(b)
- Department of Defense Instruction (DoDI) 4715.03, Natural Resources Conservation Program, 18 Mar 2011
- Department of Defense Manuel (DoDm) 4715.03, Integrated Natural Resources Management Plan Implementation Manuel, 25 November 2013
- Department of the Army Memorandum, Guidance for Implementation of the Sikes Act Improvement Act, 25 May 2006
- AR 200-1, Environmental Protection and Enhancement; 13 December 2007
- 32 Code of Federal Regulations (CFR) 651, *Environmental Effects of Army Actions*;
- AR 315-19, The Army Sustainable Range Program;
- Memorandum, DAIM-ED, Guidance for Implementation of the SAIA, 25 May 2006;
- 32 CFR 190, Appendix-Integrated Natural Resources Management;

1.3 Responsibilities

The Adjutant General is directly responsible for the operation and maintenance of CBTC facilities, including implementation of this INRMP. Under the direction of the Adjutant General, the force structure (types and number of units, types of equipment, training events, etc.), projects, construction and budgets at CBTC are determined throughout

the 5-year period of the INRMP. Under the leadership of the Adjutant General, all CBTC personnel are trained in environmental awareness and as such, comply with policies, procedures, requirements and applicable laws and regulations that accomplish the goals and objectives of the INRMP. The Joint Force Headquarters - North Carolina (JFHQ-NC), J3 Directorate implements the Adjutant General's policies at CBTC.

CBTC Facility Manager conducts day-to-day operations, schedules training areas, supervises the full-time staff, enforces the rules and regulations, and supervises the maintenance of facilities and administration.

The State Training Site Manager (TSM), located in the J3 Directorate, is responsible for coordinating the Integrated Training Area Management (ITAM) program. The TSM develops a baseline of current and projected training requirements, provides CBTC utilization data, assists the Director of Environmental Management (DEM) in determining the capacity for the training site, schedules Land Rehabilitation and Maintenance (LRAM) projects with the DEM and the TSM, and allocates funds and resources to accomplish ITAM requirements.

The DEM is responsible for directing the management of existing resources (flora, fauna, air quality, and water quality of the training site), identifying compliance requirements and providing guidance to the NCNG personnel. The DEM provides technical assistance to the training site personnel to develop projects, secure required permits, conduct field studies, provide Sustainable Range Awareness (SRA) materials, identify natural and cultural resources, direct the NEPA process, and provide input to the revision of the INRMP.

The statewide Construction and Facilities Management Office (CFMO) provides a full range of environmental, financial and engineering services for all facilities under the jurisdiction of the NCNG. The CFMO is responsible for master plan implementation and construction. The CFMO also provides input for the development of SRA training materials.

The Public Affairs Officer (PAO) serves as a liaison between the NCNG and the public. The PAO represents the NCNG in public meetings, prepares media presentations and promotes the personnel and events occurring at various NCNG locations.

The Staff Judge Advocate is the legal advisor to the Adjutant General and the NCNG staff on laws and regulations that affect training land use, environmental compliance and policy.

The Army National Guard (ARNG), Installations and Environment Directorate (ARNG-IEZ):

- Ensures environmentally sustainable operations and planning.
- Ensures that Army environmental policy is implemented within the ARNG.
- Ensures that environmental stewardship is incorporated into all aspects of the ARNG mission
- Integrates program guidance, goals, and issues across installation functional areas and planning areas.
- Budgets and executes environmental resources consistent with program needs.

The USFWS provides technical assistance to the CBTC Natural Resources Manager and is a cooperator during preparation of this Plan. Specifically, the USFWS is the principal advisor to CBTC on issues regarding federally protected rare, threatened and

endangered species.

The NCDEQ provides guidance to CBTC Natural Resources Manager on species and habitats of special state concern and is a cooperator during the preparation of this Plan. The Division of Forest Resources provides information pertaining to forest management. They also provide information for the management of wildlife**,** recreation, water quality protection, and soil protection**.**

The North Carolina Wildlife Resources Commission, a special agency to the NCDEQ, has been dedicated to conserve and sustain the state's fish and wildlife resources through research, scientific management, wise use, and public input. Their policies and programs are based on scientifically sound resource management, assessment and monitoring, applied research, and public input. The commission provided input to the NCNG during the INRMP update and continually advises the NCNG on wildlife and forestry related issues and concerns.

1.4 Management Philosophy

This INRMP update for CBTC has been developed in cooperation with USFWS and NCDEQ. Developed using an interdisciplinary approach, information has been gathered from various NCNG directorates, the CBTC staff, as well as other Federal, State and local agencies and special interest groups with an interest in the management of natural resources at CBTC. Agencies and organizations consulted during the development of this INRMP, as well as initial agency coordination and response letters, have been included in **Appendix A**.

Enabling long-term use of CBTC for military training is the primary purpose of natural resources management at CBTC. The CBTC INRMP is a training-driven plan, created with a dual goal:

- To allow for and support the conduct of military training at levels necessary to maintain a full readiness posture for national defense and civil missions; and
- To provide for management of natural resources in an ecosystem-oriented, sustainable manner, consistent with federal, state, and local regulations.

NCNG embraces the concept of integrating holistic natural resource management with mission activities. NCNG recognizes that on-going military training and associated mission activities can consume and potentially damage the natural resources on mission land, and that successful execution of their mission in perpetuity is dependent upon sustainable land use and the conservation of these natural resources. NCNG is committed to the planned, deliberate management of natural resources, supporting the installation operational mission, meeting or exceeding stewardship requirements, partnering in local and regional conservation initiatives, and enhancing the quality of life for its personnel and guests.

NCNG recognizes that it is a steward of publicly-owned natural resources and, as compatible with the military mission and CBTC safety and security requirements, that it has a responsibility to provide access for the use and enjoyment of these resources in a manner consistent with the resources' ability to support such use. NCNG also recognizes the responsibility to ensure that the natural resources entrusted to their care are sustained in a healthy condition for scientific research, education and other compatible uses by future generations.

The overall policies and philosophy of land management at CBTC are derived from AR

200-1 and 32 CFR 651. These policies, regulations and programs are based on the concept that natural resources management is an integral component of the primary mission of military use. NCNG must train; therefore, NCNG will manage CBTC to conserve valuable training resources, including the natural environment. Management of natural resources on an ecosystem basis ensures the sustainable use of training lands while considering the effects on the surrounding environment and public concern.

1.4.1 Military Mission

The primary purpose of natural resources management at CBTC is to support the military training mission. With regard to accomplishment of the military mission, the overall goal is to maintai*n sustainable natural resources as a critical training asset* upon which to accomplish the mission of the NCNG at CBTC. Components of this overall goal include:

- Ensure no net loss in the capability of installation lands to support existing and projected military training and operations at CBTC; and
- Maintain quality training lands through proactive management, range and training land monitoring and damage minimization, mitigation, and rehabilitation.

This INRMP integrates aspects of natural resources management into the military mission. As such, it becomes the primary tool for ecosystem management at CBTC while ensuring the successful, efficient accomplishment of the military mission. A multiple-use ecosystem management approach will be implemented to accommodate mission-oriented activities and provide for good stewardship, thereby maintaining and improving the quality, aesthetic values and ecological relationships of the environment.

Specific military missions and training requirements are fluid and change from time to time with realignments, transformations, and changes in equipment and tactics. This requires the establishment of basic underlying natural resource management principles and practices that have broad application and can be adapted in multiple situations, such as is the case with surface water and soil management practices. Implementation of this INRMP at CBTC will successfully promote adaptive stewardship practices that protect and enhance natural resources for multiple use, sustainable yield and biological integrity, while supporting the military mission.

1.4.2 Environmental Management System

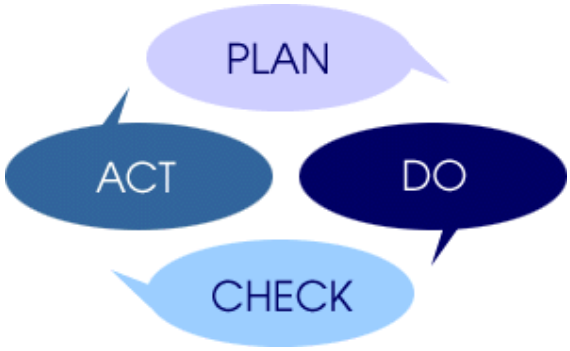
This INRMP directly supports the NCNG's and the NGB's EMS. Executive Order (EO) 13693, Planning for Federal Sustainability in the Next Decade, was signed by President Obama on 19 March 2015. Section 16 of this EO revokes the following:

- Executive Order 13423 of January 24, 2007;
- Executive Order 13514 of October 5, 2009;
- Presidential Memorandum of December 2, 2011 (Implementation of Energy Savings Projects and Performance-Based Contracting for Energy Savings);
- Section 1 of Presidential Memorandum of February 21, 2012 (Driving Innovation and Creating Jobs in Rural America through Biobased and Sustainable Product Procurement); and
- Presidential Memorandum of December 5, 2013 (Federal Leadership on Energy Management); and

- Presidential Memorandum of May 24, 2011 (Federal Fleet Performance).

The goal of EO 13693 is to maintain Federal leadership in sustainability and greenhouse gas emission reductions. Army Directive 2014-02 (NZ Policy)(28 Jan 2014) establishes The Army's Net Zero (NZ) Initiative and is built upon the Army's long-standing energy efficiency and sustainability practices. It is a strategy for managing existing energy, water, and solid waste programs with the goal of exceeding minimum targets, where fiscally responsible, to provide greater energy and water security and increase operating flexibility. The NCNG has developed and is implementing an EMS that covers all its operations, facilities, and training sites. The EMS is part of the overall NCNG management system and includes organizational structure, planning, responsibilities, practices, procedures and processes, and resource allocation for developing, implementing, achieving, reviewing, and maintaining environmental commitments. The International Standards Organization (ISO)-14001 EMS model used by the NCNG leads to continual improvement based upon a cycle of "plan, do, check, and act":

- Planning, including identifying environmental aspects and establishing goals [plan];
- Implementing, including training and operational controls [do];
- Checking, including monitoring and corrective action [check]; and
- Reviewing, including progress reviews and acting to make needed changes to the EMS [act].



Source: USEPA 2004

The EMS is continually updated through this cycle, fine-tuning its management of operations that may harm the environment. This continual improvement cycle is a fundamental attribute of the EMS that allows the system to adapt to the dynamic nature of the organization's operations.

This INRMP directly supports the NCNG's and the NGB's EMS. Annual review of the INRMP in conjunction with the USFWS, NCDEQ, and other state agencies will be conducted in order to support the concept of EMS. Annual reviews are discussed in **Section 8.3** and monitoring of implementation is discussed in **Section 8.4.**

1.4.3 Ecosystem Management

An ecosystem is the "sum of the plant community, animal community, and environment in a particular region or habitat" (Barbour et al. 1987). Ecosystem management may be defined as management "to restore and maintain the health,

sustainability, and biological diversity of ecosystems while supporting sustainable economies and communities" (U.S. Environmental Protection Agency [USEPA] 1994).

The goal of ecosystem management is "to ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity" (DoDI 4715.03). Natural resources at CBTC will be managed with an ecosystem management approach.

Principles and guidelines of ecosystem management, per DoDI 4715.03, are as follows:

1. Guarantee continued access to land, air and water for realistic military training;
2. Maintain and improve the sustainability of native biodiversity of ecosystems;
3. Administer with consideration of ecological units and timeframes;
4. Support sustainable human activities;
5. Develop vision of ecosystem health;
6. Develop priorities and reconcile conflicts;
7. Develop coordinated approaches to work toward ecosystem health;
8. Rely on the best science and data available;
9. Use benchmarks to monitor and evaluate outcomes;
10. Use adaptive management;
11. Implement through installation plans and programs.

Biological diversity or biodiversity may be defined as "the variety of living organisms considered at all levels of organization, from genetics through species, to higher taxonomic levels, and including the variety of habitats and ecosystems, as well as the processes occurring therein" (Meffe and Carrol 1994).

Biodiversity refers to the variety and variability among living organisms and the environment in which they occur. Biodiversity has meaning at various levels including ecosystem diversity, species diversity, and genetic diversity. The DoD has developed a Biodiversity Management Strategy (Keystone Center 1996). This document identifies five reasons to conserve biodiversity on military lands:

1. Sustain natural landscapes required for the training and testing necessary to maintain military readiness;
2. Provide the greatest return on the DoD investment to conserve and protect the environment;
3. Expedite the compliance process and help avoid conflicts;
4. Engender public support for the military mission;
5. Improve the quality of life for military personnel.

The Keystone Center report notes that the challenge is "to manage for biodiversity in a way that supports the military mission". This strategy identifies the INRMP as the

primary vehicle to implement biodiversity conservation on military installations. The model process developed within the strategy includes the following principles:

- Support the military mission;
- Use joint planning between natural resources managers and military operations personnel;
- Integrate biodiversity conservation into the INRMP and other planning protocols;
- Involve internal and external stakeholders up front;
- Emphasize the regional (ecosystem) context;
- Concentrate on results.

Specific management practices identified in this INRMP have been developed to enhance and maintain biological diversity within the ecosystems at CBTC. **Section 6.1** identifies the specific natural resources management programs. Details on ecosystem management strategies are given in applicable program descriptions.

1.4.4 Sustainable Range Program

The SRP is the Army's overall approach for improving the way in which it designs, manages, and uses its ranges to ensure long-term sustainability. Requirements for the SRP are set forth in AR 350-19, *Army Sustainable Range Program*, effective August 2005. The SRP is defined by its two core programs, the Range and Training Land Program (RTLP) and the ITAM Program, which focus on the doctrinal capability of the Army's ranges and training land. To ensure the accessibility and availability of Army ranges and training land, the SRP core programs are integrated with the facilities management, environmental management, munitions management, and safety program functions supporting the doctrinal capability.

1.4.5 Range and Training Land Program (RTLP)

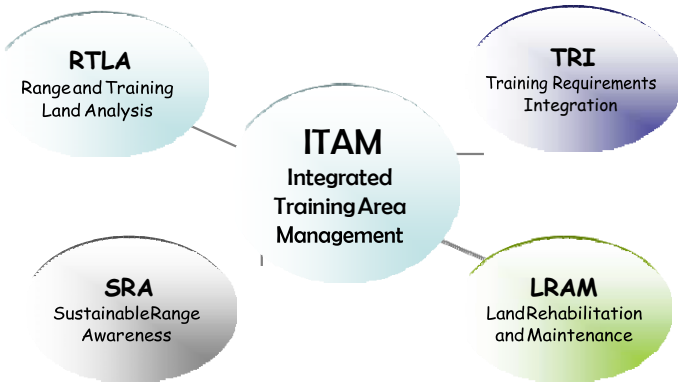
The RTLP provides a range operations and modernization capability for the central management and prioritization and the planning and programming of live-fire training ranges and maneuver training lands, including the design and construction activities associated with them. The RTLP planning process integrates mission support, environmental stewardship, and economic feasibility and defines procedures for determining range projects and training land requirements to support live-fire and maneuver training. The RTLP defines the quality assurance and inspection milestones for range development projects and the Standing Operating Procedures (SOP) to safely operate military training, recreational, or approved civilian ranges under Army control and support Commanders' Mission Essential Task List, (METL) and Army training strategies. RTLP also establishes the procedures and means by which the Army range infrastructure is managed and maintained on a daily basis in support of the training mission.

1.4.6 ITAM

The Integrated Training Area Management (ITAM) program is a core program of the Army's Sustainable Range Program (SRP) and is responsible for maintaining the land to help the Army to meet its training requirements. The ITAM program provides Army range managers with the capabilities to manage and maintain training and testing lands by integrating mission requirements derived from the RTLP with environmental requirements and environmental management practices. The objectives of the Army's ITAM program are to:

- Achieve optimal sustained use of lands for the execution of realistic training and testing by providing a sustainable core capability that balances usage, condition, and level of maintenance.
- Implement a management and decision-making process that integrates Army training and other mission requirements for land use with sound natural resources management.
- Advocate proactive conservation and land management practices by aligning Army training land management priorities with the Army training and readiness priorities.

The NCNG's ITAM program is administered through J3. CBTC is classified as a Category IV ITAM site. The ITAM program is comprised of four proactive subprograms designed to facilitate these processes as illustrated and discussed further below:



1.4.6.1 Range and Training Land Analysis

Range and Training Land Analysis (RTLA), formerly known as the Land Condition Trend Analysis (LCTA), is the natural resources data collection and analysis component of the ITAM program and focuses on sustaining doctrinal training. RTLA provides for the collecting, inventorying, monitoring, managing, and analyzing of tabular and spatial data concerning land conditions on an installation. The intent of RTLA is to collect essential natural resources baseline information that is needed to effectively manage training lands. The Army initiated RTLA in the mid-1980s and emphasized uniform data collection methodologies to provide regional, Major Command, or national-level land assessments.

With the adoption of SRP/ITAM by the Training and Operations community, RTLA has evolved into a decentralized, installation-level program. This allows installation-level land managers and range operations staff to determine how they can best collect and use resource data to support short- and long-term land management decisions such as training area allocation, training area use, and land rehabilitation.

RTLA Implementation at CBTC

RTLA plots were established in 1999 throughout CBTC. The 30 RTLA plots were distributed in the following community types: bottomland hardwood, grass (range 4 and 7, natural pine, pine plantations, pine-hardwood, and upland hardwood. Initial data at each plot included: soil data; land use and disturbance (if any); vegetation;

and songbirds and small mammals (at 10 of the plots). Data was collected from 1999 – 2001. RTLA data is maintained by the CBTC Environmental Office.

Special use plots have also been established at CBTC. Installations may establish special use plots for matters they deem significant, and may determine plot design and monitoring methods. The following types of special use plots have been designated for inclusion in the RTLA program at CBTC.

- **Stream Sediment.** The purpose of these plots is to ensure that installation roads/trails do not have a detrimental effect on stream sediment load. Water samples will be collected quarterly, upstream and downstream from three points where roads intersect with streams. Two of these points have no erosion control devices installed at the present time. At the third, a large culvert has recently been constructed to replace a smaller one that had washed out during a heavy storm event.
- **Stream Health.** Benthic macroinvertebrate communities are used to assess stream health at these plots. A segment of each of the two major streams that traverse the installation, Camp Creek and Knap of Reeds Creek, will be sampled annually to determine the number and types of macroinvertebrate species present. The sampling locations will be selected in areas with a variety of microhabitats to maximize the number of species encountered. Stream Health monitoring protocols are included in **Appendix D**.
- **Invasive Plants.** Invasive plant species such as Japanese stilt grass (*Microstegium vimineum*), kudzu (*Pueraria lobata*), and Chinese wisteria (*Wisteria sinensis*) can become extremely aggressive and exclude native species. These species will be monitored at several locations where they have been identified as problematic. The approximate boundaries of each infestation will be delineated annually using Global Positioning System (GPS) to determine the total area occupied by the species and to ascertain whether the population is expanding into new areas or contracting. In addition, photo points will be established to aid in the description of changes over time and the results of any control efforts employed.
- **Weed Control.** CBTC maintenance personnel use limited herbicide applications for the elimination of unwanted vegetation, including the invasive species mentioned above.
- **Prescribed fire.** Prescribed burning is a useful practice for reducing fuel loads, improving wildlife habitat, and managing timber stands. To evaluate the outcome of a burn, a series of subplots will be randomly allocated within the area that was burned the previous year. At each subplot, char height will be measured, and the fuel load estimated using photo indices. Understory plant species will be sampled to gather information on species composition and density following burns. Any occurrence of invasive plants on burned areas will be documented to enable the prompt initiation of control measures. If deemed appropriate, these plots may be monitored for several years following the burn.

Several other types of special use plots are currently being considered for CBTC, which include:

- Monitoring the condition of sensitive soils, particularly Tatum loam and other series with high potential for erosion
- Evaluation of erosion control efforts on range areas
- Monitoring stream water quality at entry and exit points on CBTC, through chemical analyses of water samples
- Surveys of snags and downed woody material available for wildlife
- Estimates of wild turkey (*Meleagris gallopavo*) and white-tailed deer (*Odocoileus virginianus*) populations

1.4.6.2 Training Requirements Integration

Training Requirements Integration (TRI) is the land degradation prevention program of ITAM that provides a decision support procedure that integrates training requirements with land management, training management, and natural and cultural resources management processes and data derived from RTLA and Army Conservation Program components. TRI relies heavily on RTLA-generated data to assist in determining the capability of the land to sustain a particular training activity with minimal disturbance to the affected environment.

Disturbances produced by training may be minimal and not appear to require restoration efforts. However, even small areas of disturbance can start a gully on sloping lands. Gullying can result in damage to vehicles and structures, loss of access to training areas, degraded wildlife habitat, and deposition of soil into streams.

TRI matches a training activity with the most suitable site, and includes a rotation schedule for training lands. TRI also incorporates restrictions required to maintain site quality, protect significant natural resources and minimize land damage while providing a safe training environment. The implementation of TRI requires coordination between installation/operations training staff and natural resources management/environmental staff.

TRI allows appropriate allocation of specific training requirements to specific land parcels. The decision-making and allocation process is based on the land's "carrying capacity" with respect to training activities. The following are examples of possible land use options exercised through TRI:

- Re-designate the parcel's use to an alternative training, mission, or non-mission activity to permit natural recovery; prolong sustainable use; or allow for rehabilitation, repair and maintenance;
- Re-design or reinforce a given parcel to support higher impact training;
- Alter likely training use of a given parcel by redesigning and reconfiguring the parcel;
- Cease training temporarily on a given land parcel to permit rehabilitation, repair and maintenance; and
- Cease all training permanently on a given parcel of land due to severe impacts and initiate restoration of that parcel.

1.4.6.3 Land Rehabilitation and Maintenance

Land Rehabilitation and Maintenance (LRAM) is the component of the ITAM Program that provides preventive and corrective land rehabilitation and maintenance to reduce long-term impacts of training on an installation. It includes training area redesign and/or reconfiguration to meet training requirements. Training-damaged lands can be repaired and land construction technology can be used to avoid future damage.

Projects are specifically designed to maintain quality military training lands, minimize long-term costs associated with land rehabilitation or additional land purchase, ensure compliance with environmental laws and regulations, and reduce erosion. The LRAM process begins with identification of potential LRAM projects, which may be planned and conducted in-house or through contract. RTLA data and GIS technology are typically used to help identify projects. Two common types of LRAM projects are training area rehabilitation and hardened sites.

Training area rehabilitation uses a wide array of techniques to correct erosion features, minimize disturbance, and revegetate denuded areas. Rehabilitation areas may also be temporarily "off-limits" or protected through other restrictions. Techniques are specific to each project. Revegetation techniques use native plant species proven effective for erosion control.

Hardened sites are areas that have been resurfaced with a base material, often overlaid with gravel. Sensitive areas within hardened sites may also be protected using barriers. Hardened sites are created in areas that receive repetitive training within a small area to the point where vegetation is damaged and "realism" is already drastically compromised. Potential locations include bivouac sites, firing points and troop assembly areas.

LRAM Implementation at CBTC

NCNG implements the LRAM program at CBTC through the use of cost-effective technologies, such as revegetation and erosion control techniques, to reduce soil loss, control water runoff, and protect wetlands and waterways. LRAM efforts are specifically designed to minimize long-term costs associated with land rehabilitation and reduce the need to relocate training activities due to unusable existing training site conditions. Successful execution of the CBTC LRAM program will ensure compliance with environmental laws and regulations, in particular the federal Clean Water Act (CWA). Specific water protection and soil conservation management strategies are described in greater detail in **Section 6.5**.

1.4.6.4 Sustainable Range Awareness

Awareness is crucial to the protection of diverse resources, such as sensitive species and wetlands. SRA is an educational program that promotes environmental stewardship and responsible use of natural resources on military lands. NCNG SRA program focuses on all land users including soldiers, leaders, civilians, and the local community. SRA serves to educate the public on the military mission's natural resources needs and impacts.

Military Personnel Awareness

The SRA program particularly focuses on developing and distributing awareness materials, such as soldier's handbooks, leader's handbooks, field cards, training videos, and posters. Site-specific information can be provided to training site users to

prevent unnecessary damage to the environment and in particular, training lands. Through the dissemination of information, site users can improve their understanding of the effects of their mission and training activities on natural resources.

Implementing natural resources protection requirements in the field depends on effective communication with military trainers. Awareness materials and briefings are important methods of communicating natural resources concerns to CBTC military personnel. SRA materials should be as site-specific as possible, with photographs or drawings illustrating specific or unique on-site natural resources. Materials should be durable for field use. Photographs of rare species and special habitats should be placed in highly visible places to ensure maximum audiences (briefing rooms, billeting common areas, etc.).

Public Awareness

Articles published in local newspapers, public service announcements on television and radio are excellent means of promoting new or existing programs involving the NCNG and CBTC. Such media reaches a diverse audience, and will be specifically designed to promote the CBTC mission within the context of stewardship. Awards presented to training site personnel are a good topic for such articles/announcements, and can highlight a "good neighbor" ethic. All correspondence will be coordinated through the NCNG PAO in Raleigh, NC.

NCNG is committed to cultivating a conservation ethic in the community, especially local youth. Natural resources personnel work with community and youth groups on conservation programs whenever possible. Scouts, in particular, often need support with projects, merit badges, and conservation talks. Scouting events are held annually at CBTC. A Noise Management Plan was prepared in 2013. The CBTC Outreach Plan is on-going. NCNG will continue to work with community and youth groups whenever possible.

1.5 Conditions for Implementation and Revision

1.5.1 Implementation

The NCNG DEM is responsible for directing the management of natural resources and for the development and implementation of the INRMP Successful implementation of the INRMP will require:

- Administrative and technical support;
- Agency cooperation and technical assistance;
- Funding;
- Priorities and scheduling;
- Production of project scopes and budgets;
- The ability to amend and revise this document as necessary.

Where projects identified in the plan are not implemented because of lack of funding, or other compelling circumstances, the NCNG will review the goals and objectives of this INRMP to determine whether adjustments are necessary.

1.5.2 Effectiveness

The primary measure of INRMP effectiveness is whether it helps prevent "net loss in the capability of military lands to support the military mission". NCNG is preserving CBTC's capability to support training through its natural resource management practices outlined in the 2010 INRMP and in this 2019 update. NCNG works with several partners to manage the forest, preserve sensitive areas, and practice effective soil conservation. These activities are coordinated through ongoing INRMP implementation.

Long-term management effectiveness is also evaluated through periodic inventories of species populations, habitat quantity and quality, and habitat values through the recurring PLS. Trends can be used to indicate the degree of success. NCNG will evaluate these recurring data as they become available.

A practical evaluation of INRMP implementation includes reviewing whether planned projects have been accomplished. An analysis of the 2010-2015 projects and their implementation status is included in **Table 1**. There were a couple projects included in the 2010 INRMP that fall outside of the realm of conservation or any environmental program. As part of the updating process, these projects have been removed because they cannot be funded or implemented via the INRMP.

Overall, CBTC has benefited from using the INRMP as a management tool. The goals articulated in the 2010 INRMP are being addressed through implementation of management actions recommended in the INRMP. Most of the specific management actions have been implemented through projects. A large number of the projects are recurring actions that are continued in this INRMP.

1.5.3 Reviews, Updates and Revisions

The SAIA requires a review for operation and effect no less than every five years to keep the INRMP current. Major changes require a revision of the INRMP, while minor changes can be incorporated with an update to the existing INRMP. A revision or update will be used based on the review for operation and effect conducted jointly with the USFWS and the NCDEQ.

On an annual basis the NCNG, the USFWS and the NCDEQ will meet to review the INRMP and discuss implementation of upcoming programs and projects. At this annual meeting the need for updates or revisions will be discussed. If minor updates are needed, the requesting party will initiate the updates and after agreement of all three parties they will be added to the INRMP. If it is determined that major changes are needed, all three parties will provide input and an INRMP revision and associated NEPA review will be initiated with the NCNG acting as the lead coordinating agency.

If not already determined in previous annual meetings, a determination will be jointly made to continue implementation of the existing INRMP with minor updates or to proceed with a revision by the fourth year annual review. If the parties feel that the annual reviews have not been sufficient to evaluate operation and effect and they cannot determine if the INRMP implementation should continue or it should be revised, a formal review for operation and effect will be initiated. The determination on how to proceed with INRMP implementation or revision will be made after the parties have had time to complete this review.

Section 1.5.2 describes how the EMS of Plan, Do, Check, and Act is tied into INRMP reviews and updates/revisions. **Section 8.3** provides specific guidance on the INRMP review process including review for operation and effect and annual reviews.

Table 1 – Implementation Analysis of the 2010-2015 INRMP

Project	Description	Implementation Status	Included in INRMP Update
GIS Support	GIS support to include contract help through NC State University for GIS assistance. This would support the training site, including Range Control.	Implemented/On-going; Annual support required	Yes
Advanced Data Processing (ADP) Equipment	Acquisition and annual support of ADP Equipment needed for range operations related to ITAM.	Implemented/On-going	Yes
Fire Suppression	Upgrade and maintenance of existing firebreaks.	Implemented/On-going; Firebreaks are maintained annually.	Yes
Tactical Vehicle Crossing	Construct one tactical vehicle crossing at Knapp of Reeds Creek. Currently, training is restricted because no environmentally sound crossing point is available.	On-going; One vehicle Crossing was completed in 2006. Maintenance of stream crossings is ongoing.	Yes
LRAM Materials	LRAM materials are needed to stabilize the soil and the firing ranges.	Implemented/On-going; Annual requirement	Yes
Installation Forestry Program	Develop an installation forestry plan to include prescribed burning to aid in the determination and data focus on over-story vegetation for both summer and winter burning.	Implemented/On-going; Updated FMP in 2006. Implementation of management plan is ongoing.	Yes
Erosion Control	Annual cost and repair of major eroded areas resulting from training.	Implemented/On-going	Yes

Table 1 – Implementation Analysis of the 2010-2015 INRMP

Project	Description	Implementation Status	Included in INRMP Update
Water Quality Monitoring	This project will involve the monitoring of permanent sample points that support both LRAM and RTLA. This will measure the effectiveness of the LRAM program by measuring the levels of sedimentation in the creeks and wetlands within the training areas to include special use plots.	Implemented/On-going	Yes
Rehabilitation and Stabilization	Training area rehabilitation and soil stabilization at bivouac areas.	Implemented	No
Print Materials	Development and publication of environmental awareness materials to include soldier field cards, leader books, posters, etc.	Implemented/On-going	Yes
Ecological Health Report	Develop an Ecological Health Report	Implemented/On-going	Yes
Public Outreach Program	Develop Public Education and Involvement Program	Implemented/On-going	Yes
CBTC user guides	Update and distribute CBTC user's guides	Implemented/On-going	Yes
Cultural Resources Surveys	Determine potential impacts to cultural resources	Implemented/On-going	Yes
Trail development and maintenance	Ongoing maintenance of existing trails and the development of new trails within inaccessible areas.	Implemented/On-going	Yes
Erosion Control	Implement erosion control measures along roads and trails, and during training and construction activities.	Implemented/On-going	Yes

Table 1 – Implementation Analysis of the 2010-2015 INRMP

Project	Description	Implementation Status	Included in INRMP Update
GIS management	Database development	Implemented/On-going	Yes
INRMP update	Update and/or revise INRMP at 5-year intervals	Implemented/On-going	Yes
Forest Management	Update stand information and outline management goals for each stand; conduct prescribed burning and timber harvests; plant trees; and apply herbicide	Implemented/On-going	Yes
Fire Management	Obtain necessary equipment and training for prescribed burning at CBTC. Implement a monitoring program for prescribed burns.	Implemented/On-going	Yes
Water Quality	Monitor water quality within CBTC	Implemented/On-going	Yes
Wetland Delineation	Update the CBTC wetland delineation report and data.	Completed in 2006; updates are done every 5 years.	Yes
Stream Management Zones (SMZ)	Develop and implement SOP for SMZ	Implemented/On-going	Yes
Stream crossings	Develop stream crossings and conduct routine maintenance and monitoring of them.	Implemented/On-going	Yes
Fauna survey	Survey of terrestrial, avian and aquatic fauna	Implemented	Yes
Wildlife Management Plan	Develop and implement wildlife management plan	not completed/On-going	Yes
Invasive Species	Control and eradicate invasive species on CBTC	Implemented/On-going	Yes
Rare Species	Manage rare species and their corresponding habitat; map high diversity areas.	Implemented/On-going	Yes

1.5.4 National Environmental Policy Act Compliance

An Environmental Assessment (EA) of the 2001 CBTC INRMP was completed to fulfill the requirements of the NEPA. The EA presented the *Preferred Alternative* (implementation of the INRMP) and other alternatives, summarized the affected environment, and assessed the environmental consequences of implementation. The EA concluded that implementation of the INRMP under the *Preferred Alternative* was expected to result in net positive effects by sustaining and enhancing the natural resources while providing for no let loss in training lands. A Finding of No Significant Impact (FNSI) was signed by NGB and the 2001 CBTC INRMP was implemented.

As discussed in **Section 1.1**, the INRMP will be reviewed by the USFWS, NCDEQ, and the NCNG as to operation and effect in accordance with the 25 November 2013 Integrated Natural Resources Management Plan (INRMP) Implementation Manual. There are no military mission changes, no program or management philosophy changes, and no input received from the USFWS or NCDEQ that resulted in changes to the way natural resources are managed at CBTC. The implementation projects identified in **Table 10** are continuations of ongoing projects with one newly identified project needed to continue implementation of an existing program. There have been no substantive changes to the content and implementation will be a continuation of the *Preferred Alternative* identified in the EA for the 2001 CBTC INRMP. As such, the 2001 INRMP EA and the FNSI are valid for the updated INRMP and a new NEPA analysis is not necessary.

An Environmental Checklist and a REC have been included in **Appendix C**. The Environmental Checklist describes the Proposed Action (update and continued implementation of the 2001 CBTC INRMP), identifies that the updated INRMP is addressed in the 2001 CBTC INRMP EA, identifies potential impacts to various environmental media and concludes that a REC is the appropriate level of NEPA documentation. The REC that goes along with the Environmental Checklist cites the EA for the 2001 CBTC INRMP as adequately covering the updated INRMP.

2.0 INSTALLATION OVERVIEW

2.1 Location and Acreage

The approximately 4,880-acres[1] CBTC, a state-owned facility, is located in Durham and Granville Counties in the north-central Piedmont section of North Carolina (**Figure 1)** and is approximately 35 miles northwest of Raleigh, 15 miles northeast of the city of Durham, and 4 miles northwest of the town of Butner and Interstate 85 (I-85). The primary access to CBTC is provided by Range Road, approximately 2 miles north of its intersection with Old North Carolina State Route (SR) 75. The Durham-Granville County line bisects CBTC, with the western portion of the installation included in Durham County and the eastern portion in Granville County. Holt Reservoir (historically Lake Butner) separates a small southeastern section of CBTC property from the primary CBTC lands (**Figure 2**). Several watercourses traverse the site, some of which drain into Holt Reservoir.

2.2 CBTC History

The present day CBTC originated from a portion of the former 40,000-acre Camp Butner Military Reservation, which was activated in June of 1942 with the outbreak of World War II. During World War II, the Camp Butner Military Reservation was used primarily for troop training exercises for two infantry divisions, the 78th and the 35th. The reservation also functioned as a prisoners-of-war (POW) camp for approximately 3,000 German prisoners. The part of the old military reservation that once housed the POW now houses the Federal Center for Correctional Research and is located off CBTC in the town of Butner.

Subsequent to the end of World War II, the need for large-scale training areas was reduced, and the installation was declared surplus property in January 1947. Ownership of approximately 4,880 acres of the Camp Butner Military Reservation was eventually conveyed to the State in September 1954, with the restriction that it be used for military training purposes only. The remaining portions of the original military reservation outside the 4,880 acres were sold to private landholders or the State. The town of Butner encompasses the cantonment area for the old military reservation. Since 1954, CBTC has been used with increasing regularity; however, improvements to the property have been made incrementally due to funding constraints.

2.3 Military Mission

In order to accomplish specific military missions and maintain overall military readiness, CBTC provides training and logistical support in North Carolina to the NCNG units, other state ARNG units, other DoD units, state and local agencies, and civic groups.

The NCNG mission is three-fold:

- **Federal Mission** – To provide properly trained and equipped units capable of immediate expansion to war strength. These units must be available for service in times of war or national emergency, or when appropriated to augment the active Army.

[1] According to CBTC GIS data, the training site is approximately 4,894 acres in size. Acreage estimates within subsequent tables were obtained via GIS.

- **State Mission** – To support civil authorities in the protection of life and property; the preservation of peace, order, and public safety; and in the event of a disaster under competent orders from North Carolina authorities.
- **Community Mission** – To participate in local, state and national programs designed to enhance the quality of life for all its citizens.

The NCNG has seven Major Subordinate Commands (MSCs) under control of the JFHQ-NC. Their missions are as follows:

- **30th Armor Brigade Combat Team** (30th HBCT, 3300 Soldiers) – To conduct full-spectrum combat operations with Abrams Tanks, Bradley Fighting Vehicles, artillery, and other weapons.
- **60th Troop Command** (60thTC, 1200 Soldiers) - To prepare and support subordinate units in mobilizing and deploying;
- **113th Sustainment Brigade** (113th SB, 2100 Soldiers) - To provide theater-level logistical support.
- **130th Maneuver Enhancement Brigade** (130th MEB, 2400 Soldiers) - To provide theater-level engineer support.
- **139th Regiment** (139th, approximately 300-500 Soldiers) To provide combat arms and combat support training, including Military Occupational Specialty Training (MOST), Additional Skill Identifier (ASI), and Noncommissioned Officer Education System (NCOES) training for the Army National Guard, the United States Reserve (USAR), and the Active Component (AC).
- **145th Air Wing** (145thAW, 1500 Airman), - To provide assorted air support, especially C-130 transport aircraft.
- **449th Theater Aviation Brigade** (449th TAB, 800 Soldiers) - To conduct aerial operations, especially with AH-64D Apache attack helicopters.

The NCNG has an extensive and active counter-drug program that provides highly skilled personnel, specialized equipment, and facilities to support law enforcement agencies and community-based organization in response to the drug threat throughout the state of North Carolina.

The Weapons of Mass Destruction mission is to protect the territory of the United States and its citizens from "all enemies both foreign and domestic." The same is true for the State of North Carolina and the NCNG. The primary reason for the increased emphasis on homeland defense is the change, both in type and degree, in the threats to the U.S.

The Tarheel Challenge program is designed to improve the life-coping skills and employment potential of high school dropouts or expellees so that they may become productive member of their communities and society in general. The program does this by concentration on eight core components: academic excellence, leadership and followership, physical fitness, community service, employment skills, health and nutrition, life-coping skills and responsible citizenship.

2.4 Surrounding Communities and Land Use

The surrounding land use zones of CBTC are predominantly rural and undeveloped. The land use consists mostly of single family homes located in a low-density pattern with scattered fields and forests. There are neither large-scale residential developments nor commercial areas in the vicinity of CBTC. The CBTC is connected to the South Granville Water and Sewer Authority's sewer system.

The area adjacent to CBTC in Durham County is zoned as rural district, which specifically designates the principal land use as agriculture. Two watershed protection districts located in Durham County include portions of CBTC: Lake Michie/Little River District A and B. Watershed District A encompasses the area lying within a one-mile distance from the normal pool of Lake Michie and the Little River Reservoir, or to the ridge lines defining their drainage basins, whichever is less. Lake Michie/Little River Watershed District B includes those portions of the drainage basis of Lake Michie and the Little River Reservoir not covered by District A.

The zoning for the land adjacent to CBTC in Granville County is an agricultural-residential district, which allows for a compatible land use mixture of agricultural, forestry, conservation, and very low-density residential. The master plan for Granville County projects little change from the current zoning and land use because no public infrastructure is planned for the area of Granville County.

The area of CBTC within Granville County lies within the Holt Reservoir and Falls Lake watershed districts. The State of North Carolina Division of Water Quality (NCDWQ) designates these Watersheds as a water supply critical area, since the lake supplies the drinking water for the town of Butner. As such, land disturbing and development activities within the watershed are subject to certain restrictions, as discussed in **Section 3.4.1**.

The town of Butner is an unincorporated city and a state entity, operated by the North Carolina Department of Human Resources. As such, its boundary is fixed in perpetuity. The administrative affairs of the town are managed through the business office of the John Umstead State Hospital. The town is primarily residential, but also includes several small industrial, institutional, and commercial businesses.

The NCNG is currently seeking land easements around the facility to restrict development adjacent to the property boundary and to reduce the likelihood of future noise issues. A no-build, no change easement is proposed for the Lake Holt property to protect the Town of Butner's water supply. The approximate 225-acre Thacker property is being proposed as a no development area in conjunction with the Durham Soil and Water Conservation District and Triangle Greenways Council. A conservation easement of approximately 500 feet along the two streams within the Barnes-Goode property is being proposed through the North Carolina Clean Water Management Trust Fund (CWMTF) in addition to the approximately 1000-acre Gantt property being considered for easement or outright purchase. Proposed conservation easements as well as properties already protected within the vicinity of CBTC are illustrated in **Figure 3**.

3.0 PHYSICAL ENVIRONMENT

3.1 Climate

CBTC climate is both moderate and seasonal, characterized by cool winters, mild spring and fall seasons, and hot summers. The climate is influenced by the proximity to the mountains to the west and the Coastal Plain to the east. The average temperature of the coldest month, January, is 37 degrees Fahrenheit (°F) (2.8 degrees Celsius [°C]), and the average temperature of the warmest month, July, is 77°F (25°C) (see **Chart 1**; WorldClimate 2001). The average growing season for the CBTC area is 200 days (Natural Resources Conservation Service [NRCS] 1999), with the last spring freeze occurring around 10 April and the first fall freeze occurring around 27 October (Southeast Regional Climate Center [SERCC] 2001). Rainfall is relatively constant throughout the year, averaging 45 inches annually and ranging from 3.1 inches of rain in April to 4. 5 inches of rain in August (**Chart 1**). There are thunderstorms approximately 44 days each year, and an average of 7.9 inches of snow falls annually. The prevailing winds are from the west-southwest at 7.5-mph (State Climate Office [SCO] 2001).

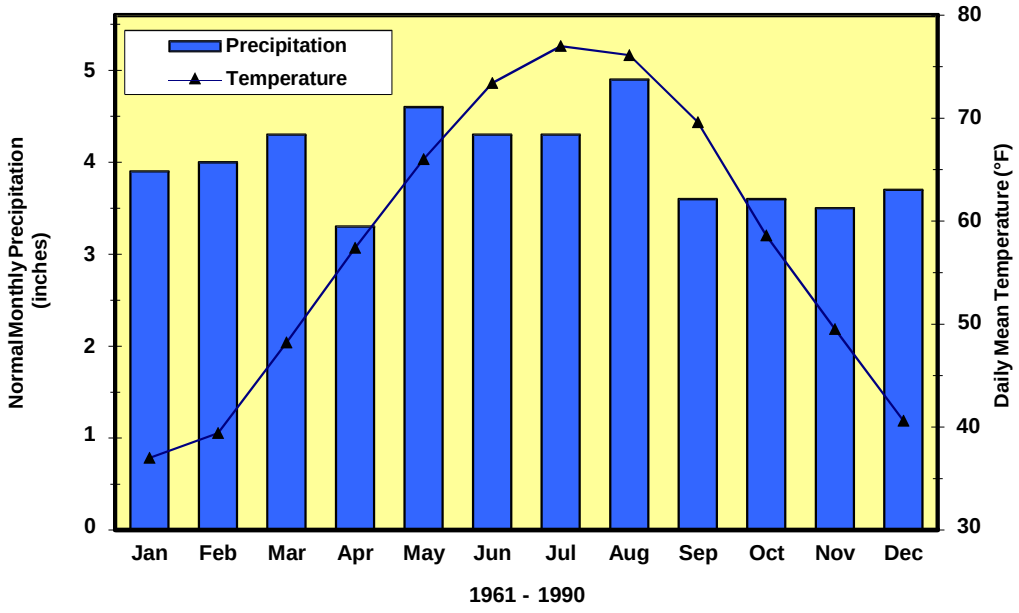


Chart 1. Normal Monthly Precipitation and Daily Mean Temperature for CBTC Area (Durham, North Carolina)

3.2 Topography

CBTC is located in the physiographic region known as the Southern Piedmont Province, a region comprised of a series of upland ridges dissected by numerous drainage systems. The installation lies approximately 475 feet above mean sea level on average, exhibiting moderately rolling terrain varying between 350 and 500 feet above mean sea level. The topographic gradient is more variable in the northeast section of the installation, which drains to tributaries of Knap of Reeds Creek. The lowest

elevation occurs in the Holt Reservoir basin at the eastern portion of the installation (NRCS 1999). CBTC topography is illustrated in **Figure 4**.

3.3 Geology and Soils

The primary geologic formation at CBTC is the Carolina Slate Belt; the Triassic Basin is the next nearest formation, located directly to the south of CBTC. Felsic[2] volcanic rocks are present in a southwest-to-northeast band running through the center of CBTC. Parallel bands of metamorphosed felsic intrusive rock are located on each side of the central volcanic band (NRCS 1999).

There are 16 soil series and 25 individual soil map units identified at CBTC. The four most common soil series are the Helena Series, the Lignum series, the Nason Series, and the Georgeville Series. These four-soil series comprise approximately 63 percent of CBTC. The Helena soils have the most extensive acreage, covering 1,354 acres or 27.7 percent of CBTC. These soils, found primarily in the western and southern portions of CBTC, exhibit a perched water table and a severe shrink-swell potential as a result of the heavy clay subsoil associated with this soil series (NRCS 1999). The Helena soils and the other major soil series are described in **Table 2**. The individual soil types are identified on **Figure 5** and further described in **Table 3**.

Table 2 – Major Soil Series Descriptions for CBTC

Soil Series	Percent of CBTC Area	Description
Helena	27.7	Gently to moderately sloping, moderately well drained sandy loam soils formed from weathered felsic (light-colored igneous rock) intrusive rocks. Found on interstream divides, heads of drainageways, depressions, and the lower hill slopes. There are two Helena soil types found at CBTC.
Lignum	16.2	Gently sloping, moderately well drained or somewhat poorly drained silt loam soils formed from weathered felsic volcanic rocks. Found on broad interstream divides, slight depressions, and heads of drainageways. One Lignum series soil type, Lignum silt loam, is found at CBTC.
Nason	10.2	Gently sloping to steep, well drained gravelly loam soils formed from weathered felsic volcanic rocks. Found on narrow ridgetops and hill slopes. There are four Nason soil types found at CBTC.
Georgeville	9.0	Gently to moderately sloping, well drained silt loam soils formed from weathered mixed felsic and mafic (dark rock composed of magnesium silicates) volcanic rocks.

Source: NRCS 1999

2 The term *felsic* indicates a light-colored volcanic or crystalline metamorphic rock with an abundance of quartz, feldspars, and white mica

3.3.1 Farmland Soils

Prime and unique farmlands are monitored by the NRCS to ensure preservation of agricultural lands that are of statewide or local importance. Soils designated as prime farmland are capable of producing high yields of various crops when managed using modern farming methods. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Unique farmlands are also capable of sustaining high yields of crops and meet the prime farmland criteria. In addition, soils designated as unique farmlands have special combinations of favorable soil and climate characteristics that support specific high-value foods or crops. North Carolina also recognizes farmlands of statewide importance that are important for production of food and crops in the state.

Approximately 80 percent of CBTC soils are given special recognition as a farmland soil. Within CBTC, there are approximately 2,404 acres of soils characterized as prime farmlands (**Table 3**). Of the prime farmlands, the 275 acres of Chewacla and Wahadkee soil type are considered to be prime farmland only if drained and either protected from flooding or not frequently flooded during the growing season. There are 1,557 acres of soils considered to be statewide important farmland. No unique farmlands are found at CBTC.

3.3.2 Hydric Soils

Hydric soils are defined by the National Technical Committee for Hydric Soils as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the profile and therefore support hydrophytic vegetation. The Wahadkee part of the map unit Chewacla and Wahadkee soils, 0 to 2 percent slopes, frequently flooded, meets the requirement for hydric soils with possible non-hydric inclusions. The map unit Lignum silt loam, 2 to 6 percent slopes, generally does not meet the requirement for hydric soils. A portion of this map unit, however, may include hydric soils (NRCS 1999). These soil map units are indicated on **Figure 5**.

3.3.3 Soil Erosion Potential

Whenever the soil surface is disturbed and stripped of its protective cover (e.g., vegetation), wind and/or water reacting with the bare soil surface removes soil particles through the process of erosion. The potential of a soil to erode is a combination of physical and chemical properties of soils such as soil texture, organic matter content, permeability, clay mineralogy, structure, and depth. Erosion results in the transportation of soil particles from the site. Erosion caused by wind contributes to the degradation of air quality through the generation of dust particles. Erosion caused by water contributes to the degradation of water quality by overloading stream systems with sediment.

A critical criterion for selecting specific training areas is the ability of the soil to withstand or recover from the effects of desired training. For example, wheeled vehicle training can strip the protective cover from the soil surface, disrupt the topsoil layer and compact the soil surface. Such forces increase the potential for soil loss through either wind-induced or water-induced erosion.

There is a scientific method that translates the interaction of water with the physical and chemical properties of soils into a mathematical equation known as the Universal Soil Loss Equation. This equation defines the most important factors that control surface erosion by water:

A = RK(LS)CP where

A = average soil loss (tons/acre);

R = rainfall factor;

K = soil-erodibility factor (a function of soil type);

LS = slope length-steepness factor;

C = cropping factor (a function of land use); and,

P = conservation factor.

In this equation, ***R*** is the eroding mechanism of rainfall. The other variable factors are related to either the natural characteristics of the soil (***K***) or the specific site (***LS***) or the result of human actions, such as land use (***C***) or soil erosion control (***P***) through conservation factors like contour plowing. The K-factor indicates the susceptibility of the soil to sheet and rill erosion by water; the higher the K-factor, the more susceptible the soil is to erosion (**Table 3**).

When siting certain training functions, soils with lower K-values have higher clay or organic content or rougher surfaces. As such, these soils are better able to withstand and recover from the effects of training. In areas where soils have a higher K-factor, ground-disturbing types of training should be designed to minimize the potential for erosion. For example, roadways or vehicle training lanes can be designed with a permanent surface (asphalt or gravel) or sited along the contour of the land as opposed to across the contour. A K-factor greater than 0.35 indicates soils sensitive to erosion that would require erosion minimization measures if they were to be disturbed (**Table 3**).

The potential for future soil erosion, inherent in the soil itself, in adequately protected areas has been estimated for CBTC soils using the Universal Soil Loss Equation, assuming the presence of bare soils and using rainfall and climate factors for North Carolina. The calculation resulted in the potential amount of soil loss per hectare. The soils were then grouped into Erosion Hazard classes based on that potential soil loss (**Table 3**). Soils with moderate to severe erosion hazard are considered sensitive to erosion and would require erosion minimization measures if they were to be disturbed (NRCS 1999).

A total of 1,311 acres of CBTC soils are considered sensitive soils under one or both of the criteria discussed above (**Figure 5**). Approximately 647 acres of CBTC soils have a moderate or severe erosion hazard and are therefore considered sensitive soils. Approximately 895 acres of CBTC soils have a K-factor greater than 0.35 and are also considered sensitive soils. Of these soils, the Tatum loam soil type (231 acres) meets both sensitive soil criteria.

Table 3 – Soil Types and Properties at CBTC

Soil Map Unit	Slope (%)	Symbol	Acres	% of CBTC Area	Typical Landform	Depth to bedrock (inches)	Drainage Class[1]	Hydrologic Soil Group[2]	K-factor[3]	Erosion Hazard[4]	Farmland Status
Appling sandy loam	2-6	ApB	187	3.8	Broad ridges	>60	Well drained	B	.24 - .28	Slight	Prime
Appling sandy loam	6-10	ApC	139	2.8	Broad to narrow hill slopes	>60	Well drained	B	.24 - .28	Slight	Statewide Important
Cecil sandy loam	2-6	CaB	17	0.3	Broad ridges	>60	Well drained	B	.28	Slight	Prime
Chewacla and Wahadkee soils, frequently flooded	0-2	ChA	275	5.6	Higher ridges and lower swales, respectively, on flood plains	>60	Somewhat poorly drained	C-D	.24 - .32	Slight	Prime farmland if drained and either protected from flooding or not frequently flooded during growing season
Georgeville silt loam	2-6	GeB	265	5.4	Broad ridges	>60	Well drained	B	.28 - .43	Slight	Prime
Georgeville silt loam	6-10	GeC	177	3.6	Broad to narrow hill slopes	>60	Well drained	B	.28 - .43	Slight	Statewide Important
Helena sandy loam	2-6	HeB	1,141	23.3	Interstream divides, heads of drainageways, depressions, and the lower hill slopes	>60	Moderately well drained	C	.24 - .28	Slight	Prime
Helena sandy loam	6-10	HeC	213	4.4	Hill slopes	>60	Moderately well drained	C	.24 - .28	Slight	Statewide Important
Herndon silt loam	2-6	HrB	146	3.0	Broad ridges	>60	Well drained	B	.28 - .43	Slight	Prime
Herndon silt loam	6-10	HrC	76	1.6	Hill slopes	>60	Well drained	B	.28 - .43	Slight	Statewide Important
Iredell loam	2-6	IrB	23	0.5	Broad interstream divides and heads of drainageways	40-60 to soft; >60 to hard	Moderately well drained	C/D	.20 - .32	Slight	Statewide Important
Lignum silt loam	2-6	LmB	791	16.2	Broad interstream divides, slight depressions, and heads of drainageways	40-60 to soft; >60 to hard	Moderately well drained to somewhat poorly drained	C	.28 - .37	Slight	Statewide Important

Table 3 – Soil Types and Properties at CBTC

Soil Map Unit	Slope (%)	Symbol	Acres	% of CBTC Area	Typical Landform	Depth to bedrock (inches)	Drainage Class[1]	Hydrologic Soil Group[2]	K-factor[3]	Erosion Hazard[4]	Farmland Status
Nason gravelly loam	2-6	NaB	182	3.7	Narrow ridges	40-60 to soft; >60 to hard	Well drained	B	.24 - .32	Slight	Prime
Nason gravelly loam	6-10	NaC	83	1.7	Narrow ridges and hill slopes	40-60 to soft; >60 to hard	Well drained	B	.24 - .32	Slight	Statewide Important
Nason gravelly loam	10-25	NaE	156	3.2	Narrow hill slopes adjacent to floodplains and drainageways	40-60 to soft; >60 to hard	Well drained	B	.24 - .32	Moderate	--
Nason gravelly loam	25-50	NaF	88	1.8	Narrow hill slopes adjacent to floodplains and drainageways	40-60 to soft; >60 to hard	Well drained	B	.24 - .32	Severe	--
Pacolet sandy loam	10-25	PaE	108	2.2	Hill slopes adjacent to floodplains and drainageways	>60	Well drained	B	.20 - .28	Moderate	--
Pacolet sandy loam	25-50	PaF	27	0.6	Hill slopes adjacent to floodplains and drainageways	>60	Well drained	B	.20 - .28	Severe	--
Tatum loam	10-25	TaE	231	4.7	Hill slopes adjacent to flood plains and drainageways	40-60 to soft; >60 to hard	Well drained	B	.28 - .37	Moderate	--
Udorthents, loamy	N/A	Ud	209	4.3	Variable; commonly depressional areas or broad flats in urban areas	>40	Well drained or moderately well drained	N/A	N/A	N/A	--
Vance sandy loam	2-6	VaB	191	3.9	Convex knolls and ridges	>60	Well drained	C	.24 - .28	Slight	Prime
Vance sandy loam	6-10	VaC	32	0.7	Narrow hill slopes	>60	Well drained	C	.17 - .24	Slight	Statewide Important
Wateree-Rion-Wedowee complex	15-30	WaE	37	0.8	Hill slopes	20-40 to soft; 40->60 to hard	Well drained	B	.17 - .28	Moderate	--

Table 3 – Soil Types and Properties at CBTC

Soil Map Unit	Slope (%)	Symbol	Acres	% of CBTC Area	Typical Landform	Depth to bedrock (inches)	Drainage Class[1]	Hydrologic Soil Group[2]	K-factor[3]	Erosion Hazard[4]	Farmland Status
Wedowee sandy loam	6-10	WeC	23	0.5	Narrow hill slopes	>60	Well drained	B	.24 - .28	Slight	Statewide Important
Wilkes sandy loam	10-25	WxE	15	0.3	Side slopes adjacent to major drainageways	<20 to soft; 40->60 to hard	Well drained	C	.24 - .32	Slight	--

[1] **Drainage Class** = Refers to the frequency and duration of wet periods under conditions similar to those under which the soil was formed. Alternations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil.

[2] **Hydrologic Soil Group** = Runoff potential of the soil, affected by depth to high water table, infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. Group A = High infiltration rate when thoroughly wet and a low runoff potential. Group B = Moderate rate of infiltration and runoff. Group C = Borderline. Group D = Very slow rate of infiltration, therefore the associated runoff potential is high.

[3] **K-factor** = Indicates the susceptibility of a soil to sheet and rill erosion by water; one of six factors used in the Universal Soil Loss Equation to predict the average annual rate of soil loss by sheet and rill erosion. The higher the value, the more susceptible the soil is to erosion by water; *a K-factor over 0.35 indicates soils sensitive to erosion.*

[4] **Erosion hazard** = Potential for future erosion, inherent in the soil itself, in adequately protected areas. *Slight* = No particular prevention measures are needed under ordinary conditions; *Moderate* = Erosion-control measures are needed in certain activities; *Severe* = Special precautions are needed to control erosion in most activities.

Source: NRCS 1999

Hydrologic soil group classifications refer to soils that are grouped according to their runoff-producing characteristics. The primary consideration is the inherent capacity of bare soil to permit water infiltration. Group A soils have a high infiltration rate when thoroughly wet and a low runoff potential. Such soils are mainly deep, well drained and sandy or gravelly. Group B soils have a moderate rate of infiltration and runoff. Soils in Group C are borderline. Group D soils have a very slow rate of infiltration; therefore, the associated runoff potential is high. The hydrologic groups of CBTC soils are identified in **Table 3**.

3.4 Water Resources

Water resources considered in this INRMP encompass both surface and groundwater. Surface water resources include lakes, rivers and streams, and are important for a variety of reasons including ecological, economic, recreational and human health. Groundwater comprises subsurface water resources and is an essential resource in many areas because it is used as a source of potable water, for agricultural irrigation, and for industrial purposes. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water quality and the surrounding geology.

3.4.1 Surface Water

CBTC is located in the headwaters of the Neuse River basin of North Carolina. The 6,192-square mile Neuse River basin spans 19 counties, is the third largest river basin in North Carolina, and contains approximately one-sixth of the state's population (Neuse River Basin Regional Council [NRBRC] 2001). The streams found on CBTC eventually contribute to the Neuse River via Fall Reservoir (Falls Lake). CBTC comprises only a small fraction (<1 percent) of the 490,000-acre headwater sub-basin of the Neuse River (NCDWQ 2006).

Surface water features within CBTC include approximately 42 miles of streams, 1.1 acres of ponds, and the Holt Reservoir. Surface water features and wetlands are depicted in **Figure 6**. Generally, CBTC streams drain to two separate drinking water reservoirs. The northwest, northeast, and southeast quadrants of the installation drain through a series of intermittent streams directly into Holt Reservoir (historically Lake Butner) or into Camp Creek or Knap of Reeds Creek, both perennial streams, before flowing into Holt Reservoir. The southwest quadrant of CBTC flows into either Rocky Creek or Dry Creek, which in turn flow into Lake Michie. Holt Reservoir is a 374-acre impoundment on Knap of Reeds Creek and serves as the drinking water supply for the Town of Butner. A portion of Holt Reservoir lies within CBTC at the eastern boundary. Lake Michie lies approximately two miles southwest of CBTC boundary and supplies water to the City of Durham. Both lakes are within the Falls Lake watershed.

North Carolina classifies surface waters based on their best intended use and then sets water quality standards (both biological and chemical standards) on those waters in an effort to achieve the intended use. Classifications and water quality standards are set forth in 15 North Carolina Administrative Code (NCAC) 2B. Fresh water classifications range from Class C (minimum freshwater uses, including aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture), up to Class WS (Water Supply). Water Supply waters are further divided into tiers I through V based on the geographic position and relative existing development within the particular area draining to the classified water body. Critical Area refers to the area adjacent to a water supply intake or reservoir where risk associated with pollution is greater than from the remaining portions of the watershed. The Critical Area is

defined as 2 miles from normal pool elevation of a reservoir, 2 miles upstream from a drinking water intake, or the ridgeline of the watershed, whichever is closest.

The surface waters of CBTC feed to water supply reservoirs, and as such have been assigned to Class WS. All surface waters in the Neuse River basin, including those on CBTC, have been given a supplemental Nutrient-Sensitive Waters (NSW) classification, which means that all waters in the Neuse River basin require limitations on nutrient inputs. Falls Lake Rules were adopted in January 2011 to restore water quality in the lake by reducing the amount of pollution entering upstream. The rules are a staged nutrient management strategy designed to reduce nutrient discharges to the lake from various sources, including stormwater runoff from new and existing development, wastewater treatment plants and agriculture. Specific activities occurring within 50 feet of Neuse River basin streams are regulated according to the Neuse River Basin Rules (see **Appendix E**). Both Dry Creek and Rocky Creek, which flow to Lake Michie, are classified as WS-III NSW, indicating a low to moderately developed watershed. Camp Creek and Knap of Reeds Creek are classified WS-II NSW, indicating predominantly undeveloped watersheds. Land use and development guidelines have been established for each category, with more protective guidelines in place for the undeveloped WS-II watershed areas than in the low to moderately developed WS-III watershed areas. In accordance with North Carolina regulations (15 NCAC 2B), the Critical Areas surrounding Holt Reservoir and Falls Lake have been identified within CBTC. Restrictions on land development, such as increasing the impervious surface area, apply within the Critical Areas in order to protect the water supply (**Figure 6**).

Historical water quality data for streams in CBTC region indicate water quality has remained relatively steady. The NCDWQ monitors Knap of Reeds Creek downstream of Holt Reservoir at sites upstream and downstream of the Butner Waste Water Treatment Plant (WWTP). In 2004, the Knap of Reeds Creek supported its uses overall, but received a biological classification of "Fair," the same rating as received in all survey years since 1982. The 2004 survey data indicated that Knap of Reeds Creek below Holt Reservoir is impaired and rated as "partially supporting" its uses. Knap of Reeds Creek (5.2 miles) is currently impaired from Lake Butner (Holt Reservoir) to Falls Lake because of a "Fair" biological classification. NCDWQ will continue to monitor this segment to evaluate future improvements at the Butner WWTP and upstream water quality. NCDWQ continues to recommend that Butner WWTP improve plant operations and collection systems as needed to reduce the potential for negative water quality impacts to Knap of Reeds Creek (NCDWQ 2006).

The portion of Knap of Reeds Creek in CBTC is upstream from both the WWTP and the Holt Reservoir and therefore exhibits higher water quality than indicated in the NCDWQ data gathered downstream of these influences. Knap of Reeds Creek at CBTC is 15 to 20 feet wide and 1 to 2 feet deep with moderately flowing clear waters. The Knap of Reeds Creek banks are in excellent conditions with well-developed riparian vegetation, and the in-stream substrate consists of boulders and cobble. However, Camp Creek contains sediment deposits and debris from heavy scouring during storms. Camp Creek banks are somewhat incised, and the water flows more slowly and murkier than Knap of Reeds Creek (North Carolina Natural Heritage Program [NCNHP] 1995).

3.4.2 Floodplains

The Federal Emergency Management Agency (FEMA) has identified 100-year floodplains at CBTC as shown on the FEMA Flood Insurance Rate Maps (FIRM) 3720086800K, 3720084800K, and 3720086900J, effective 16 April 2007. These 100-year floodplains are located in the area immediately adjacent to the main channel of Camp Creek and Knap of Reeds Creek, including Holt Reservoir, as well as some upstream portions of Rocky Creek and Dry Creek (**Figure 6**). The intermittent tributaries of these main channels are not included within the FEMA 100-year floodplain. The surface water drainage provided by the numerous streams at CBTC is capable of efficiently draining the site; therefore, flooding has not been a problem at CBTC.

3.4.3 Groundwater Resources

According to soil survey data, geologic maps of the area, and soil boring information, sufficient groundwater supplies for domestic potable and fire protection needs appear to exist in the surficial aquifer at depths of approximately 12 to 150 feet below land surface. Groundwater flow characteristics were not confirmed, but the flow is believed to be generally perpendicular to surface gradients and toward down gradient surface streams (NCNG 2001).

Water supply at CBTC is provided by four 8-inch wells and a water tower. Wells can be operated remotely from the headquarters office. The eastern portion of the training site also contains numerous fire hydrants, which are to be used for wildland fire suppression activities only (**Figure 2**). The majority of the facilities, such as Range Control, the Maintenance Area, the Cantonment Area, and the medical facility, have been connected to the new water system (NCNG 2008).

3.4.4 Wetlands

Wetlands are an important natural system because of the diverse biological and hydrologic functions they perform. These functions may include water quality improvement, groundwater recharge, pollution treatment, nutrient cycling, the provision of wildlife habitat and niches for unique flora and fauna, storm water storage and erosion protection. The U.S. Army Corps of Engineers (USACE) defines wetlands as

> "those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328)."

Wetlands are protected as a subset of the "waters of the United States" under Section 404 of the CWA. The term "waters of the United States" has broad meaning under the CWA and incorporates deep water aquatic habitats and special aquatic habitats (including wetlands). Jurisdictional waters of the United States are areas regulated under the CWA and may also include coastal and inland waters, lakes, rivers, ponds, streams, intermittent streams, vernal pools, and other waters, that if degraded or destroyed could affect interstate commerce. For an area to be classified as a jurisdictional wetland, three conditions must be present: (1) wetland hydrology; (2) hydric soil; and (3) hydrophytic vegetation. Areas that may be periodically wet, but that do not meet the requisite criteria, are not classified as "jurisdictional" wetlands.

Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill into the "waters of the United States," including wetlands. Section 401 of the CWA gives the State of North Carolina the authority to regulate, through the State water quality certification program, proposed federally-permitted activities that may result in a discharge to water bodies, including wetlands. Additional information pertaining to wetland management and permitting is included in **Section 6.5.1.3**.

3.4.5 Description of CBTC Wetlands

Wetlands and other regulated waters at CBTC were first identified and mapped by the USACE Waterways Experiment Station (WES) using aerial photograph interpretation in combination with ground-truthing and subsequent modifications (USACE-WES 1998). Wetlands and other waters of the US were delineated at planning level survey accuracy, which is typically greater than 90 percent accurate. In 2005-2006, a wetland survey update was conducted at CBTC.

Based on the 2005-2006 wetland study, approximately 158 acres of potential wetlands were identified within CBTC (**Figure 6**). This includes approximately 155 acres of palustrine forested (PFO) wetlands, approximately 0.5 acre of palustrine scrub-shrub wetland (PSS), and approximately 2.5 acres of palustrine emergent (PEM) wetlands (AMEC Earth & Environmental, Inc. [AMEC] 2006). The majority of the wetlands are forested systems with a canopy of hardwoods. Additional wetlands are shrub dominated or emergent wetlands along the fringes of lakes, ponds, or streams.

Final jurisdictional determinations are made by the USACE. Thus far, only areas adjacent to recent and/or proposed road expansions have been assessed by the USACE. Approximately 1.11 acres of jurisdictional wetlands were identified in these areas. Jurisdiction of the vast majority of the wetland areas identified during the 2005-2006 survey has yet to be determined (AMEC 2006).

4.0 ECOSYSTEMS AND BIOTIC ENVIRONMENT

4.1 Ecosystem Classification

The CBTC is located in the US Ecoregion – Humid Temperate Domain – Subtropical Division – Southern Mixed Forest Province. This province comprises the Piedmont and the irregular Gulf Coastal Plains, where 50 to 80 percent of the area slopes gently toward the sea. Local relief is 100 to 600 feet (30 to 180 meters) on the Gulf Coastal Plain, and 300 to 1,000 feet (90 to 300 meters) on the Piedmont. Generally, climax vegetation is composed of medium-tall to tall forests of broadleaf deciduous and needle-leaf evergreen trees.

4.2 Vegetation

CBTC can be broadly described as having four distinct vegetation community types: mixture of upland and alluvial hardwoods, mixed pine and hardwood, pine forest, and pine plantations. Forests are largely mid-successional with little mature forest (AMEC 2007a). These forest communities, as well as pine plantations, occupy the majority of CBTC lands.

A flora and vegetation communities' survey was conducted on CBTC in 2013 that identified natural communities and rare plants on the installation. A total of 18 vegetation community types were identified including five communities considered to be unusual or rare in North Carolina (see **Figure 7**). **Table 4** summarizes the CBTC community types (or associations). Community types are classified using NCNHP classifications and the International Vegetation Classification (IVC) System. The IVC system is accepted as the standard by the Federal Geographic Data Committee (FGDC) and is to be used by all federal agencies. Additional information on CBTC flora and plant communities is provided in the *CBTC Vegetation Community & Rare Plant Survey* (AMEC 2007a). A copy of this survey is on file in the CBTC DEM.

A total of six rare plant species have been identified on CBTC, including the State-threatened low wild-petunia (*Ruellia humilis*). State-listed plant Species of Concern (AMEC 2007a). A complete inventory of flora identified at CBTC is provided in **Appendix F.**

Also noteworthy, CBTC has the two largest common pear trees (*Pyrus communis*) in the State. They are located within the northeast corner of the installation. These pear trees, which are still alive, were listed on the North Carolina list of Champion Big Trees in 1987.

Table 4 – NCNHP and IVC Classifications of Vegetation Communities on CBTC

NCNHP Associations Identified at CBTS	IVC Similar Association	IVC Association Code	State / Federal Status
RARE VEGETATION COMMUNITIES			
Basic Mesic Hardwood Forest (Piedmont	*Fagus grandifolia-Quercus rubra/Ostrya virginiana-Acer barbatum/Adiantum pedatum- Sanguinaria canadensis*	CEGL008466	S2 / G3G4
Upland Depression Swamp	*Quercus phellos/Carex (albolutescens, intumescens, joorii)-Chasmanthium*	CEGL007403	S3 / G2G3
Floodplain Pool	*Peltandra virginica-Saururus cernuus-Carex crinita/Climacium americanum Herbaceous Vegetation*	CEGL007696	S2S3 / G2[1]
Piedmont Mafic Woodland	*1) Juniperus virginiana var. virginiana-Ulmus alata/Schizachyrium scoparium Woodland* *2) Fraxinus americana-Carya glabra/Symphoricarpos orbiculatus-Rhus aromatica/Piptochaetium*	CEGL004443	S1 / G?
Piedmont Bottomland Forest	*1) Platanus occidentalis-Liriodendron tulipifera- Betula (allegheniensis, lenta)/Alnus serrulata- Leucothoe fontanesiana Forest* *2) Liquidambar styraciflua-Liriodendron tulipifera-(Platanus occidentalis)/Carpinus caroliniana-Halesia*	CEGL004691; CEGL007880	S3 / G5
Piedmont Swamp Forest	*Betula nigra-Platanus occidentalis/Alnus serrulata/Boehmeria*	CEGL007312	S1S2 / G3
MATRIX / COMMON VEGETATION COMMUNITIES			
Dry Oak–Hickory Forest (Piedmont Subtype)	*Quercus falcata-Quercus alba-Carya alba/Oxydendrum arboreum/Vaccinium stamineum Forest*	CEGL008475 (only similar IVC association)	S5 / G5
Dry-Mesic Oak-Hickory Forest (Piedmont	*Quercus alba-Quercus (rubra, coccinea)-Carya (glabra, alba)/Vaccinium (stamineum, pallidum) Forest*	CEGL008475	S5 / G5
Mesic Mixed Hardwood Forest (Piedmont	*Fagus grandifolia-Quercus rubra/Cornus florida/Polystichum acrostichoides-Hexastylis virginica Forest*	CEGL008465	S5 / G5
Sand and Mud Bar	*No Association*	No Association	N/A
Loblolly Pine Forest	*Pinus taeda/Liquidambar styraciflua-Acer rubrum var. rubrum/Vaccinium stamineum Forest*	CEGL00601	Unranked
Pine / Mixed Hardwood	*Pinus taeda-Quercus (rubra, alba, falcata, stellata)-Carya (glabra, alba)*	No Association	Unranked
SUCCESSIONAL / MAN-MADE COMMUNITIES			
Loblolly Pine	*Pinus taeda Planted Forest*	CEGL007179	Unranked
Clearcut	No Association	No association	Unranked
Urban Landscape	No Association	No association	Unranked
Lakes and Ponds	No Association	No association	Unranked

Source: AMEC 2013

Forest resources were inventoried by NC Division of Forest Resources in 2006. A summary of the general cover types from this inventory is provided in **Table 5**. Detailed information on CBTC forest management blocks and stands is included in the CBTC FMP (Smith and Such 2006), which is included in **Appendix B**.

Table 5 – Land Cover Types at CBTC

Land Cover Type	Acreage
Open Areas	225
Old Fields	118
Pine Plantation	758
Natural Pine	2,047
Hardwood	1,188
Mixed Hardwood/Pine	533

Source: Smith and Such 2006

4.3 Fish and Wildlife

CBTC comprises a major portion of an undeveloped wildlife corridor between the Neuse River watershed, including the Falls Lake Gamelands to the south, and Rocky Creek, a tributary of the Tar River. This corridor of undeveloped uplands, one of the largest remaining in the eastern Piedmont, is broken only by a few secondary trails. This corridor, therefore, is a crucial element in wildlife conservation planning for the entire eastern Piedmont, bridging the Neuse and Tar River basins (NCNHP 1995).

Wildlife surveys have been conducted at CBTC since 1994 and were most recently conducted in 2013. However, surveys prior to 2006 were limited in scope and not as comprehensive as the more recent faunal surveys. Surveys have been performed for birds, mammals (including bats), fish, reptiles, amphibians, aquatic macroinvertebrates, and terrestrial invertebrates. No documented species are listed as state or federally endangered, threatened, or federal species of concern (AMEC 2013). A complete fauna list is provided in **Appendix F**. Additional information on CBTC flora and plant communities is provided in the *Survey of Vertebrates and Invertebrates at CBTC* (AMEC 2013).

4.3.1 Mammals

A total of 23 mammal species (includes four bat species) have been observed at CBTC. The majority of the species encountered at CBTC, such as raccoon (*Procyon lotor*), eastern cottontail (*Sylvilagus floridanus*), whitetail deer (*Odocoileus virginianus*), white-footed mouse (*Peromyscus leucopus*), eastern red bat (*Lasiurus borealis*), and striped skunk (*Mephitis mephitis*), are considered common and widespread within their represented ranges. A few species are considered uncommon and/or uneven in distribution, such as the river otter (*Lutra canadensis*), eastern harvest mouse (*Reithrodontomys humulis*), and the eastern chipmunk (*Tamias striatus*). No rare or unique mammal species have been observed at CBTC (AMEC 2013).

CBTC may serve as a migratory corridor for black bear (*Ursus americana*). Several black bear sightings have been reported at CBTC in recent years. Black bear are rare to uncommon visitors to the Piedmont region (AMEC 2013).

4.3.2 Birds

A total of 94 bird species have been observed at CBTC, which include 61 species known to actively breed on the facility. The breeding status of 21 species is undetermined, but suspected to occur based on life history requirements and habitat availability on the facility. Six species are migratory with breeding ranges outside of the North Carolina Piedmont, and eight species are regional wintering species. No state or federally listed species were determined to be breeding at CBTC (AMEC 2013).

CBTC lacks good representation of rare or unique plant/habitat communities, but there still exists significant breeding bird habitat diversity. Habitat types and communities that contribute to the greatest diversity are bottomland hardwoods and open, savannah-like areas, followed by pine dominated systems, mature upland hardwood stands, and early successional clearcuts. Avian community guilds are well-established with nearly all expected constituents breeding in good numbers within their representative communities. Neotropical migrant species such as scarlet tanager (*Piranga olivacea*), Acadian flycatcher (*Empidonax virescens*), blue grosbeak (*Passerina caerulea*), common yellowthroat (*Geothlypis trichas*), hooded warbler (*Wilsonia citrine*), and northern parula (*Parula americana*) are well-represented within their respective guilds. The large, contiguous expanse of forested area contributes to the presence of area sensitive species, such as pileated woodpecker (*Dryocopus pileatus*) and wild turkey (*Meleagris gallopavo*) (AMEC 2013).

Primary considerations with regard to migratory bird management are compliance with the Migratory Bird Treaty Act (MBTA); implementation of migratory bird management actions in accordance with EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*; and support, contribution and compatibility with the goals and efforts of numerous regional migratory and game bird conservation programs. The MBTA controls many actions that may negatively affect migratory birds, particularly collection and transportation of birds. Special purpose permits may be requested and issued that allow for the relocation or transport of migratory birds for management purposes. A list of birds protected by the MBTA is provided in **Appendix F**. Examples that the installation natural resource manager (NRM) is considering in the INRMP for minimizing and mitigating effects on migratory birds at CBTC include:

Forest management

- Convert to uneven-age and/or other progressive forest management that enhances available habitat values.
- Maintain and enhance bottomland hardwood forests.
- Create snag trees or protect existing snags during forestry programs.

Habitat enhancement/restoration

- Maintain and restore priority habitats.
- Incorporate habitat enhancement into project review and project design.
- Create habitat as mitigation programs.
- Promote nest box and platform programs.

- Encourage nesting in tower structures, where appropriate.

Invasive, non-native species

- Implement feral cat eradication programs.
- Removal of exotic species.

Wetlands

- Protect and restore wetlands.
- Promote positive water use modifications to improve hydrology and avian habitat in arid areas.

Agricultural Outleases

- Initiate establishment of native warm-season grasses or other field and grassland conditions beneficial to birds found in the area.
- Modify agricultural leases to promote nesting and fledgling protection by setting appropriate dates for mowing, haying, or harvesting.

Communication towers, power lines, wind energy, and buildings

- Identify and remove inactive/abandoned communication towers.
- Remove unused power lines and poles, especially in open habitat areas such as deserts and grasslands where such structures provide artificial raptor perches.
- Minimize new tower and wind turbine construction impacts through critical assessment of structure requirement, location site evaluation and structure design assessment for minimal avian impacts.
- To promote appropriate nesting, maintain towers that do not present collision issues or provide raptor perches in inappropriate habitats (e.g., desert, grasslands, prairie).

4.3.3 Amphibians and Reptiles

Habitat types that support amphibians and reptiles are relatively diverse and in good abundance at CBTC. The abundance of wetland systems scattered throughout the facility in the form of man-made ponds, vernal ponds and swales, roadside ditches, and bottomland hardwoods as well as streams and seepages contribute a great deal to the reptile and amphibian diversity. In addition, the mature hardwood stands in the northeastern and lakeshore areas are home to large populations of redback (*Plethodon cinereus*) and white-spotted slimy salamanders (*Plethodon cylindraceus*) (AMEC 2013).

A total of 23 amphibian and 19 reptile species have been observed at CBTC. Two rare species were detected: the mole salamander (*Ambystoma talpoideum*), the four-toed salamander (*Hemidactylium scutatum*) (AMEC 2013).

According to historic records, the woodlands present at CBTC have the potential to provide habitat for timber rattlesnakes (*Crotalus horridus*), a State species of Special

Concern. There is a great deal of suitable rock outcropping habitat at CBTC that would be favored by timber rattlesnake, primarily occurring along the eastern side slopes of Knap of Reeds Creek, but also along the lower reach of Camp Creek. Despite several attempts, the timber rattlesnake has not been observed on CBTC to date. This species has largely been eliminated in most of the Piedmont region by deforestation and development (NCNHP 1995).

4.3.4 Fish

Fish surveys were conducted in six separate stream systems, including Camp Creek, Knap of Reeds Creek, Rocky Creek, Dry Creek, and an unnamed tributary to Lake Butner. A total of 17 fish species were observed. No rare or unique species were collected. Mountain redbelly dace (*Phoxinus oreas*), rosyside dace (*Clinostomus funduloides*), pirate perch (*Aphredoderus sayanus*), and redear sunfish (*Lepomis microlophus*) were documented exclusively at only one site. With the exception of the central portion of Knap of Reeds Creek, the surveyed areas exhibited a low abundance of fish and a prevalence of pollution tolerant species, which may be attributed to poor habitat diversity, degraded channel morphology, and potentially poor water quality. Dry Creek was absent of fish species (AMEC 2013).

4.3.5 Terrestrial and Aquatic Invertebrates

A total of 472 terrestrial invertebrates (insects, land snails, spiders, millipedes and centipedes) were identified at CBTC. None of the species identified are listed as rare species. In general, invertebrate collections at CBTC were relatively low in abundance and diversity. However, a meaningful measure of terrestrial invertebrate community health is difficult to ascertain because of the very limited sampling efforts of this vast taxonomic group and the resultant lack of comprehensive, comparative data (AMEC 2013).

A total of 103 species of aquatic invertebrates were documented to occur at CBTC based on collections from 11 different sample sites at CBTC. None of the species identified are listed as rare species. Macrofaunal assemblages sampled in streams according to standard qualitative methods indicated that the streams were in good- fair condition and not impaired (AMEC 2013). A mussel and macro-snail inventory was conducted at CBTC in 2003 that was designed to develop a comprehensive list and distribution information of mussels and aquatic macro-snails to provide management recommendations for future land use changes. The survey results did not find any federally protected species during the survey. However, undescribed lampmussels were found in the Knap of Reeds Creek. The yellow lampmussel is a Federal Species of Concern and freshwater mollusk populations will benefit from land management practices designed to maintain and increase their populations (TCG, 2003).

4.4 Threatened and Endangered Species

No federally listed species are known to reside at CBTC, and no critical habitat occurs. Federal status as a threatened or endangered species is derived from the ESA of 1973 (16 USC 1531 et seq.) and is administered by the USFWS.

Several State-listed species have been confirmed by biological surveys to be on CBTC property. The North Carolina Wildlife Resources Commission and the Natural Heritage Program determine the state status of animal species, while the North Carolina Plant

Conservation Program and the Natural Heritage Program determine the state status of plant species. Endangered, threatened and special concern species are protected under North Carolina General Statutes (NCGS) Annotated § 113-331 – 377, Endangered and Threatened Wildlife and Wildlife Species of Special Concern and NCGS
§ 106-202.12-22, Article 19B: Plant Protection and Conservation Act. Candidate and significantly rare designations are an administrative status, not a legal status. They indicate a rarity and a need for population monitoring and conservation action. North Carolina species designations are defined below.

- **Endangered –** Any native or once-native species of wild animal or any species or higher taxon of plant whose continued existence as a viable component of the State's flora and fauna is determined to be in jeopardy or any species determined to be an 'endangered species' pursuant to the ESA. This is a legal status designation.
- **Threatened –** Any native or once-native species of wild animal or any resident species of plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, or one that is designated as a threatened species pursuant to the ESA. This is a legal status designation.
- **Special Concern –** Any native or once-native species of wild animal or any species of plant which requires monitoring, but which may be collected and sold in accordance with State regulations. This is a legal status designation.
- **Candidate** – Species which are very rare in North Carolina, generally with 1-20 populations in the state, generally substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease). These species are also either rare throughout their ranges (fewer than 100 populations) or disjunct in North Carolina from a main range in a different part of the country or world. Also included are species which may have 20-50 populations in North Carolina, but fewer than 50 populations range-wide. These are species which have the preponderance of their distribution in North Carolina and whose fate depends largely on their conservation here. Also included are many species known to have once occurred in North Carolina but with no known extant occurrences in the state (historical or extirpated species). This is an administrative status, not a legal designation.
- **Significantly Rare** – k Species which are very rare in North Carolina, generally with 1-20 populations in the state, generally substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease). These species are generally more common somewhere else in their ranges, occurring in North Carolina peripherally to their main ranges, mostly in habitats which are unusual in North Carolina. Also included are some species with 20-100 populations in North Carolina, if they also have only 50-100 populations range-wide and are declining. This is an administrative status, not a legal designation.
- **Proposed** – A species which has been formally proposed for listing as Endangered, Threatened, or Special Concern, but has not yet completed the legally mandated listing process.

Table 6 presents a list of federal and state-listed species known to occur within Durham and/or Granville Counties, North Carolina as well as those species observed at CBTC.

Table 6 – Federal and State Listed Species of Concern Documented within Durham and/or Granville Counties, North Carolina

Scientific Name*	Common Name	County[1]	State Status[2]	Federal Status[3]
Amphibians				
Ambystoma talpoideum*	Mole Salamander	G	SC	
Hemidactylium scutatum*	Four-toed Salamander	D/G	SC	-
Necturus lewisi	Neuse River Waterdog	D/G	SC	-
Birds				
Haliaeetus leucocephalus	Bald Eagle	D	T	-
Nyctanassa violacea	Yellow-crowned Night-Heron	D	SR	SR
Accipiter striatus	Sharp-shinned Hawk	D	SR	
Crustaceans				
Cambarus davidi	Carolina Ladle Crayfish	D/G	SR	-
Orconectes carolinensis	North Carolina Spiny Crayfish	G	SC	-
Orconectes virginiensis	Chowanoke Crayfish	G	SC	FSC
Fish				
Ambloplites cavifrons	Roanoke Bass	D/G	SR	FSC
Anguilla rostrata	American eel	D	-	FSC
Etheostoma collis	Carolina Darter – Eastern Piedmont Population	D/G	SC	FSC
Notropis volucellus	Mimic Shiner	D/G	T	FSC
Noturus furiosus	Carolina Madtom	D/G	T	FSC
Insects				
Bombus affinis	Rusty-patched Bumble Bee	D	SR	E
Dibusa angata	A Caddisfly	D	SR	-
Ephemerella berneri	A Mayfly	D	SR	-
Erynnis martialis	Mottled Duskywing	D/G	SR	-
Gomphus abbreviatus	Spine-crowned Clubtail	D	SR	-
Gomphus lineatifrons	Splendid Clubtail	D	SR	-
Gomphus septima	Septima's Clubtail	D	SR	FSC
Macromia margarita	Mountain River Cruiser	G	SR	
Neonympha areolatus	Georgia Satyr	D	SR	
Neonympha helicta	Helicta Satyr	D/G	SR	
Neurocordulia virginiensis	Cinnamon Shadowdragon	D	SR	-
Pontia protodice	Checkered White	D/G	SR	
Satyrium favonius ontario	Northern Oak Hairstreak	D	SR	

Mollusks				
Alasmidonta heterodon	Dwarf Wedgemussel	G	E	E
Alasmidonta undulata	Triangle Floater	D/G	T	-
Alasmidonta varicosa	Brook Floater	G	E	
Elliptio lanceolata	Yellow Lance	G	E	T
Elliptio fisheriana	Northern Lance	G	SR	
Fusconaia masoni	Atlantic Pigtoe	D/G	E	FSC
Lampsilis cariosa	Yellow Lampmussel	D/G	E	FSC
Lampsilis sp. 2	Chameleon Lampmussel	D/G	SR	-
Lampsilis radiata	Eastern Lampmussel	D/G	T	
Lasmigona subviridis	Green Floater	D/G	E	FSC
Somatogyrus virginicus	Panhandle Pebblesnail	D	SR	FSC
Strophitus undulatus	Creeper	D/G	T	-
Villosa constricta	Notched Rainbow	D/G	T	-
Villosa delumbis	Eastern Creekshell	G	SR	-
Reptiles				
Crotalus horridus	Timber Rattlesnake	D/G	SC	-
Ophisaurus attenuatus	Slender Glass Lizard	G	SR	
Vascular Plants				
Acmispon helleri	Carolina Birdfoot-trefoil	G	SC-V	
Agastache nepetoides	Yellow Giant-hyssop	D/G	SR-P	
Asclepias purpurascens	Purple Milkweed	D	SR-T	
Baptisia minor var. aberrans	Prairie Blue Wild Indigo	D/G	E	-
Berberis canadensis	American Barberry	D/G	SC-V	-
Buchnera americana	American Bluehearts	D	E	-
Callitriche terrestris	Terrestrial Water-starwort	G	SR-O	
Cardamine dissecta	Dissected Toothwort	D	SC-V	-
Cardamine douglassii	Douglass's Bittercress	D/G	T	-
Carex bushii	Bush's Sedge	D/G	SR-P	-
Carex crus-corvi	Crowfoot Sedge	D	SR-P	
Carex jamesii	James's Sedge	D	SR-P	-
Carex meadii	Mead's Sedge	D/G	SR-P	-
Carex vestita	Velvet Sedge	D	SC-H	-
Carya laciniosa	Big Shellbark Hickory	D	T	-
Cirsium carolinianum	Carolina Thistle	G	E	-
Corallorhiza wisteriana	Spring Coral-root	D	SR-O	
Cornus racemosa	Gray Dogwood	D	SR-P	-
Cyperus granitophilus	Granite Flatsedge	G	T	-
Delphinium exaltatum	Tall Larkspur	D/G	E	FSC
Dichanthelium bicknellii	Bicknell's Witch Grass	G	SR-P	
Dichanthelium annulum	A Witch Grass	D	SR-P	-
Echinacea laevigata	Smooth Coneflower	D/G	E	E

Echinacea pallida	Pale Coneflower	G	SR-D	
Enemion biternatum	Eastern Isopyrum	D/G	SC-V	-
Eupatorium saltuense	Tall Boneset	G	SR-L	-
Euphorbia mercurialina	Cumberland Spurge	G	SC-V	
Eurybia spectabilis	Showy Aster	D/G	SR-O	
Fleischmannia incarnata	Pink Thoroughwort	D	T	-
Gaylussacia brachycera	Box Huckleberry	D	E	-
Gillenia stipulata	Indian Physic	D/G	T	-
Hackelia virginiana	Virginia Stickseed	G	SR-P	-
Heteranthera multiflora	Multiflowered Mud-plantain	D	SR-P	
Hexalectris spicata*	Crested Coralroot	D/G	SR-P	-
Hydrastis canadensis	Goldenseal	D	SR-O	
Isoetes piedmontana	Piedmont Quillwort	G	E	-
Liatris squarrulosa	Earle's Blazing-star	D	SR-P	-
*Linum sulcatum var. sulcatum**	Glade Flax	G	SC-H	-
Lithospermum canescens	Hoary Puccoon	D/G	T	-
Lysimachia tonsa	Southern Loosestrife	G	SR-P	
Marshallia sp. 1	Butner Barbara's-buttons	G	SR-L	FSC
Matelea decipiens	Glade Milkvine	D/G	SR-P	-
Monotropsis odorata	Sweet Pinesap	D	SC-V	FSC
Nabalus albus	Northern Rattlesnake-root	G	T	
Orbexilum pedunculatum	Sampson's Snakeroot	D	SR-P	
Packera paupercula var. paupercula	Balsam Ragwort	G	SR-P	
*Panicum flexile**	Wiry Panic Grass	D/G	T	-
Panicum lithophilum	Flatrock Panic Grass	G	SR-T	
Parthenium auriculatum	Glade Wild Quinine	D/G	SR-T	-
Phemeranthus piedmontanus	Piedmont Fameflower	G	SR-L	
Platanthera peramoena	Purple Fringeless Orchid	D	T	-
Polygala senega	Seneca Snakeroot	D	SR-D	
Portulaca smallii	Small's Portulaca	G	T	-
Prunus pumila var. susquehanae	Susquehanna Cherry	D	SR-P	
Pseudognaphalium helleri	Heller's Rabbit-Tobacco	G	SR-P	-
Pseudognaphalium micradenium	Small Rabbit-Tobacco	D/G	SR-T	-
Ptilimnium nodosum	Harperella	G	E	E
Pycnanthemum torrei	Torrey's Mountain-mint	G	SR-T	FSC
Ranunculus micranthus	Rock Buttercup	D	SR-P	
Rhus michauxii	Michaux's Sumac	D	E	E
*Ruellia humilis**	Low Wild-petunia	D/G	E	-
*Ruellia purshiana**	Pursh's Wild-petunia	D/G	SC-V	-
Sceptridium jenmanii	Alabama Grape-fern	G	SC-V	
Scirpus pendulus	Rufous Bulrush	D/G	SR-O	-

Scleria bellii	Smooth-seeded Hairy Nutrush	G	SR-L	FSC
Scutellaria australis	Southern Skullcap	G	E	-
Scutellaria leonardii	Shale-barren Skullcap	D/G	E	-
Scutellaria nervosa	Veined Skullcap	D/G	E	-
*Silphium terebinthinaceum**	Prairie Dock	D/G	SR-P	-
Solidago ptarmicoides	Prairie Goldenrod	G	E	
Solidago rigida var. glabrata	Southeastern Bold Goldenrod	D/G	SR-P	
Solidago ulmifolia	Elm-leaf Goldenrod	D	SR-D	-
Stachys matthewsii	Yadkin Hedge-nettle	D/G	SR-T	
Stewartia ovata	Mountain Camellia	G	SR-P	-
Symphyotrichum depauperatum	Serpentine Aster	G	E	-
Symphyotrichum laeve var. concinnum	Narrow-leaf Aster	D/G	T	-
Talinum mengesii	Large-flowered Fameflower	G	E	-
Thermopsis mollis	Appalachian Golden-banner	D/G	SC-V	-
Trichostema brachiatum	Glade Bluecurls	G	E	-
Tridens chapmanii	Chapman's Redtop	D	T	-
Trifolium reflexum	Buffalo Clover	D/G	T	-
Nonvascular Plants				
Aneura sharpii	A Liverwort	D	SR-T	-
Aphanorrhegma serratum	A Moss	D	SR-O	-
Brachythecium rotaeanum	Rota's Feather Moss	D	SR-D	-
Dicranella rufescens	Red Fork Moss	D	SR-O	-
Dicranella varia	Variable Fork Moss	D/G	SR-O	-
Ephemerum cohaerens	Northern Short-lived Moss	D	SR-T	-
Micromitrium synoicum	A Moss	D	SR-O	-
Plagiochila ludoviciana	A Liverwort	D	SR-P	-
Pleurochaete luteola	Spring-leaved Screw Moss	D	SR-O	-
Pohlia melanodon	Pink-fruited Thread-moss	D	SR-D	-
Weissia ludoviciana	A Moss	D	SR-T	-

KEY:

* Observed at CBTC during the 2006 survey. No rare state-listed species were observed prior to this comprehensive survey.

[1] Counties: D – Durham, G - Granville

[2] State-listed: E – Endangered, T – Threatened, SC – Special Concern, SR – Significantly Rare, SR-P – Significantly Rare-Peripheral, SR-O – Significantly Rare-Other, SR-T – Significantly Rare-Throughout, PT – Proposed Threatened

[3] Federally-listed: E – Endangered, T – Threatened, FSC – Federal Species of Concern. A FSC is under consideration for listing, but there is insufficient information to support listing at this time. This is not a legal designation.

Source: NCNHP 2017, USFWS 2018, AMEC 2007a, b

5.0 NATURAL RESOURCES AND THE MILITARY MISSION

5.1 Land Use

5.1.1 CBTC Facilities

Military training is the most significant use of lands at CBTC. Two major types of training activities occur at CBTC: live fire weapons training and light maneuver exercises. The CBTC's coordinated environmental program is active, progressive, and continually assessing the effects of military training. The extensive program is also continually assessing actions necessary to ensure the environmental requirements are met and that ranges, training lands, and facilities are preserved in a state that will meet training requirements and are maintained in an environmentally sound condition.

Current training facilities and activities at CBTC include small arms ranges, a land navigation course, an obstacle/confidence course, an engagement skills trainer (EST),[3] a multipurpose building (MPB), an army physical fitness test (APFT) area, a rappelling tower, several bivouac areas, barracks, landing zones for rotary-wing aircraft, and several administrative support buildings (**Figure 2**). A brief description of the ranges is provided in **Table 7**.

Table 7. Small Arms Ranges at CBTC

Range	Description
Range 1	A competitive pistol range composed of 50 firing lanes that are spaced 1.5 yards on-center. The range depth is approximately 90 yards, with 25- and 50-yard firing distance points on level terrain. This range is used primarily for pistol qualification, instruction, weapon familiarization, and competitive marksmanship.
Range 2	A computer-operated, combat training pistol range composed of ten firing lanes spaced approximately 8 meters (m) on center with multiple targets on each lane. Combat pistol training is utilized for pistol qualification, instruction, and familiarization.
Range 3	Used for simulating both daytime and nighttime rifle engagement techniques with the M16A1 and M16A2 Combat rifles, M-249 automatic rifles, and M-60 machine guns. There are 25 firing positions spaced approximately 5 m on-center, and two parallel firing lines, one at 25 m and one at 50 m. The minimum depth of the firing lanes is approximately 65 m. This range is constructed on level terrain and away from artificial light sources. During night fire training activities, a single-light illumination system is employed to assist trainees in identifying targets.

[3] The EST is a computer-simulated, multipurpose device designed to support the indoor training of individuals on basic marksmanship and fundamental tactical engagement skills.

Table 7. Small Arms Ranges at CBTC

Range	Description
Range 4	A 1,000-yard Known Distance (KD) range used for marksmanship practice, rifle qualification, M60 machine gun qualification and training, competitive firing training, and other field firing training when the other ranges are not available. There are 50 firing points with the firing lane width approximately 165 m, and 6 firing points per firing lane. The maximum range depth is approximately 1,000 yards, with parallel firing lines spaced at 100, 200, 300, 400, 600, and 1000 yards from the target areas.
Range 5	CLOSED
Range 6	CLOSED
Range 7	A multipurpose range used for pistol, rifle, shotgun, machine gun and other small arms weapon training and qualification. There are 32 firing positions or identified firing lanes. The maximum firing range is approximately 100 m, constructed on generally level terrain.
Range 8	Used exclusively for M16A2 training and qualification. There are 16 firing positions, each located on a firing lane approximately 50 m wide. The maximum range depth is approximately 300 m.
Range 9	Hand grenade range using non-explosive training grenades. Six throwing positions.
Range 10	A multi-purpose machine gun (MPMG) range that was completed in 2010(??) at the far northwest corner of the installation.

5.1.2 Transportation System

Entrance and exit at CBTC is controlled through designated and gated access points. The main gate to CBTC is accessed from Roberts Chapel Road, just north of its intersection with Range Road (State Route 1121), approximately 2 miles north of its intersection with Old North Carolina Route 75. Several gates along Roberts Chapel Road and Range Road provide access to most of CBTC training areas (**Figure 2**). CBTC does not have a perimeter fence.

Within CBTC, a sparse network of unpaved trails provides limited access to most portions of the site. Most of the trails are located in the southern portions of the site, and provide access to the firing range complexes. Many of the trails in the northern portions of CBTC are bare soil trails and inaccessible in wet weather.

5.1.3 Water Supply

Water supply at CBTC is provided by four 8-inch wells and a water tower. Wells can be operated remotely from the headquarters office. The eastern portion of the training site also contains numerous fire hydrants, which are to be used for wildland fire suppression activities only (**Figure 2**). The majority of the facilities, such as Range

Control, the Maintenance Area, the Cantonment Area, and the medical facility, have been connected to the new water system (NCNG 2008).

5.2 Current Potential Impacts

5.2.1 Minimum Impact Training

Types of training activities that generally have a minimal impact on natural resources at CBTC include: small unit infantry tactics; reconnaissance; terrain and map analysis; escape and evasion tactics; infiltration tactics; land navigation and patrolling. In many cases, these types of training require undisturbed cover to conceal movements. As such, the disturbance is no greater than walking through the woods or open areas and would normally require no extraordinary precautions, limitations or restrictions. Because minimum impact training has few adverse effects on natural resources, these types of training are generally not restricted.

5.2.2 Maximum Impact Training

Some types of training devices disturb soils, vegetation or both. Secondary impacts to the soil and water resources may affect water quality, fish populations and wildlife. Such disturbances may require corrective actions such as leveling ruts, adding soil, seeding, mulching, and/or installation of erosion control devices, sedimentation structures, or other management practices.

The types of training activities that have the potential for causing soil or vegetation disturbance that are conducted at CBTC include: tactical concealment/bivouac; off-road cold or wet weather operations; certain cover and concealment training; field fortifications; simulated minefield operations; breaching and clearing operations; obstacle training; cut, fill and haul (horizontal) operations; demolition training; non-standard bridge construction; fording, bridging operations; mobility and counter mobility operations; and major construction activities (military and contracted civilian).

5.2.3 Noise and Encroachment Concerns

Encroachment issues pertaining to surrounding land use at the CBTC include trespassing by hunters and noise complaints. Trespassing is a particular problem within the northeast portion of the site because hunting camps are directly adjacent to the training site and the site is not fenced. Noise limitation/reduction is always a concern at the installation particularly due to past occurrences. The 16-lane MPMG range (Range 6) on West Range Road was closed due to numerous complaints from a nearby land owner.

The existing ranges are located and oriented in such a way that high noise levels are primarily contained within the installation. Current low-density development surrounding CBTC has kept complaints to a minimum since the closure of the MPMG range. However, the NCNG remains concerned that current or future activities could lead to noise complaints and additional training restrictions if the land uses surrounding the facility change and become less compatible. To avoid and/or minimize future conflicts, the NCNG is currently pursuing land easements around the facility to restrict development adjacent to the property boundary and to reduce the likelihood of future noise issues. Additional information on potential land easements is included in **Section 2.4**.

In accordance with AR 200-1, the NCNG has implemented a noise complaint management program. This program is outlined in the *NCNG Statewide Operational*

Noise Management Plan (SONMP) (U.S. Army Center for Health Promotion and Preventative Medicine [USACHPPM], 2013). A copy of the SONMP can be obtained in the NCNG Environmental Office or via North Carolina Guard Knowledge Online (NCGKO).

5.3 Potential Future Impacts

The ultimate goal of this INRMP, as well as its subsequent additions or revisions, is to ensure continuous military training capability for the NCNG, while managing for the mutual sustainability of the natural resources at CBTC. The development and implementation of an active ecosystem management program will accommodate the NCNG's training mission, while emphasizing a holistic, adaptive management style that focuses on maintaining biological diversity. Future development of CBTC to meet the training needs of the NCNG is addressed in the CBTC Master Plan.

The primary environmental impacts associated with training site development will be to soil and surface water resources from the construction of buildings, ranges, parking, and roadway access changes. Other potential impacts to vegetation and wildlife may arise from new range construction. The specific impacts from training site development will be reviewed in a separate NEPA document.

The natural resources management techniques, policies, and procedures identified in this plan will be used to facilitate development while minimizing impacts to natural resources and the environmental. Jurisdictional wetland delineations and archeological surveys must be completed prior to any land disturbing development. These surveys, along with general natural resources management practices identified in this plan, will enable the NCNG to successfully develop the training site to meet mission requirements. Thoughtful training site development will minimize impacts from the military mission on natural resources.

Ongoing training will result in some vegetation and soil disturbance. Disturbance may result from activities, such as bivouacking, tactical concealment, fox holes, tank trenches, and off-road foot and vehicle traffic. In training areas that receive high amounts of disturbance, erosion control measures such as silt basins and vegetative filter strips will be implemented. Soil disturbance will be monitored and land rehabilitation projects initiated to restore damaged areas. Disturbed areas will be leveled and vegetated and the use of the areas restricted until capable of supporting training again.

Training also has the potential to impact wetlands and cultural sites. These areas will be delineated and designated as simulated mine fields or other training-related obstacles in order to protect them from training disturbance. Off-road vehicle traffic will be permitted in accordance with soil conditions. Hardened bivouac sites will be used when possible, and troops will not be permitted to cut standing trees for cover. Other techniques, such as covering tree root areas with mulch will be used to minimize soil compaction and root damage in heavily trafficked areas.

If further noise-sensitive development occurs in close vicinity to CBTC, there is a chance that training could generate noise complaints and new training restrictions. Past noise complaints as result of MPMG range use led to the closure of this range. Therefore, the NCNG is currently seeking land easements around the facility to restrict development adjacent to the property boundary and to reduce the likelihood of future noise issues. Additional information on potential land easements is included in **Section 2.4**.

5.4 Natural Resources Needed to Support the Military Mission

The NCNG requires a mixture of open and forested land areas to support military training requirements. Realistic training is dependent upon an intact natural setting. Degraded training lands, soil erosion, degraded forests, silted streams, and flooded training areas would prevent sustainable long-term training. Degradation of natural resources results in inadequate training, impaired readiness, and wasted training dollars. Maintaining healthy ecosystems keeps the training land continuously available for use by soldiers. Healthy ecosystems are resilient and can support long term training needs. The NCNG needs the land and its natural resources to function together in a healthy ecosystem to support training.

Missionscape refers to the condition of the landscape best suited to support the various training missions and varies depending upon the type of training. The terrain at CBTC is comprised mainly of hardwood and pine forests broken up by a network of roads, trails and streams. Less than 10 percent of the site is comprised of old fields and open grassland areas. The grasslands are mostly on the ranges or training areas maintained in grass for bivouacking.

All the landscapes at CBTC are important in supporting training activities. Military training is done in conjunction with the existing landscape and when necessary the landscape is modified to better support the training mission needs, such as restoring grassland for range development. The ideal missionscape for CBTC would consist of healthy mature forests with a mixture of grassland and other open/brushy vegetated areas; more access roads and trails throughout the facility; and urban areas not overgrown with vegetation. Management activities in this INRMP are designed to support the desired type of natural landscapes.

5.5 Natural Resources Considerations for Mission Planning and Initiation

The ultimate goal of this INRMP is to ensure the sustainability of doctrinally-required military training at CBTC, while providing for conservation of the installation's natural resources. Training success at CBTC is only possible through a supportive, proactive natural resource management program. CBTC natural resource management program aims to minimize the impacts of normal training use on CBTC natural resources, and complements the doctrinally required military training conducted on the installation. Proper execution of the INRMP provides sustainable training lands, and provides adaptive means of dealing with normal training impacts, thereby protecting our natural resources. Many features of this plan contribute to its ability to provide sustainable training lands. Some of these features are techniques, practices and procedures, which include immediate repair and restoration of terrain damage, "resting" repaired terrain while vegetation is re-established, minimizing off-road vehicle activity when soil is saturated, posting wetlands as no-go areas, and establishing rotational use of field bivouac sites. Other features provide for "hardening" of areas frequently used for training, to minimize impacts on natural resources within the surrounding areas. Permanent stream crossing sites are another example of these best management practices (BMP), which minimize damage to vegetation, soil loss, erosion, and sedimentation. Natural resources management will facilitate the accomplishment of the military mission.

Refer to **Sections 6.3** through **6.10** for additional information on how to properly manage these natural resources limitations during mission planning. Laws and regulations pertaining to these natural resources are incorporated into **Chapter 6**.

6.0 NATURAL RESOURCES PROGRAM MANAGEMENT

6.1 Natural Resources Program Management

Intra- and inter-agency cooperation, coordination, and communication at the Federal, State and local levels (for example, USFWS and NCDEQ) are requisite to the success of the INRMP. The USFWS and NCDEQ review the INRMP. Specialized expertise is required to adequately manage natural resources at CBTC. Technical assistance will be sought from Federal and State agencies, universities, and special interest groups.

6.1.1 Administrative and Technical Support

The Natural Resources Program at CBTC is administered by the NCNG DEM. Responsibilities of the NCNG DEM in regard to this INRMP include:

- Implementing this INRMP;
- Providing oversight and coordination with other agencies;
- Developing and implementing programs to ensure the inventory, delineation, classification, and management of all applicable natural resources to include: forests, wetlands, endangered and threatened species, sensitive or unique habitats, and other natural resource areas of special interest
- Providing for the training of natural resources personnel;
- Maintaining natural resources management records;
- Reviewing environmental documents (e.g., environmental impact assessments and remedial action plans) and construction designs and proposals to ensure adequate consideration of natural resources, while ensuring that technical guidance as presented in this INRMP is adequately considered;
- Evaluating impacts of training missions and providing guidance to trainers;
- Coordinating with local, State, and Federal governmental and civilian conservation organizations relative to CBTC natural resources management program;
- Implementing and executing AR 200-1;
- Assisting the Adjutant General with developing funding priorities for all-natural resources program and compliance activities.

The DEM also receives support from CBTC staff, each of whom has significant duties in addition to natural resources support. Additional labor resources may include:

- Federal agencies (for example, USFWS, NRCS, USACE, and the U.S. Army Environmental Center);State agencies;
- Local and regional Universities;
- Scouting groups;
- Conservation groups (for example, Audubon Society, and sportsmens' clubs).

6.1.2 Cooperative Agreements

6.1.2.1 Federal Agreements

The DoD and subcommand entities have Memorandums of Understanding (MOU), Memorandums of Agreement (MOA), and other cooperative agreements with other federal agencies, conservation and special interest groups, and various state agencies in order to provide assistance with natural resources management at installations across the U.S. Generally, these agreements allow installations and agencies or conservation and special interest groups to obtain mutual conservation objectives. The DoD agreements applicable to CBTC are stored at JFHQ NC and include:

- MOU between DoD and the USFWS concerning ecosystem-based management of fish, wildlife, and plant resources on military lands;
- Cooperative Agreement between the DoD and The Nature Conservancy (TNC) for assistance in natural resources inventory;
- MOA for Professional and Technical Assistance Conducting Biological Surveys, Research and Related Activities between the DoD and the National Biological Service of the Department of the Interior;
- MOU between the DoD and the USEPA with respect to Integrated Pest Management (IPM);
- MOA for Federal Neotropical Migratory Bird Conservation Program and addendum ("Partners in Flight-Aves De Las Americas") among DoD, through each of the Military Services, and over 110 other Federal and State agencies and non-governmental organizations;
- MOU between the DoD and Ducks Unlimited, Inc. to provide a foundation for cooperative development of selected wetlands and associated uplands in order to maintain and increase waterfowl populations and to fulfill the objectives of the North American Waterfowl Management Plan, within the context of DoD's environmental security and military missions;
- MOU for Watchable Wildlife Programs.

6.1.2.2 State and Local Agreements

There are no formal interagency agreements between the CBTC and other agencies. However, the NCNG has a good informal working relationship with NCDEQ and Butner Public Safety.

The NCDEQ provides guidance to the CBTC Natural Resources Manager on species and habitats of special state concern. They also provide information for the management of wildlife, recreation, water quality protection, and soil protection**.** The NCNG and North Carolina Division of Forest Resources (NCDFR) work together annually to identifyareas requiring forest management and scheduling. The NCDFR conducts and aids in the management of prescribed burns at CBTC

The North Carolina Wildlife Resources Commission, a special agency to the NCDEQ, has been dedicated to the wise-use, conservation, and management of the state's fish and wildlife resources. Their policies and programs are based on scientifically sound resource management, assessment and monitoring, applied research, and public input. The commission provided input to the NCNG during the preparation of this INRMP and continually advises the NCNG on wildlife and forestry related issues and concerns.

6.2 Geographic Information Systems

GIS data for natural resources is maintained by the NCNG GIS Manager at CBTC. GIS technology is used to manipulate and analyze data. GIS data needs to be Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) compliant and a copy should be stored at NGB as well. Currently, the NCNG has electronic data files for the following natural resources on CBTC.

- Topography (Digital Raster Graphics [DRG] for U.S. Geological Survey (USGS) Quad Michie Lake, NC; 2-foot contours; 10-meter contours);
- Aerial (Digital Ortho Quarter Quads [DOQQ]);
- Soils (NRCS, 1999);
- Lakes, streams, FEMA floodplains, critical watershed areas, stream management zones;
- Wetlands (AMEC, 2006);
- Terrestrial communities (AMEC 2006);
- Forest management and prescribed burn units, firebreaks and fuel types;
- Rare floral and fauna species locations.

In addition, the NCNG has electronic data files for the following: installation boundary, buildings, roads, gates, potable water sources, ranges, and various other training facilities.

6.3 Fish and Wildlife Management

Since support of doctrinally required military training is the primary mission of CBTC, fish and wildlife management programs will be accomplished through direct coordination with the TSM. Fish and wildlife management at CBTC will protect, conserve, and regulate fish and wildlife populations, including State-listed threatened and endangered species, using modern scientific principles. This management will be conducted in a manner consistent with all applicable laws and regulations and in coordination with state and federal wildlife management agencies. The NCNG will maintain optimum and diverse fish and wildlife habitat by integrating fish and wildlife management strategies with other ecosystem management activities such as training area and forest management.

Some laws and regulations pertaining to fish and wildlife management include:

- Bald Eagle Protection Act (16 USC §668a-d);
- CWA (33 USC §1341);
- EO 11990, Protection of Wetlands;
- EO 11988, Floodplain Management;
- ESA, 7 U.S.C. 136;16 U.S.C. 460 et seq. (1973) as amended;
- Fish and Wildlife Conservation Act (USC §2901 et seq.);
- Fish and Wildlife Coordination Act, as amended (16 USC §661 et seq.);
- MBTA, as amended (16 USC §703-712);
- NEPA (42 USC §4321 et seq.);

- SAIA (16 USC §670a-o);
- Endangered and Threatened Wildlife and Wildlife Species of Special Concern (NCGS Annotated § 113-331 – 377);
- NC Wildlife Commission's Inland Hunting, Fishing and Trapping Regulations Digest (revised annually);
- JFHQ – NC 215-2, Deer Hunting on CBTC.

These laws and regulations are described in **Appendix G.**

Hunting at CBTC is no longer allowed.

6.3.1 Regional Wildlife Management

CBTC adjoins the Butner-Falls of the Neuse Game Lands, which includes over 43,000 acres of terrestrial and aquatic habitat in Durham, Granville and Wake Counties. Butner-Falls of the Neuse Game Lands is part of the Falls Lake project lands, which are owned by the USACE and managed as game lands and recreation areas by the North Carolina Wildlife Resources Commission and North Carolina Division of Parks and Recreation, respectively. Additionally, there are other State lands managed by the North Carolina Department of Agriculture that adjoin CBTC.

The size, location, habitat types, and current missions of CBTC offer an opportunity to manage a number of non-game wildlife species whose populations may be declining due to regional loss of habitat and forest fragmentation. On a regional basis, urban development, agriculture, reservoir construction, and expanding human populations continue to contribute to the fragmentation of the piedmont deciduous forest. Large contiguous blocks of habitat that are relatively free of fragmentation are becoming increasingly rare in the North Carolina Piedmont; thus, CBTC is considered a significant natural resource. As mentioned previously, CBTC also lies within two protected watersheds, Lake Michie and Holt Reservoir, which supply drinking water for Durham and Butner, respectively.

6.3.2 CBTC Habitat Management

The establishment of Stream Management Zone (SMZ) at CBTC (see **Section 6.5.1.1** for details) is greatly beneficial to the overall management of fish and wildlife on the training site. SMZ provide an unfragmented forested area for neotropical migrants and songbirds while enhancing game (e.g., deer, turkey, raccoon, and squirrel) and non-game (e.g., amphibians, reptiles, small mammals) habitat. They also protect water quality and provide connectivity to other habitat types on CBTC and on adjacent lands. Forest management activities within SMZ are minimal and vary by location. Activities may include very long rotations, no cut zones, or only selective harvesting (see **Section 6.6.1.2**). Snags within riparian areas or SMZ will be retained, when they are not considered a troop safety hazard, as they provide beneficial habitat for cavity dependent wildlife.

The management of wildlife is inter-related with timber management at CBTC. The forest resources at CBTC will be managed for a diversity of species and age classes while minimizing fragmentation. This will benefit neotropical migrants as well as game and non-game species. The first priority will be to restore the forest resources back to a healthy functioning ecosystem. This will be accomplished by harvesting the Virginia pine (*Pinus virginiana*) stands and replanting with loblolly pine (*Pinus taeda*), thinning overcrowded stands, and maintaining the prescribed fire program. A percent of the forested area is managed at longer rotations, 60 years for pine and 100 years for

hardwoods.

Areas proposed for clearcutting are limited in size and location to reduce the potential for erosion, limit the creation of new edge habitat, increase the acreage of open field habitat, and minimize fragmentation. When possible, efforts are made to make clearcuts 40 acres or larger and located close to previously clearcut areas or early successional habitat. However, it is unlikely that many stands will be 40 acres due to the dimensions of existing stands, various age classes, topography, and required buffer areas. Therefore, the focus will be to limit the creation of new edge habitat and to collocate cuts when feasible.

Leaving small groups of trees within the clearcut areas can encourage tree snag development and provide nesting habitat. However, a single tree or group of trees that protrudes above the surrounding canopy offer perch sites for undesirable species, such as cowbirds (*Molothrus* spp.), and present opportunities for parasitic plants to develop. With this in mind, leaving snags or copses of trees will be left up to the recommendation of the Wildlife Resources Commission or wildlife biologist when the area is clearcut.

To enhance bird and turkey habitat, prescribed burning in these areas occurs in the winter months. Grass openings will not be mowed between April and August to avoid disturbing ground nesting birds. Fruit-bearing shrub species and sapling mast producing species are protected. Open areas ranging from approximately 1 to 3 acres and planted with native grasses are provided for nesting and brood ranges. Locating new clearcuts adjacent to existing cuts or early successional areas can minimize forest fragmentation as well as create temporary open areas for turkey.

As discussed in **Section 4.3.3**, the timber rattlesnake, State species of Special Concern, has not been observed on-site to date. However, this species has been observed in the areas surrounding CBTC. CBTC contains suitable rock outcropping habitat, primarily along the eastern side slopes of Knap of Reeds Creek, but also along the lower reach of Camp Creek. Despite several attempts, the timber rattlesnake has not been observed on CBTC to date. Because this species has largely been eliminated in most of the Piedmont region by deforestation and development, the NCNG will avoid development and maintain potential buffers, to the extent feasible, around potential den sites (i.e., rock outcrops).

Refer to **Section 6.6** for additional information on the CBTC forest and prescribed fire management programs.

6.4 Management of Protected Species and Habitats

This section presents information about the management of sensitive species that are located at CBTC. Laws and regulations pertaining to the management of threatened and endangered (T & E) species include the following, which are described further in **Appendix G**.

- ESA of 1973 (16 USC 1536);
- SAIA (16 U.S.C.670a et seq.);
- AR 200-1, Environmental Protection and Enhancement;
- MBTA of 1918;
- Authorization of Take Incidental to Military Readiness Activities (50 CFR 21.15);
- Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668-668d, 54 Stat.

250);

- DoDI 4715.03, Environmental Conservation Program;
- Endangered and Threatened Wildlife and Wildlife Species of Special Concern (NCGS Annotated § 113-331 – 377);
- Plant Protection and Conservation Act (Article 19B of NCGS § 106-202.12-22).

The following general guidelines will be followed to facilitate the military mission and natural resources management objects while minimizing negative impacts on rare species and their habitats.

- Consult biological inventories and this plan in the planning stage of projects and forest management operations to ensure rare species and unique habitats are identified and special needs considered.
- Update biological inventories periodically as the occurrence of threatened and endangered species is subject to change over time as a result of either recruitment, identification of additional protected species, or the change in status of species currently present at CBTC.

6.4.1 Federally Listed Species

According to the USFWS, five federally endangered species are known to occur in Durham and/or Granville Counties (see **Table 7**). There are also 15 federal species of concern known to occur in these counties (see **Table 6**). A federal species of concern is not a legal designation. No federally listed endangered, threatened, or candidate species, or critical habitat have been identified at CBTC as a result of previous biological surveys. If a federally listed species is found at CBTC in the future, consultation with the USFWS and the NCDEQ (as appropriate) would be initiated to avoid jeopardizing any listed species as a result of mission activities. The NCNG is required to manage federally listed threatened and endangered species. Failure to protect federally listed species could lead to an ESA violation, which could negatively impact training land availability.

Species	Common Name	County	Habitat	Threats
Alasmidonta heterodon	Dwarf wedgemussel	Granville	Small streams to large rivers	Riparian disturbance, pollution, sedimentation, impoundments, artificial flow regimes, and stream fragmentation
Ptilimnium nodosum	Harperella	Granville	Rocky or gravel shoals and sandbars	Changes in water flow and water quality

Echinacea laevigata	Smooth coneflower	Granville/Durham	Open woods, glades, cedar barrens, roadsides, clear-cuts, dry limestone bluffs, and power line rights-of-way	Fire suppression and habitat destruction
Rhus michauxii	Michaux's sumac	Durham	Sandy or rocky open woods	Fire suppression and habitat destruction due to residential and industrial development
Bombus affinis	Rusty-patched Bumble Bee	Durham	Sand dunes, farmland, marshes, and wooded areas.	Increased land development and agricultural use.

6.4.1.1 Dwarf Wedgemussel

Historically, this species occurred from the Neuse River basin, North Carolina, in the south, north to the Petitcodiac River Basin, New Brunswick, Canada, with sporadic distribution in the river basins in between (Bogan et al. 2008). No historical population estimates exist, but findings by Strayer et al. (1996) are similar to observations by Clark (1981) that the species forms sparse populations and was never numerous.

However, the species has experienced significant declines including regional extirpations (e.g., the last remaining population in Canada) and there are only a small number of extant occurrences remaining (NatureServe 2009).

6.4.1.2 Harperella

Harperella in North Carolina (described as Ptilimnium viviparum, above) is a perennial herb that grows to a height of 6 - 36 inches (in) (0.15 - 1.0 meter; m). The leaves are reduced to hollow, quill-like structures. The small, white flowers occur in heads, or umbels, reminiscent of a small Queen Anne's lace (Daucus carota) flower head.

Harperella is known from only two locations in North Carolina. One population occurs in the Tar River in Granville County. Another population was reintroduced to the Deep River recently after the original population known from that area disappeared. This population occurs in Chatham County, but the river serves as the divide between Chatham and Lee counties.

6.4.1.3 Smooth coneflower

The smooth purple coneflower, is an Endangered Species Act federally listed endangered species of plant found in the piedmont of the eastern United States. Most populations are found on roadsides and other open areas with plenty of sunlight, often on calcium- and magnesium- rich soils.

Its current range is within the states of Virginia, North Carolina, South Carolina, and Georgia, and it was historically also found in Pennsylvania and Maryland. It has been rare as long as it has been known, but a number of human activities and associated processes have reduced its range further. Today there are about 100 occurrences, and many of these are in poor condition. The amount of appropriate habitat available for this plant has been greatly reduced and it continues to decline.

6.4.1.4 Michaux's Sumac

Michaux's sumac is a rare species of flowering plant in the cashew family also known by the common name false poison sumac. It is endemic to the southeastern United States, where it can be found in the states of Virginia, North Carolina, South Carolina and Georgia. It is threatened by the loss and degradation of its habitat and by barriers to reproduction. It is a federally listed endangered species of the United States.

6.4.1.5 Rusty Patch Bumble Bee

The U.S. Fish and Wildlife Service listed the rusty patched bumble bee (Bombus affinis) as endangered under the Endangered Species Act. Historically, the rusty patched bumble bee was broadly distributed across the eastern United States and Upper Midwest, from Maine in the U.S. and southern Quebec and Ontario in Canada, south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Its range included 28 states, the District of Columbia and 2 provinces in Canada. Since 2000, this bumble bee has been reported from only 13 states and 1 Canadian province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin – and Ontario, Canada.

Bumble bees need areas that provide nectar and pollen from flowers, nesting sites underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil). In order to manage habitat for the rusty patch bumble bee at CBTC the following management strategies are recommended:

- Increase the diversity of native wildflowers by direct seeding to establish a new cover type – for example, conversion of disused ranges to native floral and grassland habitat.
- Implement or alter prescribed fire and other land management to increase the diversity of native wildflowers and that maintain or facilitate the development of nesting and over wintering habitat, this can include leaving areas left un-mowed (or mowed at a height of greater than 12 inches in the fall or winter.)
- Remove and control invasive plants in woodlands, forest edges, prairies, and meadows – in any habitats used for foraging, nesting, or overwintering.
- Increase the diversity of native wildflowers in grasslands and pastures by inter-seeding or similar practices.

- Establish native trees and shrubs, whose flowers are often good early season pollen and nectar sources.

6.4.2 State Listed Species

Approximately 106 state-listed species are known to occur within Durham and/or Granville Counties. A total of eight state-listed species have been confirmed by biological surveys to be on CBTC property (see **Table 6**). These include one state threatened plant, two state special concern species, and five state significantly rare species. As discussed in **Section 4.4**, state listed endangered, threatened and special concern species are protected under State law. While other state listings are only administrative and are used for monitoring and conservation purposes. Species protected by State law are discussed in greater detail below.

6.4.2.1 Mole Salamander

The mole salamander (*Ambystoma talpoideum*) is listed as a special concern species in North Carolina and is known to occur in only a few localities in the Mountain and Piedmont regions. The species has an aquatic larval stage and usually breeds in fishless ponds during the fall and winter months; some populations have gilled adults (Petranka 1998). Previously, the nearest documented locality for this species was to the north of CBTC in Person County. These two populations, along with a third in southern Virginia (Mitchell and Reay 1999), represent a disjunct region for the species. Only one breeding site was found at CBTC, located at the man-made, permanent pond adjacent to Camp Creek Road. Six adults (sexes undetermined, not gilled) were collected in pitfall traps at the site in March 2006 (most likely captured while leaving the pond, post-breeding) and a post-metamorph was found at the same location in late April 2006 and verified again in 2013(AMEC 2013).

The mole salamander and other Ambystoma species generally require temporary, fishless pond environments for completion of their life cycle. Adults of the genus Ambystoma prefer forested areas adjacent to breeding sites. In order to protect the mole salamander at CBTC, the following management strategies are recommended:

- Maintain current hydrologic conditions at the pond site. The removal of any impoundment barriers or other activities that act to permanently drain the pond would decimate the population.
- Avoid stocking of game fish into this pond as these fish species are predators of eggs and aquatic larvae and could likely have an adverse effect on the breeding population size, and overtime, may destroy it.
- Maintain at a minimum a 300-foot buffer of deciduous hardwoods or mixed pine/hardwood species around the pond. There is a beaver colony at the pond, but currently there appears to be no real threat of beaver-caused deforestation to a degree detrimental to the survival of the mole salamander population (AMEC 2013). Beaver populations and their effects will be monitored on a regular basis. Removal of beavers will only be done if populations are found to be impacting the mole salamander or causing timber damage.

6.4.2.2 Four-Toed Salamander

The four-toed salamander (*Hemidactylium scutatum*) is a special concern species in North Carolina and is rare in the Piedmont, upper Coastal Plain, and westernmost mountain regions of the state. The species is a restrictive habitat breeder with an aquatic larval stage and usually requires moss mats near water for nesting. Two adults were found in the Knap of Reeds Creek floodway near the northern facility boundary. Both individuals were found in late March 2006 beneath cover objects near a dry vernal depression with scattered sphagnum moss (Sphagnum sp.) hummocks.

Management for this species should focus on the preservation of existing bottomland hardwood stands and vernal wetlands where there is appropriate habitat. The four-toed salamander's life history involves an aquatic larval stage, and therefore logging and construction activities that cause sedimentation and erosion of watercourses may negatively impact the species. Logging activities that remove the forest canopy; thus, reducing soil and ground level moisture levels should be avoided in known population areas or areas that provide significant microhabitat. Targeted preservation areas include the floodplain of Camp Creek, Knap of Reeds Creek above the confluence with Camp Creek, and isolated wetlands and small streams/seepages where there is an abundance of Sphagnum sp. and other mosses (AMEC 2013).

6.4.2.3 Low Wild-Petunia

The low wild-petunia (*Ruellia humilis*) is listed as a state threatened species. The low wild-petunia's multi-branched stem may reach a height of two feet, but is usually less than a foot tall. The short internodes give the plant a compact, leafy, bushy appearance. Its showy flowers are petunia shaped and vary in color from lavender to purple.

According to the Duke University Herbarium this species was observed previously on CBTC in 1950-1951 by W.T. Batson. This species was observed in the diabase glade habitat. This species has not been observed in any subsequent CBTC surveys (AMEC 2013).

6.5 Water Resources Management and Soil Conservation

Management of water resources at CBTC is crucial, as two separate drinking water supply reservoirs provide the primary drainage features for CBTC. It is imperative that state-required water quality standards be met or exceeded. In accordance with both federal and state regulations regarding water quality, surface water quality testing protocols and designated testing sites on all perennial streams should be established and maintained, both at the point of entry and point of exit at CBTC.

Soil erosion can be a major contributor to the degradation of water quality both on- and off-site. Stormwater BMP will be implemented for activities conducted at CBTC. Rehabilitation and maintenance of areas that experience soil erosion, compaction, or other problems are implemented through both the DEM and the LRAM program (**Section 1.4.6.3**).

Laws and regulations pertaining to water resources and soil management include the following, which are described in **Appendix G**.

- Federal Water Pollution Control Act as amended by the CWA of 1977 (33 USC §1251);
- U.S. Fish and Wildlife Coordination Act (16 USC §661);
- Rivers and Harbors Act of 1899;
- Land and Water Conservation Fund Act of 1968;
- NEPA (42 USC §4321);
- EO 11990, Protection of Wetlands;
- EO 11752, Prevention, Control, and Abatement of Environmental Pollution;
- EO 12088, Federal Compliance with Pollution;
- EO 11989, Off-road vehicle use;
- EO 11988, Floodplain Management;
- EO 11990, Protection of Wetlands;
- SAIA (16 USC §670 et seq.);

AR 200-1, 32 CFR 651;

- Soil Conservation Act (16 USC §590a et seq.);
- North Carolina Forest Practices Guidelines Related to Water Quality (FPG): (15A NCAC 01I .0100 - .0209);
- North Carolina Surface Water and Wetland Standards (15A NCAC 2B.0100 & .0200);
- North Carolina Section 401 Certification (15A NCAC 2H; 15A NCAC 2B);
- North Carolina Sedimentation Pollution Control Act of 1973 (Article 4 of NCGS 113A).

6.5.1 Management of Water Resources at CBTC

As discussed in **Section 3.4.1**, all surface waters in the Neuse River basin (including those on CBTC) have been given a supplemental NSW classification, which means that all waters in the Neuse River basin require limitations on nutrient inputs. Specific activities occurring within 50 feet of Neuse River basin streams are regulated according to the Neuse River Basin Rules (see **Appendix E**).

In accordance with North Carolina regulations (15 NCAC 2B), two Critical Areas surrounding Holt Reservoir and Lake Michie have been identified within CBTC. Restrictions on land development, such as increasing the impervious surface area, apply within the Critical Areas in order to protect the water supply (**Figure 6**).

It is important to maintain communication with upstream, off-site property owners that conduct activities with the potential to impact water quality to ensure that their activities will not adversely impact the resources at CBTC, as well as off-site, downstream resources. Such activities can include agricultural operations, land clearing projects, and timber harvesting. Communication should also be maintained with the various state regulators that may regulate these private-entity activities.

To reduce sedimentation and protect water quality, main trails and roads will be graveled to eliminate the need for grading. Trails used only occasionally will be

reseeded. Non-essential trails will be closed, or access will be limited. Firebreaks will be made into permanent lines and be reseeded and used when needed, which will eliminate the need to use a fire plow and reduce wind and water soil erosion.

6.5.1.1 Streamside Management Zones

Riparian or SMZ are lands adjacent to streams, rivers, lakes, and wetlands. They can be highly productive ecosystems because they receive nutrients, water, and energy from the adjacent uplands. They intercept overland drainage, reduce stream bank erosion, trap sediments and nutrients, filter water, replenish groundwater reserves, and help to moderate flooding. SMZ are also important habitats for wildlife because the vegetation they support is often unique and very diverse and they create travel corridors for wildlife. In order to further protect water quality, the NCNG has established the following SMZ at CBTC (see **Figure 6**):

- 325 feet on each side of Camp Creek and Knap of Reeds Creek (650-foot SMZ)
- 150 feet on each side of other streams (300-foot SMZ)

SMZ will be maintained at CBTC to allow sediment and potential pollutants to be filtered out of stormwater runoff and to prevent them from entering surface water features on site. Potential sources of pollutants can include sediment from land disturbing activities, forestry practices, and pesticide or fertilizer applications.

6.5.1.2 Stream Crossings

When doctrinally required military training necessitates vehicular stream crossings, the NCNG will coordinate planning with the USACE and obtain required CWA permits. All USACE permits must be acquired prior to the commencement of any construction activity. Permanent stream crossings for interior access trails will be constructed and maintained and vehicular traffic limited to using these crossing sites. Drainage ways, creeks and streams will be crossed at right angles using culverts and/or bridging. BMP will be utilized in construction of the stream crossings to minimize restriction to surface water flow and mitigate the storage capacity of the floodplain.

All necessary stream crossings shall be designed to protect the adjacent streambank, to avoid stream flow impediments, and to allow for aquatic life passage. Generally, this means the culvert or pipe invert is buried below the natural streambed. If multiple cells are required, the second and/or third cells should be placed so that their bottoms are at stream bankfull stage (similar to Lyonsfield design). This will allow sufficient water depth in the culvert or pipe during normal flows to accommodate fish movements. If culverts are long, baffle systems are required to trap gravel and provide resting areas for fish and other aquatic organisms. If multiple pipes or cells are used, at least one pipe or box should be designed to remain dry during normal flows to allow for wildlife passage.

In addition, culverts should maintain stream dimension, pattern, and profile above and below the culvert. Riprap should not be placed on the streambed and disturbance of the stream channel must be limited to only what is necessary to install the pipes.

Heavy equipment should be operated from the bank rather than in the stream channel to minimize sedimentation and to reduce the likelihood of introducing other pollutants into the stream. If concrete will be used, work must be accomplished so that wet concrete does not contact stream water or wetland areas. If necessary and appropriate, the streambed will be restored to its original contours.

A low-water stream crossing (LWSC) is a structure that provides access across a

stream during normal flow but is periodically closed due to flooding. LWSC can provide low cost alternatives to bridges or culverts for areas with low traffic volumes like training roadways at CBTC. They are particularly suitable across streams that are sometimes dry or with low normal depth of flow. Usually, LWSCs are designed to provide streambed stabilization as well as access (Center for Transportation Research and Education [CTRE] 2001). Low-water crossings should not raise the substrate elevation above existing conditions in order to avoid ponding above the crossing, which may cause sediment deposition. Three common types of LWSC are:

- **Unvented Ford** - This structure has no culvert pipes and crosses streams that are dry most of the year, or have normal depth less than six inches. An unvented ford can conform to the streambed or it can be raised above the streambed. These crossings are usually constructed of rip rap, precast concrete, crushed stone, or articulated concrete. These are most suited for intermittent or ephemeral streams, or wide and shallow perennial streams.
- **Vented Ford -** This type of LWSC has one or more pipes under the crossing to accommodate low flows without overtopping the road. Water will flow over the crossing during higher water events. The pipes or culverts can be embedded in Portland cement concrete, aggregate, rip rap, or earths fill. A vented ford may work where stream depth is deeper than recommended for an unvented ford. However, if there is a high potential for debris that may clog the pipes, this type of crossing is not recommended.
- **Low Water Bridge** - This is a flat-slab bridge deck that is approximately the elevation of the stream bank. Its smooth cross section allows high water to flow over the structure without damaging it. This type of LWSC is recommended where higher stream flows exceed the capacity of a vented ford, where there is potential for clogging, or where an obstruction in the streambed would not be environmentally acceptable (CTRE 2001).

6.5.1.3 Wetlands and Floodplains

Wetlands are protected as a subset of the "waters of the United States" under Section 404 of the CWA. Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill into the "waters of the United States," including wetlands. Therefore, even an inadvertent encroachment into wetlands or other "waters of the United States" that results in a displacement or movement of soil or fill materials has the potential to be viewed as a violation of the CWA if an appropriate permit has not been issued by the USACE.

Section 401 of the CWA gives the State of North Carolina the authority to regulate, through the State water quality certification program, proposed federally-permitted activities that may result in a discharge to water bodies, including wetlands. The State may issue certification, with or without conditions, or deny certification for activities that may result in a discharge to water bodies. Furthermore, wetlands are protected under EO 11990 - *Protection of Wetlands* (43 CFR 6030). The purpose of this EO is to reduce the adverse impacts associated with the destruction or modification of wetlands through Federal actions.

As a result of the previously-cited Federal and State regulations, as well as DoD and Army Regulations (AR), the NCNG is responsible for identifying and locating jurisdictional "waters of the United States" (including wetlands), where these resources have the potential to be impacted by activities at CBTC. Such impacts could include construction of trails, buildings and other structures, or activities as simple as culvert

crossings of small intermittent streams, rip-rap placement in stream channels to curb accelerated erosion, and incidental fill and grading of wet depressions.

EO 11988 (Floodplain Management) requires all Federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impacts of flooding, and restore and preserve the natural and beneficial values of floodplains when acquiring, managing or disposing of Federal lands. In addition, if action is taken that allows an encroachment into a FEMA-established floodplain that ultimately alters the flood hazards or the floodplain boundary reflected on the FIRM, then the NCNG must submit an engineering analysis of the changes to FEMA. Portions of the CBTC are located in the FEMA 100-year floodplain (see **Figure 6**). Construction with the 100-year floodplain requires a permit from the local flood protection authority.

The following guidelines will be implemented to ensure compliance and to protect and enhance wetland and floodplains at CBTC:

- Avoid construction of permanent structures within floodplains.
- Avoid modifying floodplains when there are practical alternatives available. Where no practicable alternatives exist, implement BMP to mitigate the storage capacity of the floodplain and minimize potential harm to life, property, and their inherent natural values.
- Maintain SMZ at CBTC as described in **Section 6.5.1.1**.
- Avoid conducting activities (filling, modifying, draining, or construction) within delineated wetlands at CBTC.
- Minimize troop movements in ponds, wetlands, streams, drainage ways, headwaters and unapproved off-road areas.
- NR office will engage other offices to ensure proposed actions are avoiding wetlands.
- Subject proposed projects to environmental review by the DEM if direct impact to wetlands cannot be avoided. The environmental review will seek to minimize the overall impacts, and determine the required permits and mitigation procedures for the proposed project. Any changes or impacts to wetlands at CBTC will be documented.

6.5.2 Erosion and Soil Conservation

Erosion control and soil conservation are important water resource conservation issues. Accelerated erosion, continued compaction, or the removal of topsoil can drastically alter soils. Sediment resulting from erosion affects surface water quality and aquatic organisms. Two main types of soil erosion exist, wind erosion and water erosion. Soil types found at CBTC and their soil erosion potential are summarized in **Section 3.3**. A total of 1,311 acres of CBTC soils are considered to be sensitive soils. A map of the sensitive soil locations can be found in **Figure 5.**

Rehabilitation and maintenance of areas that experience soil erosion, compaction, or other problems are implemented through both the DEM and the LRAM program. General BMPs are utilized during activities that could potentially affect water resources. Examples of BMPs include: installing vegetative strips around a surface-water body to reduce runoff and sedimentation, and the use of silt fences. The NCNG will implement the LRAM program BMPs (see **Section 1.4.6.3**) as well as the following soil conservation guidelines at CBTC:

- Schedule and perform land rehabilitation projects during optimum seeding

periods. If projects cannot be performed within the optimum seeding period, then stabilize the soil and complete seeding as soon as possible.

- After maximum-impact-training exercises are conducted on the site, identify damaged areas and schedule appropriate rehabilitation.
- Use temporary erosion control methods (such as silt fences or hay bale diversions) as needed, during periods of heavy troop training and inclement weather to avoid silt migration to water bodies and other sensitive areas.
- Include soil capabilities, water management, landscaping, erosion control and conservation of natural resources in all site feasibility studies and in project planning, design, and construction. Include costs to obtain required permits and perform necessary rehabilitation work in project proposals and construction contracts.
- Areas that fail to establish a vegetative cover adequate to prevent rill erosion will be re-seeded as soon as possible.
- Design ground-disturbing types of training to minimize the potential for erosion in areas where soils have a higher K-factor (> 0.35) or a moderate to severe erosion potential. For example, roadways or vehicle training lanes can be designed with a permanent surface (asphalt or gravel) or sited along the contour of the land as opposed to across the contour.
- Monitor stream banks and gully erosion along the streams within the training site boundaries. Walk the stream banks annually during the winter months when erosion is visible. Mark erosion sites on a map, and take corrective measures where appropriate. Corrective measures often require contacting the USACE and securing appropriate permits to complete the project.
- Restrict vehicular traffic, including lawn mowers, within SMZ (**Figure 6**). Occasional crossing of dry drainage-ways may be done without bridges or culverts with minimal impacts to the drainage way. Regular crossing requires the designation of crossing sites and the installation of temporary bridging or culverts. Vehicles are not permitted within established buffer zones without prior review and approval of the DEM.
- Adhere to BMPs for construction activities described in NCDWQ's (2007) Stormwater BMP Manual in USEPA's (1992) Storm Water Management for Construction Activities.
- Implement the NCDFR (2006) *North Carolina Forest BMP Manual to Protect Water Quality* when conducting forest management practices.
- Obtain permits as needed and limit discharges.

6.5.2.1 Revegetation

There is the occasional reseeding of grasses and planting of trees to improve the training sites, and in areas disturbed by construction, training and related activities. Seeding is done to effectively establish vegetation to prevent erosion in areas of purposeful or inadvertent disturbance to the soil; the established vegetation also provides cover and food for wildlife. Seed germination, seedling establishment, plant growth and plant reproduction depend upon a variety of soil and climatic factors. Selection of appropriate seed and planting stock material and proper sowing and/or planting are critical to successful vegetation establishment. Revegetation of any disturbed area depends upon the chemical and physical properties of the material in which the plants will be rooted. Only native plant species may be used at CBTC, unless specifically reviewed and approved by the DEM. All areas seeded with grass must be

mulched with a minimum of three square bales of straw per 1000 square feet of seeded area. Use mulch netting instead of straw on slopes over six percent. Information on soil amendments is provided below.

Soil Formations

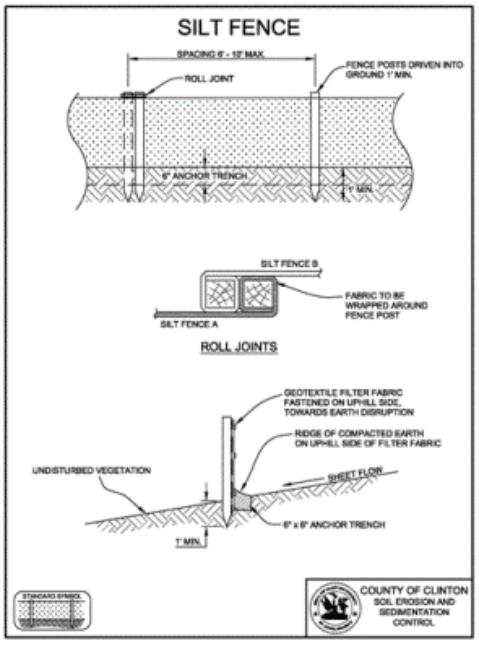
Correct pH and phosphorus levels and the need for nitrogen fertilization are necessary for keeping adequate vegetative cover on lands used for military training. Therefore, soil amendments (lime and fertilizer) will be applied to rehabilitation sites before seeding. Proper application procedures should include soil analysis to ensure proper nutrient application levels. Other factors to consider are soil moisture, effects of the amendment on non-target species, weather patterns and potential contamination of streams, ponds and lakes.

Lime is used to neutralize acidic soils. The rate of lime application should be sufficient to raise soil pH to a value to support the species of plant material used for revegetation. Quality agricultural limestone is generally the preferred choice. Lime should be incorporated into the top six inches of soil, which allows better rooting of plants, and minimizes lime loss via rainfall runoff. Lime should not be applied under wet soil conditions because it is difficult to incorporate uniformly into the soil.

Fertilizers consist of three primary plant nutrients: nitrogen (N), available phosphorous (P_2O_5) and water-soluble potash (K_2O). Mixtures of fertilizer materials are commercially available; their grade or content is expressed as a ratio in weight percent as N:P:K. Fertilizer should be applied according to the results of the soil test. Fertilizers are also incorporated into the top two to four inches of soil, and should not be applied when soils are wet. In wet soils, salt from the fertilizer forms, which can significantly reduce the percentage of seed germination, especially with grasses. The effectiveness of bacteria inoculated on legumes is also reduced under such conditions.

6.5.2.2 Silt Fences

In addition to seeding and mulching areas greater than 150 square feet, use silt fences to prevent silt from leaving the site. Line the borders from which runoff could occur with silt fences. Install silt fences according to the instructions below.



- Place the silt fence at the lowest elevation of the graded area.
- Fasten silt fence securely to each steel support post or to woven wire, which is in turn attach to the steel fence posts.
- Embed silt fence in trench and backfill.
- At each end of the silt fence, turn fence upslope, and extend until ground surface rises.
- Inspect the silt fence frequently, and repair or replace promptly as needed.
- Remove accumulated silt when it reaches a depth of six inches. Dispose of sediment trapped by this practice in an area not prone to erosion.
- Remove silt fence when it has served its usefulness to avoid blocking storm flow or

drainage.

6.5.2.3 Guidance for Roadways and Ditches

Provide V-shaped side ditches as shown in Field Manual (FM) 5-35 *Engineer Field Data* (DA 1987). Size and shape the ditches according to this manual, generally with a 2:1 slope. Slopes should not be too steep to avoid bank sloughing. Provide properly sized and installed culverts according to FM 5-35 to protect roadways and prevent erosion. In erosive areas, use riprap to stabilize the ditches. On steep erosive slopes, construct V-ditches with geotextile fabric and rip rap to add stability. Shape and crown roads to drain water. Install culverts to improve drainage and minimize shrinking, swelling, and frost damage. Add crushed rock or gravel to prevent road damage caused by low strength.

Use straw bales in sloping areas where road ditches have a tendency to wash:

- Place straw bales end-to-end, perpendicular to the ditch to completely dam the waterway approximately every 50 feet. The anchored straw bales will slow the flow of water and prevent erosion.
- Place bales in a row with ends tight against adjacent bales.
- Embed each bale in the soil a minimum of four inches where possible.
- Anchor bales securely with wooden stakes or steel rebar driven through the bales. Angle the first stake in each bale toward previously laid bale to force bales together.
- At each end of dike, turn dike upslope, and extend until ground surface rises 18 inches.
- Seed ditch banks with the recommended grass mixture. After the grass becomes established, remove every other row. Remove additional bales as the grass grows in where the removed bales were.
- Inspect bales frequently, and repair or replace them promptly as needed.
- Inspect and eliminate gullies that form under the straw bales.
- Remove accumulated silt when it is six inches deep to avoid impeding or blocking storm flow or drainage. If the silt is not removed, storm water may cut a new gully around the dike.
- Remove bales when they have served their usefulness. Fill in and smooth the area.

6.6 Forest, Grassland and Wildland Fire Management

In general, the NCNG plans to manage the land to promote native vegetation, while maintaining lands appropriate for required military training. Active terrestrial habitat management generally does not threaten the military mission because activities are scheduled around training activities and mission requirements. The NCNG will be responsible for maintaining healthy and biologically diverse ecosystems at CBTC by conserving and protecting the natural communities and through the use of environmentally sound management training methods, and through the implementation of the ITAM program.

Some important regulations and laws pertaining to forest, grassland, and wildland fire management include the following, which are described in **Appendix G**.

- Federal Insecticide, Fungicide, and Rodenticide Act (7 USC §136);

- Sale of Certain Interests in Land, Logs (10 USC §2665);
- Forest and Rangeland Renewable Resources Planning Act (16 USC §1601 *et seq*.)
- CWA of 1972, as amended (33 USC § 1329);
- ESA of 1973, as amended (16 USC §1531 *et seq*.);
- MBTA, as amended (16 USC §703-712);NEPA (42 USC §4321);
- AR 200-1, Environmental Protection and Enhancement;
- National Historic Preservation Act (NHPA) of 1966, as amended;
- SAIA (16 U.S.C 670 *et seq*.);
- Endangered and Threatened Wildlife and Wildlife Species of Special Concern (NCGS Annotated § 113-331 – 377);
- Regulation of Open Fires (Article 4C of NCGS § 113-60.21 to 60.31);
- North Carolina Prescribed Burning Act (Article 4E of NCGS § 113-60.40 to 60.45);
- Open Burning Regulations (15A NCAC 02D .1901 *et seq*);
- North Carolina Forest Practices Guidelines Related to Water Quality (FPG): (15A NCAC 01I .0100 - .0209);
- Forest Development Act (Article 11 of NCGS § 113A-176 et seq.);
- North Carolina Surface Water and Wetland Standards (15A NCAC 2B.0100 & .0200);
- Sedimentation Pollution Control Act of 1973 (Article 4 of NCGS 113A).

6.6.1 Forest Management

Prior to becoming a military training site as the former Camp Butner Military Reservation and the current CBTC, the land was predominately agricultural. However, CBTC can now broadly be described as having four distinct vegetation community types: mixture of upland and alluvial hardwoods, mixed pine and hardwood, pine forest, and pine plantations. Forest communities, as well as pine plantations, occupy over 90 percent of CBTC lands.

Forests are largely mid-successional with little mature forest. Due to poor timber markets in the past, many pine stands are dominated by Virginia pine and are overcrowded. Stands of Virginia pine offer little wildlife or timber value. Additionally, stands with poor growth and productivity are more prone to disease and insect infestation.

The primary objective of the CBTC forest management program is to support the military missions by providing forest conditions that enable military training while maintaining healthy and sustainable forest ecosystems and meeting regulatory requirements and stewardship responsibilities. Secondary objectives include providing for the production of forest products within the framework of an ecosystem management system. Management of forest resources at CBTC will be accomplished along with the coordination of the NCNG troop training and activities, which take priority. Management activities such as in-stand burning, reforestation, harvesting, timber stand improvement, buffer establishment and maintenance, and proper trail, road, and culvert maintenance, will be considered to address the objectives above.

In order to manage forest resources at CBTC and meet the objectives discussed above, the NCNG has developed a CBTC FMP, which is included in **Appendix B**. A forest management plan is required to support and enhance the immediate and long-term military mission and meet the natural resource stewardship requirements set by federal regulations. The forested lands at CBTC are managed to provide ideal military training sites while protecting the health and integrity of the ecosystem as a whole using the best science available to restore and maintain healthy ecosystems, their functions, and values.

The 2006 FMP is an update of the previous plan dated March 2001. This Plan addresses the following management concerns: timber stand data update; marketing timber resources; topographic limitations; forest practice guidelines related to water quality; allowable cut or harvest; use of herbicide; prescribed burning; and timber resources.

This CBTC FMP divides CBTC into 10 management blocks that coincide with the ten "training areas" identified on **Figure 2**. The Plan includes a separate stand type map for each block that illustrates the approximate shape and size of the various stands within each block. A table of data, with generic recommendations for each stand, accompanies each of the block maps (see **Appendix B**).

The NCNG will manage CBTC forest resources by implementing the 2006 CBTC FMP (**Appendix B**) and by adhering to the NCDFR (2006) *North Carolina Forest BMP Manual to Protect Water Quality* when conducting forest management practices.

6.6.1.1 Types of Silviculture Activities Used at CBTC

The greater the diversity of native tree species within the forest, the greater the probability of providing sustainable habitat for all endemic species. Considering the economic and environmental aspects of renewable resource management, as well as the suitability and capability of the soil and water resource systems, several timber management techniques are provided below for CBTC.

Selective Harvest

Moderately shade tolerant hardwood species, such as oaks (*Quercus* spp.), will be managed by selectively harvesting individual trees or groups of trees. Selective tree removal opens the tree canopy, allowing more light to reach the forest floor, and creates space for oak regeneration. At CBTC, the majority of the hardwood stands will be managed using this method, particularly those stands within the SMZ.

Thin and Burn

This technique is used within the pine forests to stimulate growth and reduce tree mortality. Thinning is especially effective in stands that are overstocked or dense. In North Carolina, this technique is an effective tool to prevent or lessen the severity of bark beetle damage. The NCNG will work with NCDEQ to identify optimal thinning quantities for CBTC training lands. The NCDEQ currently aims for approximately 60 square foot of basal area to be retained in a harvest area on the Butner-Falls of the Neuse and Jordan Game Lands.

A prescribed burn will be conducted in conjunction with the thinning activity. Prescribed burning will be performed 2 to 3 years subsequent to thinning to reduce the slash and litter, thereby reducing the potential for an uncontrolled fire to occur.

Hazard Reduction Prescribed Burning

The purpose of this management technique is to reduce the buildup of fuels on the forest floor, thereby limiting the intensity of an inadvertent or uncontrolled fire. Hazard reduction burning should be limited to older pine stands. Older pines possess a bark thickness that provides sufficient protection against the heat intensity of a controlled fire. Hardwood stands will be burned as well, but at a lower intensity. Hazard reduction burning will be conducted as early as age 15, if weather and fuel loading conditions are favorable. Ideally, pine stands should be burned every 3 to 5 years.

Clearcutting

Clearcutting is the most efficient and economical method to harvest mature standing timber or to clean out a poor quality or mismanaged stand. It is also the most efficient method to prepare a site for reforestation or regeneration of commercially important, shade intolerant tree species, such as pine (*Pinus* spp.) and yellow poplar (*Liriodendron tulipifera*).

Where possible, clearcutting should be conducted in areas adjacent to other clearcuts to benefit early successional wildlife species, to prevent forest fragmentation, to improve forest diversity and to create better age class distributions. Currently, clearcut activities focus on removal of Virginia pine species, as they offer little to no benefit to wildlife and are not considered valuable timber.

Reforestation/Regeneration

Once a stand has been harvested, it should be returned immediately to tree cover through mechanical reforestation or natural regeneration. Mechanical reforestation typically involves some type of site preparation and tree planting. Mechanical reforestation involves higher costs that are related to site preparation and purchasing planting stock, but the density of future forests is more easily controlled. Natural regeneration utilizes the existing seed source remaining on the site or from adjacent sites. With natural regeneration, the initial costs are less; however, there is little control over the species, spacing or quality of the regenerating trees. Natural regeneration is dependent upon the seed source (i.e., natural regeneration of loblolly pine is unlikely to occur due to the dominant presence of Virginia pine). Therefore, long-term management costs may be higher with natural regeneration than with mechanical reforestation.

6.6.1.2 Forest Management and Water Quality

In 1989, the State of North Carolina enacted water quality legislation that included performance standards for forestry practices. The performance standards specify that for forestry operations, SMZ must be established and maintained along the margins of intermittent streams, perennial streams, and perennial waterbodies. The SMZ at CBTC extend 325 feet to each side of Camp Creek and Knap of Reeds Creek and 150 feet to each side of other streams. The first 100 feet of all stream buffers adjacent to each streambank will remain undisturbed, and timber harvesting shall be restricted from these areas.

By law, SMZ must have a permanent ground cover and be of sufficient width to confine any visible sediment such that it does not enter adjacent streams. Any road construction and logging machinery, logging skids and skid trails, and/or milling equipment and site milling residue must be placed outside the SMZ. Additionally, the law specifies that BMP for erosion control, particularly within the SMZ, will be used and

selected to allow for the variation in weather, topography, soil, and vegetation expected for the site and the season.

Any forestry activity that obstructs or impedes stream flow or degrades water quality is strictly prohibited within the water quality performance standards. Stream crossings must also be avoided whenever possible. Any required stream crossings will be constructed so that stream flow is not obstructed or impeded, and the crossings will be provided with effective structures and/or ground cover to protect the banks and channel from accelerated erosion. No stream channel, intermittent or perennial, will be used as a skid trail or access road for any forestry practice. Any areas stripped of groundcover will be stabilized within ten days of the initial disturbance, and any temporary erosion protection will be maintained until the site is permanently stabilized. See **Section 6.5.1.2** on stream crossings for additional information.

In order to protect the water quality and biotic inhabitants in the stream environment, adequate shade within the SMZ shall be retained as a protective measure against water temperature fluctuation. Failure to do so is considered a violation of the state-adopted water quality standards.

All forestland disturbing activities must adhere to the Performance Standards of the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J .0101-.0209) or be subject to the requirements of the North Carolina Sedimentation Pollution Control Act of 1973. These standards are outlined in the NCDFR *Forestry Leafle*, which is included in **Appendix B**. The Neuse Basin Rules, which regulate activities occurring within 50 feet of Neuse River Basin streams (including those at CBTC) are of primary importance for any land disturbing activities at Camp Butner (see **Appendix E**).

6.6.2 Grassland Management

Approximately 340 acres of CBTC land is comprised of open and old field areas. The majority of the grasslands are located within the Cantonment Area or other improved or semi-improved areas throughout the installation (e.g., ranges).

When it does not conflict with the overall CBTC mission, native warm season grasses will be established to manage for long-term sustainability. Native warm season grasses have an extensive root system, which provides excellent soil holding capabilities. They also typically recover from land disturbances, such as military training, quicker than non-native cool season grasses. Because of these characteristics, they often improve both surface and ground water quality. Economically speaking, native grasses are also an excellent choice for re-vegetation because they require no soil additives or black dirt for establishment. Since they are adapted to the climate and conditions already, native grasses will grow with no added fertilizer. The need for brush cutting is decreased immensely because they grow densely and suffocate domestic weeds. Additionally, the introduction of native warm season grasses will enhance habitat quality at CBTC for a variety of organisms, including neotropical migrants and songbirds.

The following grassland management guidelines will be followed in addition to the establishment of native grasses at CBTC:

- Consider the effects of native grass management activities, such as planting, burning, and tree removal, near or on important cultural and natural resource areas.
- Determine areas that would be practical to avoid mowing between April and August to establish grass openings for ground nesting bird habitat and to minimize disturbance on ground-nesting birds.

- Raising mower height (~6") to avoid mowing snakes or frogs, leaving corridors from water features to woodlands, avoid mowing up to 10-20 feet from water feature, consider time of day as to avoid active period of some herps.
- Maintain the CBTC Cantonment Area as well as other improved and semi-improved grounds scattered throughout the installation (e.g., ranges) through routine or periodic grounds maintenance.

6.6.3 Wildland Fire Management

Abundant vegetation at CBTC provides fuel for wildland[1] fires which can quickly destroy entire training areas. If not controlled, wildfire has potential to threaten human health and safety, cause harm to personal property, and degradation to military training lands. In addition to damage to facilities and ranges, wildfire can destroy vegetation communities essential to a realistic training environment. This degradation can result in increased soil erosion, sedimentation in CBTC waterbodies, and long-term reduction in the capacity of training areas.

Army policy requires that an Integrated Wildland Fire Management Plan (IWFMP) be developed for installations with unimproved grounds that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. The purpose of the IWFMP is to reduce wildfire potential; protect and enhance valuable natural resources, infrastructure and facilities; and to implement ecosystem management goals and objectives. The statewide IWFMP, which includes CBTC, was completed in 2009. A copy of the NCNG IWFMP can be obtained in the NCNG Environmental Office or via NCGKO.

6.6.3.1 Prescribed Burn Management

Prescribed burning is the purposeful application of fire in a controlled, knowledgeable manner that may be used as an effective land management tool. The occurrence of fire is a natural component of many ecosystems (including both forests and grasslands) and prescribed burning can be a desirable and economically sound management practice.

Prescribed fire may be used to accomplish the following:

- *Reduce hazardous fuels* - Periodically burning the underbrush can significantly decrease the chance of a catastrophic forest fire.
- *Prepare sites for seeding or planting* - Prescribed burns often expose adequate mineral soil and can control competing vegetation.
- *Improve wildlife habitat* - Prescribed burning can improve wildlife habitat and increase forage by keeping hardwood sprouts short, tender, palatable, and abundant. Deer, dove, quail, and turkey generally benefit from prescribed burns. In addition, grassland habitat is improved by the removal of undesirable grassland species.
- *Manage competing vegetation* - Prescribed burning can be used to control invasive vegetation.
- *Control insects and disease* - Prescribed burns may be used to control some insects and diseases.
- *Enhance appearance* - Prescribed burns often enhance recreation and aesthetic values of a forest and native grasslands by removing understory brush.

[1] The term *Wildland Fire* is used when wildfire and prescribed fire are referred to collectively.

- *Perpetuate fire-dependent species* - Prescribed burning may be used to perpetuate many fire-dependent species. However, it is imperative to understand the ecology of the species to know which months will be ideal for a burn (Wade and Lunsford 1988). For example, some invasive plant species are also encouraged by fire, such as *Microstegium* spp.

The NCDFR conducts and manages prescribed burns for the NCNG on a fee basis. The County Rangers in Granville and Durham counties may assist with this work as well. The NCNG personnel with proper training often participate in these prescribed burns. Refer to the NCNG IWFMP for more details on training requirements. The NCNG and NCDFR work together annually to identify areas requiring management and to develop a schedule for these activities.

Prior to conducting a prescribed burn at CBTC, a site-specific burn plan is completed that includes, at a minimum, a description of the location, weather and fuel parameters, justification for the burn, a smoke management plan, safety considerations, contingency plan, equipment, firebreak information, and burn operations and evaluation.

Prescribed burns are conducted at CBTC for the following reasons: fire hazard reduction, wildlife habitat improvement, site preparation for tree planting, timber management, invasive species control (i.e., Chinese wisteria) and reduction of woody growth for training access. Specific prescribed burn management practices conducted at CBTC are included below.

Hazard Reduction in Forested Areas

The purpose of this management technique is to reduce the buildup of fuels on the forest floor, thereby limiting the intensity of an inadvertent or uncontrolled fire. Hazard reduction burning is limited to older pine stands. Older pines possess a bark thickness that provides sufficient protection against the heat intensity of a controlled fire. Ideally, pine stands should be burned every 3 to 5 years. Hardwood stands will be burned as well, but at a lower intensity. Assuming weather and fuel load conditions are favorable, hazard reduction burning is conducted as early as age 15. Ideally, pine stands should be burned every three to five years.

Woody Growth / Hazard Reduction on Ranges and Other Training Areas

The use of prescribed fire in the night fire zone (Range 3) and land navigation area is necessary. Night fire training on Range 3 involves the use of a tracer round, which burns a pyrotechnic compound. This activity, particularly during dry conditions and when fuel loads are high, has been known to ignite the area north of Range 3. A prescribed burn is conducted every 1 to 2 years to prevent accidental wildfires in these areas and to deter training interruptions. The land navigation area needs to have the understory maintained for ground troop maneuvers. A controlled burn is conducted every 1 to 3 years in the land navigation area.

Reduction of Woody Growth in Forests

Winter burning is used initially on forest stands that have a buildup of fuels. However,

summer burning will be used whenever possible (generally in older pine stands) to combat the proliferation of sweetgum and other woody underbrush, including wisteria, that become unwanted components of most pine stands. Areas invaded by wisteria vines are prime areas for burning. A summer silvicultural burn will control many of the vines and provide herbaceous plants a greater opportunity to exist in the understory. *Note:* winter burns conducted within cold weather grass and brush areas can decrease vital habitat and food for mammals during the winter.

Wildlife Habitat Improvement

Open areas (planted with native warm season grasses) ranging from approximately 1 to 3 acres are available for nesting and brood ranges. To enhance bird and turkey habitat, prescribed burning in these areas occurs in the winter months. Grass openings will not be mowed between April and August to avoid disturbing ground nesting birds. Fruit-bearing shrub species and sapling mast producing species are protected.

6.6.3.2 Prescribed Burn Constraints at CBTC

Constraints to the use of prescribed fire include the range use schedule; environmental restrictions such as weather conditions; accessibility issues due to impassible unpaved trails within the property; and the availability of funding, equipment and properly trained personnel. All these items combined make it difficult to not only schedule prescribed burns, but to implement them on the day for which they are scheduled. These constraints are discussed in more detail below:

- *Range Use* - Ranges are hot 242 days a year on average with weekends being the busiest (NCNG 2008). In addition, the surface danger zone (SDZ) for these ranges extends over the center of the CBTC property, which makes it difficult to conduct other activities when they are in use.
- *Weather* - Specific weather parameters must be in place at the time of the burn as designated within the Site-specific Prescribed Burn Plan. If these parameters are not in place, the prescribed burn must be canceled.
- *Breeding Season* – During first clutch of bird breeding period prescribed burns will be delayed.
- *CBTC Trails* - A network of single-lane, unpaved trails furnish access within the property. Many of these trails require use of a four-wheel drive vehicle.

  Some trails or road segments are so infrequently used that the roadway is encroached by vegetation resulting in only approximately 3 ft. of travel lane width. In addition, sections of trails are poorly drained, and the underlying soils plastic causing the roadway to be soft, slippery and impassable at times. The slopes on portions of the unpaved, interior roadways exceed a grade of 50 percent. Thus, accessibility along these trails is not only weather dependent, but also limited with regard to the vehicle type. These trails generally require a four-wheel drive and/or tracked vehicle.
- *Equipment and Personnel* – The availability of the necessary personnel and equipment are always a challenge. Currently, the NCDFR must obtain a tractor and operator from a nearby county district office when conducting prescribed burns. The availability of these two items greatly restricts when a burn can be conducted.

Prescribed fire will not be conducted in situations where these or any other issues threaten the safety of human life or property.

6.6.3.3 Permits

Prior to conducting prescribed burns, the NCNG will obtain an *Open Burning Permit* through the NCDFR per the open burning rule (15A NCAC 2D.1900 *et seq*.). No fees are associated with these permits. Violations to this rule can be fined up to $25,000 per violation or more for serious cases.

Please note an open burning permit can be canceled, any time a burning ban is instituted. Prior to conducting a prescribed burn, the NCNG will verify no burning bans or other air quality/weather restrictions are in place.

6.6.3.4 Wildland Fire Protection Guidelines

Given the constraints presented by the existing site conditions and available firefighting resources, the following recommendations will be utilized, both individually and collectively, as management tools to reduce the potential of a wildfire occurring and to limit property damage should a wildfire occur:

- Utilize prescribed burning to remove ground and ladder fuels from the understory and only conduct prescribed burns when weather conditions are appropriate.
- Have an emergency plan (i.e., contingency plan) established for each site-specific burn in the event it gets out of control.
- Provide adequate firebreaks. Firebreaks are an essential management tool for both prescribed burning and wildfire prevention. Wildfires could result from the use of pyrotechnic devices or tracer fire. In an active effort to confine fires to the smallest area possible, firebreaks should surround active impact areas and ranges where these activities might occur.
- Improve access to and within CBTC. Construct and maintain permanently surfaced trails. If possible, relocate access trails within the site away from steep slopes.
- Construct and maintain permanent stream crossings only where necessary to improve site accessibility and prevent negative impacts to the water quality (see **Section 6.5.1.2**).
- Conduct cooperative training exercises between NCNG, NCDFR and Butner Public Safety for both personnel and equipment.
- Provide training for CBTC personnel to increase on-post capability to suppress small fires that may occur on the range.
- Do not wear synthetic materials. They melt under intense heat. Wear natural fiber clothing to cover the body, arms, head, and legs. Also wear goggles, gloves, and hightop leather boots. Wear hard hats when burning near trees and brush.
- Conduct exercises with a high potential for fire away from buildings and in areas surrounded with firebreaks such as roads or mowed areas. Conduct these exercises when humidity is relatively high and wind speeds are relatively low. Extinguish all sources of fire, including cigarette butts and spent pyrotechnics. Have fire control equipment ready for use when pyrotechnic training is occurring.
- Report all fires to Range Control immediately. Report the grid location, nature and size of the wildfire, to the extent feasible, to the dispatcher. Immediately cease all training activities and call for a "check fire" on ranges.

- **Integrated Pest Management**

IPM is the use of multiple techniques in a compatible manner to avoid damage and minimize adverse environmental affects while obtaining control of target pests. The goal of IPM is to utilize non-chemical procedures to control pests, including both invasive and exotic plant and animal species. IPM is used on CBTC, and typically a combination of the below IPM techniques is required to resolve a problem on a sustained basis:

- *mechanical control*, which alters environments in which pests live, traps or removes pests (*i.e.* glue boards and live-traps) from where they are not wanted, or excludes pests from where they are not wanted (*i.e.* screening);
- *cultural control*, which manipulates environmental conditions to suppress or eliminate pests (*i.e.* removal of food scraps or spreading manure on fields);
- *biological control*, which uses predators, parasites, or disease organisms to control pests (*i.e. Gambusia* fish to eat mosquitoes or triploid grass carp to remove aquatic weeds); and
- *chemical control*, which relies on pesticides and/or herbicides to kill pest and/or undesirable species of plants.

IPM is accomplished at CBTC through the implementation of the *North Carolina National Guard Integrated Pest Management Plan* (2018). This Plan includes pest identification and management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety, and environmental requirements of the program. This plan serves as a tool to reduce pesticide use, enhance environmental protection, and maximize the use of IPM techniques.

The NCNG Pest Management Coordinator manages the pest management program at CBTC and is responsible for all aspects of pest management record-keeping. Pest management at CBTC is generally accomplished in-house for mechanical, cultural and biological control; however, chemical control is performed through outside contractors.

It is the policy of the NCNG to minimize the use of all pesticides, including herbicides, at the installation.

Laws and regulations pertaining to invasive and exotic species and pest control include the following, which are described in **Appendix G**.

- Federal Noxious Weed Act of 1974 (7 USC §2801 et seq.);
- Federal Insecticide, Fungicide, and Rodenticide Act (7 USC §136);
- Federal Pest Plant Act (7 USC §150a et seq.);
- EO 12865, Reduction of Pesticide Application by 50% by Fiscal Year (FY) 2000;
- EO 13112, Invasive Species;
- National Aquatic Invasive Species Act of 2003 (NAISA);
- North Carolina Pesticide Law of 1971 (Article 52 of NCGS § 143-434, et seq.);
- Aquatic Weed Control Act of 1991 (Article 15 of NCGS § 113A-220 et seq.);
- North Carolina Plant Pest Law (Article 36 of NCGS § 106-419 et seq.);

- Noxious Weed Regulations (02 NCAC 48A .1701-1708).

6.6.4 Invasive Plant Species and Noxious Weeds

Invasive and exotic species may include plants, insects, or animals. An **invasive** species is defined as "an alien species whose introduction does or is likely to cause economic or environmental harm, or harm to human health." An alien (or **exotic**) species is defined in EO 13112 as a "species including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem." Many exotic species have the ability to spread rapidly through ecosystems since their natural predators are often not present. Such species often retard natural succession and reforestation and generally cause a reduction of biological diversity in forests.

Noxious weeds are defined in the Federal Noxious Weed Act of 1974 as "any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the United States or the public health."

Several plant species have been designated noxious weeds per North Carolina noxious weed regulations (02 NCAC 48A .1701-1708) under the authority of the North Carolina Plant Pest Law. Noxious weeds are classified into three classes (A, B and C) in the State of North Carolina. Class A noxious weeds include: federally-listed noxious weeds, African elodea, (*Lagarosiphon* spp.), water fern (*Salvinia* spp.-except S. minima), mile-a-minute (*Polygonum perfoliatum*), swamp stonecrop (*Crassula helmsii*), water-chestnut (*Trapa* spp.). Class B noxious weeds include: Florida betony (*Stachys floridana*), yellow fieldcress (*Rorippa sylvestris*), Lythrum (any Lythrum species not native to North Carolina), *Punctureviné* (*Tribulus terrestris*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), plumeless thistle (*Carduus acanthoides*), Eurasian watermilfoil (*Myriophyllum spicatum*), Uruguay waterprimrose (*Ludwigia hexapetala*). Class C noxious weeds include: Oriental bittersweet (*Celastrus orbiculatus*). To date, none of these noxious weeds designated by the State of North Carolina have been identified on CBTC.

A field survey was conducted in fall 2007/spring 2008 to identify and describe current populations of invasive plant species at CBTC. The objectives of this investigation were to: (1) locate, map, and describe established populations; (2) estimate the area and density of these populations; and (3) develop guidance for control and monitoring of invaded areas. Nine invasive plant species were identified during this survey at CBTC (see **Table 8**).

Table 8. Invasive Plant Species Known to Occur at CBTC

Scientific Name	Common Name	Plant Type	Population Extant at CBTC
Ailanthus altissima	Tree-of-heaven	Tree	Approximately 0.6 acre of land is inhabited by this species. Open fields and cleared areas are the greatest concern at CBTC (e.g., firing range berms).
Albizia julibrissin	Mimosa, silk tree	Tree	One population was observed at CBTC; however, several are located off the installation property. This species should be monitored for annually.

Lonicera japonica	Japanese honeysuckle	Vine	This species is commonly seen covering established vegetation forming dense canopies, and spreading across forest floors. CBTC is comprised of approximately 1.9 acres of this species. The largest infestation occurs on the portion of CBTC south of Roberts Chapel Road.
Hedera helix	English ivy	Vine	A small 0.04-acre population occurs at CBTC. While this population is small it could threaten the pine oak forest community it inhabits. This species should be monitored for annually.
Lespedeza cuneata	Chinese lespedeza	Forb	This species is along the majority of roads/trails at CBTC, and is estimated to cover 2.6 acres of land.
Microstegium vimineum	Nepalese browntop, Japanese stilt-grass	Grass	Microstegium is a significant problem at CBTC. In 2008, an estimated 3.2 acres of CBTC land contained this species. Since then this area has greatly expanded.
Paulownia tomentosa	Princess tree	Tree	One small population occurs at CBTC (0.001 acre). This species should be monitored for annually.
Pueraria Montana var. lobata	Kudzu	Vine	Not currently a problem at CBTC (0.2 acre of kudzu established on Post); however, it is well established along the roads surrounding the installation. This species will remain a constant threat and should be monitored for annually.
Wisteria sinensis	Chinese wisteria	Vine	One population was observed comprising approximately 0.4 acre at CBTC.

Source: AMEC 2008

The *CBTC Invasive Species Management Plan* provides control and monitoring recommendations for the nine (9) invasive species observed at CBTC (AMEC 2008). Because control and management of invasive species can often be difficult and expensive, this Plan categorized invasive species population at CBTC as either high or low priority. High priority was given to species with the ability to substantially impact natural resources, or easy to manage populations. High priority was also given to species with the potential to cause major impacts if they become well established. Low priority was given to species that cause little impact, are nearly impossible to control, or both.

High priority invasive species populations at CBTC include (given in order of importance): kudzu (all populations), English ivy, Chinese wisteria, silk tree, princess tree, and tree-of-heaven. Easily eradicated populations of Japanese honeysuckle (green populations), and similar populations of Chinese lespedeza should also be considered high priority populations for management (AMEC 2008).

Low priority invasive species populations would include: Chinese lespedeza (difficult to eradicate populations), Japanese honeysuckle (medium to difficult populations), and Microstegium (medium to difficult populations) (AMEC 2008).

For additional information on the biology, monitoring and management of the invasive species at CBTC, please refer to **Appendix H** for a copy of the *CBTC Invasive Species Management Plan*.

6.6.5 Pest Management Guidelines

Invasive and exotic species and noxious weeds have the capability to form dense strata within the forest which could interfere with on-the-ground training activities. A key element in the Sikes Act establishment of INRMPs is to ensure "no net loss" of military training capability. Management of undesirable species is necessary to maintain military training areas in usable condition. Uncontrolled pests can become health hazards and threaten the military mission.

Controlling invasive and exotic species and noxious weeds is often expensive, lengthy, and risky because total eradication is required to prevent reestablishment. However, in accordance with laws and regulations pertaining to the management of these species, the NCNG will work to prevent the introduction of these species and take measures to manage them in an economically and environmentally sound manner.

General management strategies include:

- Prohibit the use of invasive and exotic plants for landscaping or other purposes;
- Implement BMPs to minimize land disturbances that promote invasion, and re-vegetate disturbed areas with native species. Avoidance will remain the preferred control measure;
- Monitor for invasive and exotic species and noxious weeds. The best control approach for invasive and exotic species and noxious weeds is early detection, isolation of infested areas, and control of individual plants with physical, chemical or mechanical means, depending on the species. Once established, an integrated approach to control will be necessary to minimize the damage.
- Monitor for Chinese privet (*Ligustrum sinense*), a semi-evergreen small tree or shrub. Although this species was not observed during the 2008 survey, it is highly prevalent in North Carolina and is commonly found invading the understory of moist areas.
- Implement invasive plant management recommendations included in the *CBTC Invasive Species Management Plan* for the species listed in **Table 8** (**Appendix H**).
- Use pesticides in compliance with AR 200-1, the ARNG IPM Program Policy Memo, February 2016 and the NCNG IPM Plan.
- Educate CBTC personnel and site users on the identification and avoidance of potential disease vectors and poisonous plants that include, but are not limited to, poisonous snakes, ticks, black widow spiders (*Latrodectus mactans*), brown recluse spiders (*Loxosceles reclusa*), and poison ivy (*Toxicodendron radicans*).
- Manage overgrown vegetation in and around bivouac sites to reduce tick and poison ivy problems.
- Avoid aerial or broadcast application of herbicides and pesticides to prevent adverse impacts native plants and wildlife. The use of the steam weed killer will be the primary source of noxious weed eradication. Consult the DEM before spraying pesticides aerially on the training site; an aerial application validation statement is required from the NGB.
- Use rapidly degrading pesticides and herbicides, which are less likely to contaminate soil and groundwater, if chemical control methods are applied.

Avoid spraying chemicals in riparian zones and CBTC water bodies. If chemicals must be sprayed in these areas, use an herbicide that is labeled for use near sensitive aquatic areas is required.

- Apply chemicals at a time when they will be most effective against the pest. Pest cycles are influenced by temperature and moisture conditions. In many cases, pests under dormant or stressed conditions may not be susceptible to pesticide treatments. Avoid pesticide applications during adverse weather, especially under windy, wet conditions. Do not apply volatile chemicals under high temperature conditions.

6.6.6 Certification of Pesticide Applicators

Only certified pesticide applicators are authorized to purchase and spray restricted use pesticides on State-owned (per the PRIDE database) NCNG sites and pesticide applicators must be certified for all pesticide application (other than via the Self-Help Program outline in the NCNG IPM Plan) at Federally-owned (per the PRIDE database) NCNG sites. All applicators will become certified and remain current in new pest management developments and methods. By law, all pesticides must be applied according to label specifications. Never exceed the manufacturer's recommended dosage for pesticides, apply only to the target pests identified on the label, and wear required safety clothing. Apply the lowest labeled pesticide rate that adequately controls pests. Lower rates reduce the total amount of chemical in the environment. Rotate pesticides among chemical families to minimize pest resistance. IPM does not rely on continuous use of a single pesticide or pesticide family.

By regulation and law, the NCNG must maintain records of all pesticides application at Federally-owned (per the PRIDE database) NCNG sites indefinitely and maintain records of restricted use pesticides usage at State-owned (per the PRIDE database) NCNG sites for at least two years. Keeping accurate records of all chemicals applied on the site will help the NCNG make informed management decisions. Records of non-restricted chemicals will also be maintained at this time.

- **Outdoor Recreation**

Outdoor recreation is defined as a recreational program, activity, or opportunity that is dependent on the natural environment. Examples include hunting, fishing, trapping, picnicking, birdwatching, off-road vehicle use, hiking and interpretive trails use, wild and scenic river use, and under developed camping areas. Laws and regulations pertaining to outdoor recreation include the following:

- SAIA (16 USC 670 *et seq*.);
- AR 200-1, Environmental Protection and Enhancement;
- EO 12960, Recreational Fisheries;
- NC Wildlife Commission's Inland Hunting, Fishing and Trapping Regulations Digest (revised annually);
- JFHQ-NC 215-2, Deer Hunting at CBTC.

These laws and regulations are described in **Appendix G.**

The NCNG is a trustee of public land and has a responsibility to protect and enhance environmental quality, conserve natural resources, and provide opportunities for outdoor recreation. However, it must be recognized that land under NCNG control was

acquired solely for national defense purposes. Other uses are secondary to mission needs, and offered at the discretion of the installation commander.

AR 200-1 provides guidance for access to military lands and waters by recreational users. Within the guidelines of that regulation, such access will be within manageable quotas, subject to safety, military security, threatened or endangered species restrictions, and the capability of the natural resources to support such use.

Fishing is not allowed at CBTC. The NCNG does not own Lake Holt, which traverses the southeast corner of the CBTC property. Recreational fishing does occur on Lake Holt, but public access to this lake is not available via NCNG property. For additional information on public access, recreational hunting and horseback riding, and public outreach, please refer to the following sections.

6.6.7 Public Access

Limitations on public access will be established in certain areas of CBTC for safety reasons. At the present time, these restricted use areas include, but are not limited to, the training ranges, the impact areas, and a 500-foot buffer area along the perimeter of the CBTC property. As such, public access to specified areas at CBTC will be strictly monitored and controlled by secured gates.

At CBTC, all visitors must check in at range control. Any person entering the training site for any purpose prohibited by law or lawful regulation constitutes trespassing.

6.6.8 Recreational Hunting Activities

Hunting is allowed at CBTC as a management tool to maintain a balance between wildlife populations and available habitat. Through this management strategy, recreational opportunities are available to eligible participants as long as they do not interfere with military training operations.

All hunting activities are authorized and controlled by the CBTC Facilities Manager or a designated representative. North Carolina State regulations for hunting apply at CBTC. Seasonal hunting periods for the State and Granville and Durham Counties apply, unless further limited by the facility. Hunting is authorized by permit and in designated areas only. Refer to **Figure 2** for authorized hunting areas at CBTC. CBTC range staff, state and local law enforcement, and other duly authorized personnel have the authority to limit, restrict or deny access to permit holders as necessary; revoke a hunting permit as appropriate; and inspect a hunter's license and permit on request. Law enforcement personnel have the authority to arrest for violations committed on CBTC property.

Hunting takes place in five 5-day long sessions, limited to 50 hunters per session. Those wishing to hunt must register for a specific session(s) and pay a fee per session. The annually determined fee must be paid at the time the permit application is submitted. The fee is non-refundable (i.e., even in the event of a permit revocation). Per NCNG SOP, a liability release form must accompany each individual permit application. The collected fees are deposited into a CBTC Unit Fund account.

The SOP regulating hunting activities at CBTC is contained in JFHQ-NC 215-2 (**Appendix G**). A copy of this regulation is maintained in the CBTC Range Management Headquarters and the Office of the Deputy Chief of Staff for Operations (ODCSOPS) in Raleigh, and is distributed with all approved permits. The rules of conduct for permitted hunters, limits on weapons and ammunition, and site use protocols are included in this CBTC regulation.

6.6.9 Recreational Horseback Riding

At the discretion of the NCNG, the public may have the opportunity to utilize the land resources and facilities at CBTC. Organized, group horseback riding is permitted at CBTC on a limited basis and only in site-specific areas. The safety restrictions for horseback riders are similar to those for hunters.

Organized, group horseback riding presently takes place on one weekend each year. All riders are instructed in range safety and environmental protocols. Open stream and wetland crossings are prohibited as are campfires and use of archaeological sites. Horseback riding trail signs will be used to mark the designated trails for recreational riding events. Along the designated trails, the NCNG will post signs that identify designated watering points or portable drinking troughs for horses. The placement of drinking troughs or identifying specific watering points will prevent the horses from entering the streams to drink.

6.6.10 Public Outreach

Public outreach is handled at CBTC through the NCNG SRA program, which is discussed in greater detail in **Section 1.4.6.4**. This program focuses on all land users including soldiers, leaders, civilians, and the local community. SRA serves to educate the public on the military mission's natural resources needs and impacts.

NCNG is committed to cultivating a conservation ethic in the community, especially local youth. Natural resources personnel work with community and youth groups on conservation programs whenever possible. Scouts, in particular, often need support with projects, merit badges, and conservation talks. Scouting events are held annually at CBTC.

6.6.11 Native American Consultation

No Traditional Cultural Resources have been identified to date at CBTC. Additionally, no Native American sacred sites have been identified at the installation. If concerns regarding these resources arise, the NCNG will undertake inventories as needed.

Consultation with federally-recognized Native American tribes was initiated by the NCNG during the ICRMP process. According to the 2001 ICRMP, the following federally-recognized Native American tribes have ancestral ties to lands now occupied by the NCNG: Cherokee, Catawba and Tuscarora. The Cherokee primarily resided in the western portion of North Carolina, while the Catawba and Tuscarora resided in the south-central/south-east and north-central/north-east portion of the State, respectively. Based on 2001 ICRMP consultation efforts, it was determined that the Catawba is the only tribe to have interest in CBTC (NCNG 2001). The 2010 ICRMP lists five additional tribes that have expressed an interest in various areas of North Carolina. These tribes include: Absentee-Shawnee Tribe of Oklahoma, Shawnee Tribe of Oklahoma, Cherokee Nation of Oklahoma, Muskogee (Creek) Nation of Oklahoma, and United Keetoowah Band of Cherokee of Oklahoma.

Consultation for this INRMP was initiated by the NCNG in accordance with NEPA, NHPA, NAGPRA, and DoD American Indian and Alaskan Native Policy. The NCNG contacted eight federally recognized Native American tribes that may have ancestral ties to the CBTC area. The NCNG received responses from one tribe. A copy of this correspondence as well as a memorandum for record (MFR) can be found in **Appendix A**.

- **Natural Resources Law Enforcement**

Many aspects of integrating the training mission with natural resources management require effective enforcement if they are to be successful. Such programs as hunting, protection of wetlands, water pollution prevention, special species protection, and

others are dependent on law enforcement. The town of Butner Public Safety Officers, North Carolina Department of Wildlife Officers, and other law enforcement agencies will enforce the state and local laws, regulations, and restrictions at CBTC. These agencies provide law enforcement support to the range staff. According to JFHQ-NC 215-2, law enforcement personnel have arrest authority for violations committed on CBTC property.

At CBTC, all visitors must check in at range control. Any person entering the training site for any purpose prohibited by law or lawful regulation constitutes trespassing.

7.0 GOALS, OBJECTIVES, AND PROJECTS

The goals and objectives in this updated INRMP are a consolidation and continuation of the goals and objectives in the 2001 and 2010 INRMPs. Where goals and objectives were poorly written or not clear, they have been rewritten and consolidated into one section.

The goals and objectives are supported by projects (subject to funding availability) and recurring natural resources management activities, which will allow the NCNG to achieve their management goals. Planned projects and recurring activities are summarized in **Tables 9** and **10** in **Section 8.0**. Please note that the implementation of some projects or activities will allow the NCNG to meet multiple goals and objectives. The consolidated goals, objectives, and resulting projects and recurring activities are listed below.

GOAL 1: Manage natural resources in a manner that is compatible with and supports the military mission while complying with applicable Federal and State laws and Army regulations and policies.

OBJECTIVE 1.1: Initiate programs and projects that enhance the training land availability and training opportunities and result in no net loss of training land.

OBJECTIVE 1.2: Maintain sustainable, realistic terrain for military training throughout the entire 4,880 acres of CBTC land.

Objective 1.3: Plan and allocate all activities, such as military training, wildlife-related recreation, land rehabilitation of training damage, and rare species habitat management so as to minimize conflicts with one another.

Project – 9: INRMP update

OBJECTIVE 1.4: Educate 100 percent CBTC users regarding the natural resources at CBTC and their part in ensuring sustainable use of the site in perpetuity.

Project – 8: Environmental Awareness Materials
Activity – Update the natural resources section of the safety briefing as needed.

Objective 1.5: Provide adequate signage on CBTC that identifies restricted-use areas, and visually inspect 100 percent of posted signs on an annual basis at a minimum.

Activity – Inspect signage at CBTC regularly and replace any damaged signs.

OBJECTIVE 1.6: Use the NEPA process to make informed decisions on 100 percent of all proposed projects at the CBTC that include natural resources considerations and mitigation.

Activity – Subject all projects to review by the DEM.

OBJECTIVE 1.7: Ensure feedback from training officers is incorporated into all natural resource planning and management.

Activity – Brief CBTC training staff on new or upcoming natural resources projects or management prior to implementation.

GOAL 2: Ensure the condition of natural resources at CBTC is maintained.

OBJECTIVE 2.1: Maintain current species inventories and other PLS by conducting 100 percent of all species surveys required by federal and state laws and regulations.

Project – 20: Fauna survey

OBJECTIVE 2.2: Conduct RTLA monitoring on a regular basis and conduct formal monitoring every five to ten years using a systematic, qualitative approach focusing on general site parameters such as vegetation, presence and severity of soil erosion, presence of specific animal species, and specific evidence of training related impacts.

Project – 6: Water Quality Monitoring

OBJECTIVE 2.3: Record population dynamics, evaluate management effectiveness, and identify negative impacts and appropriate mitigation within one year after receiving any new survey or inventory data.

Project – 10: Ecological Health Report

GOAL 3: Protect, restore and maintain populations of rare plant and animal species on CBTC in compliance with Federal and state laws and regulations.

Objective 3.1: Conduct specific surveys for federal and state special status species where potential habitat exists every 5 to 10 years or as required by federal and state laws and regulation to ensure management objectives are being met.

Project – 20: Fauna survey
Project – 25: Flora and Vegetation Communities Survey

Objective 3.2: Identify site-specific habitat requirements and management measures for all special status species known to occur at CBTC.

Objective 3.3: Review and coordinate all management strategies for special status species with facility training managers and cooperating/regulatory agencies prior to implementation.

Project – 23: Rare Species Management

GOAL 4: Protect and maintain populations of game and nongame fish and wildlife species

OBJECTIVE 4.1: Develop and implement, or utilize existing short- and long-range management strategies to achieve population objectives for resident game and nongame species.

OBJECTIVE 4.2: Review and coordinate all management strategies with both cooperating regulatory and non-regulatory agencies prior to implementation.

OBJECTIVE 4.3: Maintain wildlife populations at or below carrying capacity to prevent damage to their habitats.

OBJECTIVE 4.4: Minimize wildlife-related health and safety risks and environmental damage 100 percent of the time.

Project – 21: Wildlife Management Plan

OBJECTIVE 4.5: Provide opportunity for wildlife recreation to the public that is compatible with the military mission and when it does not interfere with training

activities.

Project – 7: Public Outreach Program

OBJECTIVE 4.6: Maintain SMZs per the guidelines set forth in **Section 6.5.1.1** to sustain beneficial habitat for fish and wildlife.

Activity – Inspect SMZs on a regular basis to ensure they are being maintained and that no incompatible activities (e.g., filling, modifying, draining, construction) are occurring.

GOAL 5: Sustain usable training lands and native natural resources by managing non-native and invasive species, vegetation and plant communities, and nuisance wildlife species.

OBJECTIVE 5.1: Manage all populations of invasive plant species where they hinder training and/or habitat management objectives.

OBJECTIVE: 5.2: Manage all non-native and invasive insect species that pose a threat to forest resources.

Objective 5.3: Eliminate pests using environmentally and economically sound means 100 percent of the time (i.e., limiting chemical application).

Project – 22: Invasive Species Control

Objective 5.4: Provide awareness to 100 percent of CBTC site users about snakes, spiders, insects, and feral animals that may pose a danger.

Project – 8: Environmental Awareness Materials
Activity – Update the natural resources section of the safety briefing as needed.

Objective 5.5: Identify areas that are heavily infested with ticks and predominance of poisonous vegetation, such as poison ivy, poison oak, etc. on an annual basis and more comprehensively every 5 years.

Project – 25: Flora and Vegetation Communities Survey
Activity – Update the natural resources section of the safety briefing as needed.

GOAL 6: Protect and maintain the terrestrial habitat at CBTC for the purposes of military training, soil stabilization, vegetative cover, and wildlife habitat.

OBJECTIVE 6.1: Identify and map biologically diverse grassland and forested ecosystems at CBTC.

Project – 24: High Diversity Area Mapping

OBJECTIVE 6.2: Monitor flora and vegetation communities at CBTC after troop use for training impacts and comprehensively every 5 years.

Project – 25: Flora and Vegetation Communities Survey.
Activity - Inspect training area and bivouac sites for erosion or damage and schedule appropriate rehabilitation as needed (after troop use).

OBJECTIVE 6.3: Use prescribed fire to minimize the threat to military operations from wildfire caused by training operations and to improve forest/grassland species habitat. Project – 16: IWFMP Update
Project – 17: Wildland Fire Equipment & Training
Project – 18: Wildland Fire Monitoring

OBJECTIVE 6.4: Use native tree species, shrubs, and perennial plants when landscaping or revegetating areas 100 percent of the time.

OBJECTIVE 6.5: Implement BMPs consistent with soil conservation, erosion control, and protection of water quality as outlined in **Section 6.5** for all projects and activities with the potential to result in erosion or sedimentation.

Project – 1: Trail development and maintenance
Project – 2: Permanent Stream Crossings
Project – 3: Training area erosion repair
Project – 4: Project Maintenance/Recurring conservation costs
Project – 5: Water Quality Monitoring

OBJECTIVE 6.6: Review and coordinate all management strategies with both cooperating regulatory and non-regulatory agencies prior to implementation.

Project – 9: INRMP update

OBJECTIVE 6.7: Identify areas in concert with training site personnel that would be practical to avoid mowing between April and August to establish grass openings for ground nesting bird habitat.

Activity - Coordinate "no mow" areas with training site personnel prior to the onset of the growing season.

GOAL 7: Manage forest resources to the benefit of the military mission, to perpetuate the ecosystem functions, and to support regional ecosystem needs.

OBJECTIVE 7.1: Maintain current forest resource data by conducting a timber inventory approximately every 5 years.

OBJECTIVE 7.2: Implement forest management strategies identified in the FMP to maximize the usability of CBTC forests for training, while favoring desirable trees from unwanted competition, thinning trees to healthy numbers, and removing poor quality or diseased trees.

Project – 15: Implement FMP and update stand information

Objective 7.3: Use prescribed fire at the CBTC to reduce fuel loading and therefore make wildland fire less destructive to training lands and wildlife as weather conditions and training activities allow.

Project – 16: IWFMP Update
Project – 17: Wildland Fire Equipment & Training
Project – 18: Wildland Fire Monitoring

GOAL 8: Protect, maintain, and improve soil and water quality on CBTC in accordance with applicable Federal, State, and local regulations.

OBJECTIVE 8.1: Rehabilitate, repair, and maintain areas damaged by training and other activities 100 percent of the time.

Project – 1: Trail development and maintenance
Project – 2: Permanent Stream Crossings
Project – 3: Training area erosion repair

Project – 4: Project Maintenance/Recurring conservation costs OBJECTIVE 8.2: Monitor water quality on CBTC on a regular basis.
Project – 6: Water Quality Monitoring

OBJECTIVE 8.3: Prevent erosion through education, design, and inspection.

Project – 8: Environmental Awareness Materials
Activity – Inspect roads for erosion (after troop use in wet conditions or after heavy rain).
Activity – Inspect stream banks for erosion (after troop use in wet conditions or after heavy rain).
Activity – Inspect Cantonment Area for erosion (after troop use in wet conditions or after heavy rain).
Activity – Inspect drainage structures (after troop use in wet conditions or after heavy rain).

Objective 8.4: Maintain minimum 325-foot wide buffers on each streambank (650-foot total width) along the main stems of Knap of Reeds Creek and Camp Creek and a minimum of 150-foot buffers on each streambank (300-foot total width) for the remaining streams.

Activity - Inspect training area and bivouac sites for erosion or damage and schedule appropriate rehabilitation as needed (after troop use).

OBJECTIVE 8.5: Consider non-point source pollution prevention in all construction, installation operations, and land management plans and activities, and cooperate with federal, state, and local regulatory authorities in forming and implementing water pollution control plans, when applicable.

Activity – Coordinate all construction or development activities with the DEM prior to implementation.

GOAL 9: Maintain surface waters and wetlands on CBTC in accordance with applicable Federal, State, and local regulations.

OBJECTIVE 9.1: Maintain current maps of wetlands at CBTC by conducting a wetland delineation every 5 years.

Project – 19: Wetland Delineation

OBJECTIVE 9.2: Maintain SMZs, streams, wetlands, and floodplains in accordance with the management guidelines set forth in **Sections 6.5.1.1** through **6.5.1.3**.

Activity – Inspect stream banks for erosion (after troop use in wet conditions or after heavy rain).
Activity – Inspect SMZs on a regular basis to ensure they are being maintained and that no incompatible activities (e.g., filling, modifying, draining, construction) are occurring.
Activity – Walk the stream banks annually during the winter months when erosion is visible. Mark erosion sites on a map, and take corrective measures where appropriate.
Activity - Subject proposed projects to environmental review by the DEM if direct impact to wetlands cannot be avoided. The environmental review will seek to minimize the overall impacts, and determine the required permits and mitigation procedures for the proposed project.

GOAL 10: Provide recreational opportunities within the constraints of the military mission and consistent with sound ecological principles while maintaining the security of CBTC.

Objective 10.1: Continue to allow deer hunting at CBTC in accordance with the guidelines established in JFHQ – NC Regulation 215-2.

Activity - Conduct deer hunting.

GOAL 11: Continue current partnerships and seek new partners interested in the stewardship of CBTC's natural resources.

OBJECTIVE 11.1: Continue to link efforts with scientific and community partners in the region to preserve regional ecosystems.

Objective 11.2: Partner with other state and federal entities to make use of their special expertise and to jointly obtain external funds to pursue issues beyond the normal scope of NCNG personnel or scientific mastery (i.e. research projects) as opportunities arise.

Project – 7: Public Outreach Program

GOAL 12: Manage cultural resources on CBTC in accordance with State and Federal laws and regulations while implementing the natural resources management program.

OBJECTIVE 12.1: Comply with Federal, State, and local laws and regulations pertaining to cultural resources found on the training site 100 percent of the time.

Objective 12.2: Plan and conduct natural resources management activities in accordance with the CBTC ICRMP 100 percent of the time.

Project – 11: Cultural Resources Surveys

GOAL 13: Develop, maintain, and manage data regarding natural resources at CBTC through the use of GIS for efficient data storage, retrieval, analysis, and presentation.

OBJECTIVE 13.1: Collect data throughout CBTC as needed, and update the database when new data becomes available to provide current, site-specific information.

OBJECTIVE 13.2: Train personnel in new methods to ensure the accuracy and relevance of data collection and manipulation.

Project – 12: GIS Support

OBJECTIVE 13.3: Revise existing files in the GIS database as more current data become available and when analysis warrants.

OBJECTIVE 13.4: Modify all existing GIS data in accordance with SDSFIE and FGDC metadata standards, and ensure any new GIS data developed complies with these standards as well.

Project – 14: GIS Management

OBJECTIVE 13.5: As technology advances and demands for better performance increase, update hardware/software as necessary.

Project – 13: ADP Equipment

GOAL 14: Identify and evaluate land impacts from training, and prioritize and assess land management activities in order to maximize the capability, accessibility, and availability of CBTC land to meet the training mission by implementing the RTLA program.

OBJECTIVE 14.1: Ensure that physical and biological resources are georeferenced and recorded using GPS technology to ensure data collection consistency from year to year.

Project – 12: GIS Support
Project – 14: GIS Management

OBJECTIVE 14.2: Conduct RTLA monitoring on a regular basis and conduct formal monitoring every five to ten years using a systematic, qualitative approach focusing on general site parameters such as vegetation, presence and severity of soil erosion, presence of specific animal species, and specific evidence of training related impacts.

OBJECTIVE 14.3: Establish additional RTLA plots or special use plots, when needed, in training areas and planned future training areas.

Project – 6: Water Quality Monitoring
Project – 20: Fauna survey
Project – 25: Flora and Vegetation Communities Survey

OBJECTIVE 14.4: Record the type of training that occurs in various areas in RFMSS, so that correlations among site conditions and training may later be established.

Activity – After each training activity, record the location, personnel and type of training activity into the RFMSS database.

OBJECTIVE 14.5: Maintain a record of natural events (e.g., weather events) that could affect land condition.

Activity – Record weather events that could affect training (per occurrence).

GOAL 15: Provide military trainers and land managers with the necessary technical and analytical data (1) to integrate doctrinally based training with land constraints; (2) to quantify training land carrying capacity; and (3) to ensure sustained accessibility to adequate training lands by implementing the TRI program.

OBJECTIVE 15.1: Evaluate RTLA data and RFMSS data, as new data becomes available, to determine if impacts to training lands or natural resources are occurring as a result of certain training activities, and modify training if necessary to prevent impacts to natural resources.

OBJECTIVE 15.2: Maintain a record of types and locations of training in RFMSS that occur in CBTC training areas.

Activity – After each training activity, record the location, personnel and type of training activity into the RFMSS database.

OBJECTIVE 15.3: Rotate use of bivouac sites to prevent overuse of any one site, as necessary.

Activity – Inspect Training Area and Bivouac Sites for Erosion (after troop use).

GOAL 16: Apply BMP to ensure rehabilitation, repair and maintenance results are commensurate with the applied resources and to ensure long-term sustainability of installation lands, training and testing missions by implementing the LRAM program.

OBJECTIVE 16.1: After heavy training exercises are conducted on the site, examine the site for damages and schedule appropriate rehabilitation as soon as possible (i.e., immediately or during the next optimal seeding period).

Activity – Inspect Training Area and Bivouac Sites for Erosion (after troop use).

OBJECTIVE 16.2: Schedule and perform land rehabilitation projects during optimum seeding periods. If projects cannot be performed within the optimum seeding period, then stabilize the soil immediately and complete seeding as soon as possible.

Project – 1: Trail development and maintenance
Project – 2: Permanent Stream Crossings
Project – 3: Training area erosion repair
Project – 4: Project Maintenance/Recurring conservation costs
Project – 5: Bivouac sites

OBJECTIVE 16.3: Use temporary erosion control methods (such as silt fences or hay bale diversions), as needed, during periods of heavy troop training and inclement weather to avoid silt migration to water bodies and other sensitive areas.

Activity – Inspect Training Area and Bivouac Sites for Erosion (after troop use).

OBJECTIVE 16.4: Include water management, landscaping, erosion control and natural resource conservation in all site feasibility studies and in project planning, design, and construction.

Activity – Coordinate all construction or development activities with the DEM prior to implementation.

GOAL 17: Educate CBTC land users on how their activities impact the environment and their responsibilities as stewards of the environment by implementing the SRA program.

OBJECTIVE 17.1: Maintain SRA materials on-site at CBTC at all times.

OBJECTIVE 17.2: Provide information to all units, leaders, soldiers, civilian employees, and other installation users to improve their understanding of impacts of their activities on the environment and the CBTC training lands.

OBJECTIVE 17.3: Brief the advance parties of units using the site about environmental concerns and sensitive areas 100 percent of the time.

Project – 8: Environmental Awareness Materials

OBJECTIVE 17.4: Encourage SRA activities at CBTC such as Earth Day, Arbor Day, as appropriate.

Project – 7: Public Outreach Program

OBJECTIVE 17.5: Update information on the NCNG website on an annual basis and throughout the year as needed.

Activity – Update NCNG website.

OBJECTIVE 17.6: Brief decision-makers about CBTC natural resources program on an annual basis and throughout the year as needed.

Activity – Brief CBTC training staff on new or upcoming natural resources projects or management prior to implementation.

Activity – Update the natural resources section of the safety briefing.

8.0 PLAN IMPLEMENTATION

This updated INRMP will be implemented through the various policies and programs described throughout the document and accomplishment of specific goals and objectives through the implementation of the projects identified in **Section 7.0**. A detailed analysis of 2010 INRMP project implementation showing which projects were retained and which projects were removed is given in **Table 1** (see **Section 1.5.2**).

The updated implementation schedule, funding requirements, source of funds, and how the projects relate to INRMP implementation are detailed in **Table 10**. All of the projects in the updated INRMP support existing and ongoing programs and facilitate continued implementation of the original CBTC INRMP. Projects are identified as ongoing or new projects. Ongoing projects are ones specifically identified in the 2010 INRMP and ongoing in this updated INRMP. New projects are projects that support ongoing programs but were not in the 2010 INRMP because they were not required for the original FY 2002-2009 implementation period, but are now needed to continue program implementation.

In accordance with the 25 May 2006 *Army Guidance for Implementation of the SAIA*, an INRMP is considered implemented if an installation:

- Actively requests, receives, and uses funds for projects and activities required to meet recurring natural resources conservation management requirements or current natural resources compliance needs;
- Ensures that sufficient numbers of professionally trained natural resources management staff are available to perform the tasks required by the INRMP;
- Coordinates annually with cooperating agencies; and
- Documents specific INRMP action accomplishments undertaken each year.

8.1 Annual Work Plans

Table 9 provides an overview of recurring natural resource management activities. These activities are generally performed by NCNG Environmental staff. The implementation schedule and planned projects for this updated INRMP are detailed in **Table 10. Table 10** will be used to develop budget requests and schedule annual project requirements. Funding requests will be submitted in accordance with current NGB procedures for conservation projects.

8.1.1 Funding

Implementation of this INRMP is subject to the availability of annual funding. The installation requests project validation and funding through the STEP, completed by the NCNG Environmental Office. Funding for the NCNG environmental staff and standard supplies comes from direct funding sources. Funding sources for specific projects can be grouped into three main categories by source: Federal NGB Funds, Other Federal Funds, and Non-Federal Funds. Each is discussed in the following subsections. Where projects identified in the plan are not implemented due to lack of funding, or other compelling circumstances, the installation will review the goals and objectives of this INRMP to determine whether adjustments are necessary.

The following discussion of funding options is not all-inclusive of funding sources. Since many funding sources rely on a variety of grant programs, award criteria and amounts can change considerably from one year to another. Funding through grant programs can occur on a one-time award, annually or in multiples of years.

8.1.1.1 NGB/NCNG Funding

Funding from the following NGB/NCNG sources will be required to implement the INRMP over the next five years.

The NGB is the primary source of funding to support the management of natural resources at CBTC through a master cooperative agreement with the NCNG. A budget of this type is managed by the Environmental Program Manager in Raleigh. The NGB provides funding for natural resource surveys, environmental monitoring projects, and compliance-related projects.

The ITAM Work Plan is used to channel ITAM funding requests from the NCNG, through NGB, to the JFHQ-NC J3 Directorate. The annual ITAM Work Plan is the basis for identifying installation ITAM resource requirements and for allocating funding to support installation core capabilities. ITAM funds cannot be used for:

- correcting environmental statutory compliance requirements;
- performing routine range maintenance, modifications, or Sustainment, Restoration, and Maintenance (SRM) responsibilities;
- performing Army Conservation Program requirements, such as PLS; and
- adding additional GIS data layers that are not a part of the ITAM requirement (DA 2005).

The ARNG I&E Directorate provides funding for personnel, equipment and supplies in support of the NCNG CFMO. This office is involved in planning, scheduling, and oversight of maintenance of roads and trails, vegetation management, pest management, facilities infrastructure, construction, and master planning, all of which impact, and are impacted by, the natural resources management program.

In accordance with the Sustainable Range/Installation Environmental Activities Matrix (Phase 1) facilities funds pest and noxious weed control, invasive species control, facilities vegetation control and controlled burns to manage vegetation and fuels on training areas and ranges. Conservation identifies, monitors, and plans management of invasive species and noxious weeds and funds controlled burns done for ecological conservation purposes.

Table 9 – Recurring Natural Resources Management and ITAM Activities

Activity	Objective # in Section 7.0	Occurrence											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Update the natural resources section of the safety briefing.	1.4, 5.4-5.5, 17.6	X	X	X	X	X	X	X	X	X	X	X	X
Inspect no-go maneuver areas/cultural site signage at CBTC regularly and replace any damaged signs.	1.5	X	X	X	X	X	X	X	X	X	X	X	X
Subject all projects to review by the DEM.	1.6	X	X	X	X	X	X	X	X	X	X	X	X
Brief CBTC training staff on new or upcoming natural resources projects or management prior to implementation.	1.7, 17.6	X	X	X	X	X	X	X	X	X	X	X	X
Inspect SMZs on a regular basis to ensure there is no maneuver damage	4.6, 8.4, 9.2	X			X			X			X		
Inspect Training Area and Bivouac Sites for Erosion (after troop use).	6.2, 15.3, 16.1-16.2	X	X	X	X	X	X	X	X	X	X	X	X
Coordinate "no mow" areas with training site personnel prior to the onset of the growing season.	6.7	X	X										
Inspect stream banks for maneuver caused erosion (after troop use in wet conditions or after heavy rain)	8.3, 9.2	X	X	X	X	X	X	X	X	X	X	X	X

Table 9 – Recurring Natural Resources Management and ITAM Activities

Activity	Objective # in Section 7.0	Occurrence											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coordinate all construction or development activities with the DEM prior to implementation.	8.5, 16.4	X	X	X	X	X	X	X	X	X	X	X	X
Walk the stream banks annually during the winter months when maneuver damage/erosion is visible. Mark erosion sites on a map, and take corrective measures where appropriate.	9.2	X	X										X
Subject proposed projects to environmental review by the DEM if direct impact to wetlands cannot be avoided. The environmental review will seek to minimize the overall impacts, and determine the required permits and mitigation procedures for the proposed project.	9.2	X	X	X	X	X	X	X	X	X	X	X	X
After each training activity, record the location, personnel and type of training activity into the RFMSS database.	14.4, 15.1-15.2	X	X	X	X	X	X	X	X	X	X	X	X
Record weather events that could affect training (per occurrence).	14.5	X	X	X	X	X	X	X	X	X	X	X	X
Update NCNG website.	17.5	X	X	X	X	X	X	X	X	X	X	X	X

Table 10 – Planned Projects 2019 – 2024* (Subject to Funding Availability)

Project		Objective # (Section 7.0)	Description	Legal Drivers	Funding Type	Compared to 2010 INRMP	Program Date
1	Trail development and maintenance	6.5, 8.1, 16.1-16.2	Ongoing maintenance of existing trails and the development of new trails within inaccessible areas.	CWA, Army Regulation	ITAM	Ongoing	2019-2024
2	Permanent Stream Crossings	6.5, 8.1, 16.1-16.2	Develop stream crossings and conduct routine maintenance and monitoring of them.	CWA, Army Regulation	ITAM	Ongoing	2019-2024
3	Training area erosion repair	6.5, 8.1, 16.1-16.2	Project funds will be used for stabilizing soils at training areas due to training activities. Funds will be used to purchase sediment fences and turf reinforcement mats to stabilize areas disturbed by training exercises.	CWA, Army Regulation	ITAM	Ongoing	2019-2024
4	Project Maintenance/ Recurring conservation costs	6.5, 8.1, 16.1-16.2	Funds will be used to restore disturbed areas from training activities. For example, grass seed and mulching material.	CWA, Army Regulation	ITAM	Ongoing	2019-2024
5	Bivouac sites	16.1-16.2	Training area rehabilitation and soil stabilization.	CWA, Army Regulation	ITAM	Ongoing	2019-2024
6	Water Quality Monitoring	2.2, 6.5,8.3, 14.2-14.3	This project will involve the monitoring of permanent sample points that support both the LRAM and RTLA programs.	CWA, Army Regulation	ITAM	Ongoing	2019-2024
7	Public Outreach Program	4.5, 11.1-11.2, 17.4	Implement Public Education and Involvement Program	Army Regulation	ITAM	Ongoing	2016

Table 10 – Planned Projects 2019 – 2024* (Subject to Funding Availability)

Project		Objective # (Section 7.0)	Description	Legal Drivers	Funding Type	Compared to 2010 INRMP	Program Date
8	Environmental Awareness Materials	1.4, 5.4, 8.4, 17.1-17.3	Development and publication of environmental awareness materials to include soldier field cards, leader books, posters, etc. Update and distribute CBTC user's guides	Army Regulation	ITAM	Ongoing	2019-2024
9	INRMP update	1.1-1.3, 6.6	The INRMP will be updated and revised as necessary. Failure to fund this project may result in delaying or disapproval of training and construction projects. An EA will be prepared if needed.	SAIA, Army Regulation	CONS	Ongoing	2024
10	Ecological Health Report	2.3	Develop an Ecological Health Report	CWA, Army Regulation	CONS	Ongoing	2016 2019
11	Cultural Resources Surveys	12.1-12.2	Determine potential impacts to cultural resources prior to ground disturbing activities	NHPA of 1966, Army Regulation	CONS or INSTAL	Ongoing	2019-2024
12	GIS Support	13.1-13.2, 14.1	GIS support to include contract help through NC State University for GIS assistance. This would support the training site, including Range Control.	Army Policy	ITAM	Ongoing	2019-2024
13	ADP Equipment	13.5	Acquisition and annual support of ADP Equipment needed for range operations related to ITAM.	Army Policy	ITAM	Ongoing	2019-2024
14	GIS management	13.3-13.4, 14.1	Database development	Army Policy	ITAM or CONS	Ongoing	2019-2024

Table 10 – Planned Projects 2019 – 2024* (Subject to Funding Availability)

Project		Objective # (Section 7.0)	Description	Legal Drivers	Funding Type	Compared to 2010 INRMP	Program Date
15	Implement FMP and update stand information	7.1-7.2	Update stand information and outline management goals for each stand; conduct prescribed burning and timber harvests; plant trees; and apply herbicide	Army Regulation	CONS or INSTAL	Ongoing	2019-2024
16	IWFMP Update	6.3, 7.3	Develop and implement IWFMP	Army Policy	CONS or INSTAL	Ongoing	2020
17	Wildland Fire Equipment & Training	6.3, 7.3	Obtain necessary equipment and training for prescribed burning at CBTC.	Army Policy	CONS or INSTAL	Ongoing	2019-2024
18	Wildland Fire Monitoring	6.3, 7.3	Implement a monitoring program for prescribed burns.	Army Policy	CONS or INSTAL	Ongoing	2019-2024
19	Wetland Delineation/Survey	9.1	Update the CBTC wetland delineation report and data.	CWA, Army Regulation	CONS	Ongoing	2020
20	Fauna survey	2.1, 3.1, 14.2-14.3	Survey of terrestrial, avian and aquatic fauna	ESA, Army Regulation	CONS	Ongoing	2019
21	Wildlife Management Plan	4.1-4.4	Develop and implement wildlife management plan	Army Regulation	CONS	Ongoing	2020
22	Invasive Species Control	5.1-5.3	Control and eradicate invasive species on CBTC	AR 200-1, AR 200-1, EO13112, Federal Noxious Weed Act, Army Policy	INSTAL	Ongoing	2019-2024
23	Rare Species Management	3.2 -3.3	Manage rare species and their corresponding habitat; map high diversity areas.	ESA, Army Regulation	CONS	Ongoing	2019

Table 10 – Planned Projects 2019 – 2024* (Subject to Funding Availability)

Project		Objective # (Section 7.0)	Description	Legal Drivers	Funding Type	Compared to 2010 INRMP	Program Date
24	High Diversity Area Mapping	6.1	Identify and map areas of high biological diversity.	Army Regulation	CONS	Ongoing	2019
25	Flora and Vegetation Communities Survey	3.1, 5.5, 6.2, 14.2-14.3	Identify flora species and map vegetation communities on CBTC.	ESA, Army Regulation	CONS	Ongoing	2019
*Anticipated projects needed to implement INRMP programs from FY10 through FY14.							

8.1.1.2 Other Federal Funds

Cooperative agreements may be entered with states, local governments, non-governmental organizations, and individuals for the improvement of natural resources or to benefit natural and historical research on federally owned training sites. Upon written concurrence of the CBTC INRMP by the USFWS and the NCDEQ, these agencies become signatory cooperators of this plan. As such, the potential for access to matching funds programs and services offered by these agencies will be available.

Program initiatives under the CWA provide funding through several sources. The USEPA's Office of Water sponsors those projects related to the CWA. Available funding may support programs such as cost-sharing for overall water-quality management (e.g., monitoring, permitting, and enforcement), lake water quality assessments and mitigation measures, and implementation of non-point source pollution control measures. Refer to the USEPA's Office of Water funding website for potential sources of funding http://www.epa.gov/water/funding.html.

The Legacy Resource Management Program provides financial assistance to DoD efforts to conserve natural and cultural resources on Federal lands. Legacy projects could include regional ecosystem management initiatives, habitat preservation efforts, archeological investigations, invasive species control, and/or flora or fauna surveys. Legacy funds are awarded based on national visibility. Project proposals are submitted to the program.

The NRCS manages the Federal Domestic Assistance Program (Plant Materials for Conservation) that assembles, evaluates, selects, releases, and introduces into commerce and promotes the use of new and improved plant materials for soil, water, and related resource conservation and environmental improvement programs.

8.1.1.3 Non-Federal Funds

The NCNHP Trust Fund is a supplemental funding source for state agencies to acquire for the purpose of protecting the state's ecological diversity and cultural heritage and to inventory the natural areas of the state.

Other funding sources that could be considered include The Public Lands Day Program, which coordinates volunteers to improve the public lands they use for recreation, education, and enjoyment, and the National Environmental Education & Training Foundation, which manages, coordinates, and generates financial support for the program.

8.1.2 Priorities and Scheduling

The STEP database will be used to validate projects and determine funding priority. Projects need to be funded consistent with timely execution to meet future deadlines. Projects are generally prioritized with respect to compliance. Highest priority projects are projects related to recurring or current compliance, and these are generally scheduled earliest. CBTC projects and schedules are listed in **Table 10**.

Recurring requirements include projects and activities needed to cover the recurring administrative, personnel and other costs that are necessary to meet applicable compliance requirements (Federal and State laws, regulations, Presidential EOs, and DoD policies) or which are in direct support of the military mission. Recurring costs

include manpower, training, supplies; hazardous waste disposal; operating recycling activities; permits and fees; testing, monitoring and/or sampling and analysis; reporting and record keeping; maintenance of environmental conservation equipment; and compliance self-assessments.

Current compliance includes projects and activities needed because an installation is currently or will be out of compliance if projects or activities are not implemented in the current program year. Examples include:

- Environmental analyses, monitoring, and studies required to assess and mitigate potential effects of the military mission on conservation resources;
- Planning documents;
- Baseline inventories and surveys of natural and cultural resources (historical and archaeological sites);
- Biological assessments, surveys, or habitat protection for a specific listed species;
- Mitigation to meet existing regulatory permit conditions or written agreements;
- Wetland delineations in support of subsequent jurisdictional determinations and consequent permitting;
- Efforts to achieve compliance with requirements that have deadlines that have already passed; and
- Initial documenting and cataloging of archaeological materials.

Maintenance requirements include those projects and activities needed that are not currently out of compliance but shall be out of compliance if projects or activities are not implemented in time to meet an established deadline beyond the current program year. Examples include:

- Compliance with future requirements that have deadlines;
- Conservation and GIS mapping to be in compliance;
- Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives;
- Wetlands enhancement, in order to achieve the Executive order for "no net loss" or to achieve enhancement of existing degraded wetlands; and
- Public education programs that educate the public on the importance of protecting archaeological and natural resources.

Lower priority projects include those that enhance conservation resources of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or EO and are not of an immediate nature. These projects are generally funded after those of higher priority are funded.

Examples include:

- Community outreach activities, such as "Earth Day" and "Historic Preservation Week" activities;
- Educational and public awareness projects, such as interpretive displays, oral histories, nature trails, wildlife checklists, and conservation teaching materials;
- Biological assessments, surveys, or habitat protection for a species;
- Restoration or enhancement of cultural or natural resources when no specific compliance requirement dictates a course or timing of action;
- Re-interment of Native American remains on DoD managed or controlled land; and
- Management and execution of volunteer and partnership programs.

8.2 Natural Resources Management Staffing

Natural resources program oversight and INRMP implementation are located at CBTC and the NCNG Joint Forces Headquarters (JFHQ) in Raleigh, NC.

Training for NCNG personnel, as well as others participating in the management of natural resources, should be practical and job-related. All training programs should involve at minimum a review of legal compliance requirements, applicable DoD/DA regulations, pertinent State and local laws, and current scientific and professional standards as related to the conservation of natural resources. The following annual workshops, professional conferences, and classes are excellent means of obtaining interdisciplinary training for natural resources managers:

- North American Wildlife and Natural Resources Conference http://www.wildlife managementinstitute.org/pages/main.html
- Defense Environmental Network Information Exchange (DENIX) http://www.denix.mil/;
- Army Training Support Center - http://www.atsc.army.mil/;
- National Military Fish and Wildlife Association - http://www.nmfwa.org/;
- USACE Wetland Delineation Courses - http://www.hnd.usace.army.mil/to/pindex.html;
- Locally available training through the Cooperative Extension Service, universities, professional and trade organizations, State government, and commercial businesses.

Conferences and workshops will be evaluated for their usefulness, and decisions will be made based on appropriateness to ongoing projects and funding availability. Personnel will be trained in related environmental fields, as appropriate. NEPA training will be required of all supervisory personnel and those who review or prepare NEPA documents.

8.3 INRMP Reviews

8.3.1 Review for Operation and Effect

Not less than every five years, the INRMP will be reviewed for operation and effect to determine if the INRMP is being implemented to meet the requirements of the Sikes Act and contributing to the conservation and rehabilitation of natural resources at CBTC. The review will be conducted by the three cooperating parties to include the commander responsible for the INRMP, the Regional Director of the USFWS, and Director of the NCDEQ. These agencies all have technical representatives who actually do the review.

The review for operation and effect will either conclude that the INRMP is meeting the intent of the Sikes Act and it can be updated and implementation can continue; or that it is not effective in meeting the intent of the Sikes Act to conserve natural resources while providing for no net loss in training capability and it must be revised. The conclusion of the review will be documented in a jointly executed memorandum, meeting minutes, or in some other way that reflects mutual agreement.

If only minor updates are needed, they will be done in a manner agreed to by all parties. The updated INRMP will be reviewed by the local USFWS office, USFWS Regional Director, and NCDEQ Director. Once concurrence letters or signatures are received from USFWS Regional Director and the NCDEQ Director, the INRMP will continue to be implemented. A new NEPA review is not necessary for an update and the continued implementation of an existing INRMP that has previously undergone NEPA review. In this case, an Environmental Checklist and REC citing the previous NEPA document is needed.

If a review of operation and effect concludes that an INRMP must be revised, there is no set time to complete the revision. The existing INRMP remains in effect until the revision is complete and USFWS and NCDEQ concurrence on the revised INRMP is received. The NCNG will endeavor to complete such revisions within 18 months depending upon funding availability. Revisions to the INRMP will go through a more detailed review process similar to development of the initial INRMP to ensure NCNG military mission, USFWS, and NCDEQ concerns are adequately addressed and the plan meets the intention of the Sikes Act. Revisions will usually require a new NEPA analysis. An Environmental Assessment will be done as part of the revision process if determined by NGB to be necessary.

8.3.2 Annual Reviews and Coordination

Per DoD policy, the NCNG will review the INRMP annually in cooperation with the USFWS and NCDEQ. On an annual basis the NCNG will invite the USFWS Regional Office, the USFWS local field office, the NCDEQ, and NGB to attend a meeting at CBTC to review previous year INRMP implementation and discuss implementation of upcoming programs and projects. Invitations will either be by letter or email. Attendance is at the option of those invited, but at minimum the USFWS local field office and NCDEQ are expected to attend. The meeting will be documented with an agenda, meeting minutes and sign in roster of attendees.

At this annual meeting the need for updates or revisions will be discussed. If minor updates are needed, the requesting party will initiate the updates and after agreement of all three parties they will be added to the INRMP. If it is determined that major changes are needed, all three parties will provide input and an INRMP revision and

associated NEPA review will be initiated with the NCNG acting as the lead coordinating agency. The annual meeting will be used to help expedite the more formal review for operation and effect and if all parties agree and document their mutual agreement, it can fulfill the requirement to review the INRMP for operation and effect.

If not already determined in previous annual meetings, by the fourth year annual review a determination will be jointly made to continue implementation of the existing INRMP with minor updates or to proceed with a revision. If the parties feel that the annual reviews have not been sufficient to evaluate operation and effect and they cannot determine if the INRMP implementation should continue or be revised, a formal review for operation and effect will be initiated. The determination on how to proceed with INRMP implementation or revision will be made after the parties have had time to complete this review.

In accordance with the *Army Guidance for Implementation of the SAIA*, dated May 25, 2006, annual reviews shall at minimum verify that:

- Current information on INRMP conservation metrics as described in Army Environmental Database Environmental Quality (AEDB-EQ) is available.
- All "must fund" projects and activities have been budgeted for, and implementation is on schedule.
- All required trained natural resources positions are filled or are in the process of being filled.
- Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not necessitate revising the INRMP.
- All required coordination has occurred.
- All significant changes to the installation's mission requirements or its natural resources have been identified.
- The INRMP goals and objectives are still valid.
- No net loss of training capability has occurred due to implementation of the INRMP in accordance with the Sikes Act.

As part of the annual review, the NCNG will specifically:

- Invite feedback from the USFWS and NCDEQ on the effectiveness of the INRMP;
- Inform the USFWS and NCDEQ which INRMP projects and activities are required to meet current natural resources compliance needs; and
- Document specific INRMP action accomplishments from the previous year.

Information for the annual reviews comes from the NCNG environmental staff, CBTC military leadership, cooperating agencies, project files, and AEDB-EQ as applicable. Natural resources data and program and project information are available to cooperating agencies. They may request to see project folders or to have a site visit to view natural resources projects in progress at any time.

8.4 Monitoring INRMP Implementation

8.4.1 CBTC INRMP Implementation Monitoring

Monitoring of INRMP implementation is necessary to facilitate the legal requirements of the SAIA to review for operation and effect. **Section 8.0** lists the implementation requirements given in the *DA Guidance for Implementation of the SAIA*, dated 25 May 2006. An INRMP is considered implemented in regard to the SAIA if the requirements in the Army guidance are met. These SAIA implementation criteria do not necessarily measure the effectiveness of an INRMP in facilitating mission accomplishment while conserving natural resources. CBTC INRMP implementation will be monitored for meeting the legal requirements of the SAIA as well as for other mission and biological measures of effectiveness.

The ultimate successful implementation of this INRMP is realized in no net loss in the capability of CBTC training lands to support the military mission while at the same time conserving and rehabilitating natural resources found on the training site. Initiation of projects is one measure that is used to monitor INRMP implementation, but it does not give the total picture of the effectiveness of the natural resources management program. Natural resources management is not the sum total of projects, interagency coordination or program funding and staffing. Natural resources management at CBTC is a program and a philosophy that guides the NCNG's approach to land use. A lot of the INRMP implementation is done through internal coordination in regard to training site operations and land use decision making. This type of implementation cannot be measured by project implementation or funding levels. It is evidenced by such things as the ability to continually train, sustainable land use, on-going regulatory compliance, retention of species diversity, retention of surface water quality, and the acknowledgement of sustainable natural resources management by partnering conservation agencies and other interested organizations and individuals.

In order to monitor and evaluate the effectiveness of the INRMP implementation the following will be reviewed as applicable and discussed within the context of the annual review and/or a formal review of operation and effect:

- Impacts to/from the military mission;
- Conservation program budget;
- Staff requirements;
- Program and project implementation;
- Trends in species and habitat diversity as evidenced by recurring biological surveys, land use changes, and opinions of natural resource managers;
- Compliance with regulatory requirements; and
- Feedback from military trainers, the USFWS, the NCDEQ, and others.

Some of these areas may not be looked at every year due to lack of data or pertinent information. The effectiveness of the INRMP as a mission enabling conservation tool will be decided by mutual agreement of the USFWS, the ODNR, and the NCNG during annual reviews and / or reviews for operation and effect.

8.4.2 Department of the Army INRMP Implementation Monitoring

The Army uses the Environmental Quality Report (EQR) to monitor SAIA compliance throughout the department. EQR is the automated system used to collect installation environmental information for reporting to DoD and Congress. The EQR system moved to the Army Environmental Reporting Online (AERO) portal in February 2005, creating a day-to-day management tool. The AEDB-EQ module is a full update of the Web-based software EQR application used to convey the Army's environmental status to senior Army leadership, DoD, and Congress since 1997.

Established to fulfill a semi-annual requirement to report the status of DoD's Environmental Quality program to Congress, EQR collects information on enforcement actions, inspections and other performance measures for high-level reports and quarterly reviews. EQR also helps the Army track fulfillment of DoD Measures of Merit requirements.

The module is designed to coordinate information management for conservation, compliance, pollution prevention and other Army environmental reporting. It can adapt easily to future changes in command structure or measures of merit. AEDB-EQ provides for the collection, review, and retrieval of data in 14 program areas, from enforcement actions to conservation program metrics. The Environmental Program Requirements (EPRWeb) reporting system is a module of AEDB.

The DUSD *Updated Guidance for Implementation of The SAIA* updated Conservation Metrics for Preparing and Implementing INRMPs. Progress toward meeting these measures of merit is reported in the annual EQR to Congress. Reporting requirements include:

- The installation name and state. The year the most recent INRMP was completed or revised.
- Date planned for the next revision.
- Was the INRMP coordinated with appropriate military trainers and operators?
- Were projects added to the INRMP as a result of comments from military trainers and operators?
- Were segments of the INRMP concerning the conservation, protection and management of fish and wildlife resources agreed to by the USFWS Regional Director?
- Were projects added to the INRMP as a result of USFWS comments?
- Has annual feedback been requested from the USFWS?
- Has annual feedback been received from the USFWS?
- Were segments of the INRMP concerning the conservation, protection and management of fish and wildlife resources agreed to by the State fish and wildlife agency Director? (State coordination)
- Were projects added to the INRMP as a result of State comments?
- Has annual feedback been requested from the State fish and wildlife agency?

- Has annual feedback been received from the State fish and wildlife agency?
- Does the INRMP contain a list of projects necessary to meet plan goals and objectives, as well as timeframes for implementation of any such projects?
- Money spent in reporting FY to implement the INRMP.
- Did the installation seek public comment on the draft INRMP?
- Were projects added to the INRMP as a result of public comments?

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APPENDIX A

AGENCY COORDINATION AND NATIVE AMERICAN CONSULTATION

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CONTENTS

Native American Consultation

INRMP Agency Review and Concurrence Letters

STATE OF NORTH CAROLINA
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August 31, 2015

PAT MCCRORY
GOVERNOR

FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Governor Edwina Butler-Wolfe
Absentee-Shawnee Tribe of Indians of Oklahoma
2025 S. Gordon Cooper Drive Shawnee, OK 74801

Dear Governor Butler-Wolfe,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

If you have interest, we invite you to join us as a consulting party as we update the Integrated Natural Resources Management Plan in accordance with 36 CFR Part 800.2, EO 13175 and DoD Native American and Alaska Native Policy. With your advice and assistance, we hope to maintain an ongoing cooperative relationship between your Nation and the North Carolina National Guard.

You may contact our natural/cultural resources manager, Mr. Michael Glisson, at (984) 664-6268 or michael.h.glisson.nfg@mail.mil. Mr. Glisson, in coordination with his counterpart in your tribe, can outline areas of concern and provide you with further information.

If you would like to confer with the senior leadership of the North Carolina National Guard, please contact COL Clifford Wilkins, my liaison and technical point of contact for this endeavor, at the address .above, by telephone at (984) 664-6178 or by email, at Clifford.w.wilkins.mil@mail.mil.

Sincerely,

Gregory A. Lusk
Major General, NCARNG
Adjutant General

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FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Chief Bill Harris
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730

Dear Chief Harris,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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Sincerely,

Gregory A. Lusk
Major General, NCARNG
Adjutant General

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FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Principal Chief George Tiger
Muscogee (Creek) Nation of Oklahoma
PO Box 580
Okmulgee, OK 74447

Dear Principal Chief Tiger,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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GOVERNOR

FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Principal Chief Bill John Baker
Cherokee Nation
PO Box 298
Tahlequah, OK 74465

Dear Principal Baker,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Principal Chief Michell Hicks
Eastern Band of Cherokee Indians of North Carolina
PO Box 455
Cherokee, NC 28719

Dear Principal Chief Hicks,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Chief George Wickliffe
United Keetoowah Band of Cherokee Indians of Oklahoma
PO Box 746
Tahlequah, OK 74465

Dear Chief Wickliffe,

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FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Tribal Administrator Jodi Hayes
Shawnee Tribe
29 South Highway 69A
Miami, OK 74354

Dear Tribal Administrator Hayes,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Chief Leo Henry
Tuscarora Nation
2006 Mt. Hope Road
Lewiston, NY 14092

Dear Chief Henry,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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January 17, 2017

ROY COOPER
GOVERNOR

ERIK HOOKS
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Lyn Hardison
Division of Environmental Assistance and
Customer Service
Permit Assistance & Project Review Coordinator
Washington Regional Office

Dear Ms. Hardison,

The North Carolina National Guard (NCNG) is in the process of updating its Integrated Natural Resources Management Plan (INRMP) for the Camp Butner Training Site in Durham and Granville Counties, NC. The requirement to develop and implement the INRMP is contained in the Sikes Act Improvement Act (16 U.S.C. 670).

The Environmental Office of the NCARNG requests that you review this document and contact us with any comments or concerns that you may have regarding its content. Your response on or before 17 January 2017 will enable us to complete this phase in a timely manner.

Enclosed are four CD's of the preliminary draft for your use.

We welcome your input and look forward to continued cooperation between our respective agencies. If you have any questions regarding the INRMP, please call me at 984-664-6268 or email at braden.a.ramage.nfg@mail.mil.

Sincerely,

Braden Ramage
Natural/Cultural Resources Manager

Environmental Quality

ROY COOPER
Governor

MEMORANDUM

TO: Braden Ramage
Natural/Cultural Resources Manager
NC Department of Public Safety Joint Force Headquarters
North Carolina National Guard

FROM: Lyn Hardison LBH
Division of Environmental Assistance and Customer Service
Permit Assistance & Project Review Coordinator
Washington Regional Office

RE: Environmental Review - Five-Year Update of Integrated Natural Resources Management Plan (INRMP) - Camp Butner Training Site - NC Army National Guard (NCARNG)
DEQ # 1664
Durham and Granville Counties

Date: February 22, 2017

The NC Department of Public Safety Emergency Management and NCDNCR-Division of Parks and Recreations are participating in NC Department Environmental Quality internal environmental review process. The goal of this joint collaboration is to help expedite the environmental reviews.

Based on the information provided, several of our agencies have identified permits that may be required and offered some valuable guidance to minimize impacts to the natural resources, aquatic and terrestrial wildlife resources within and around the project area. The comments are attached for the applicant's consideration.

Thank you for the opportunity to respond.

Attachments

Waste Management
ENVIRONMENTAL QUALITY

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

MICHAEL SCOTT
Director

February 13, 2017

To: Michael Scott, Director
Division of Waste Management

From: Bill Hunneke, Eastern Region Compliance Supervisor,
Compliance Branch, Hazardous Waste Section

Subject: Hazardous Waste Section Comments on Environmental Review - Five-Year Update of Integrated Natural Resources Management Plan (INRMP) - Camp Butner Training Site (Durham-Granville Counties)
Project Number: 1664

The Hazardous Waste Section (HWS) has reviewed the Environmental Review - Five-Year Update of Integrated Natural Resources Management Plan (INRMP) - Camp Butner Training Site - NC Army National Guard (NCARNG) who updated the plan and is requesting this review.

Any hazardous waste generated from the demolition, construction, operation, maintenance, and/or remediation (e.g. excavated soil) from any proposed project must be managed in accordance with the North Carolina Hazardous Waste Rules. The demolition, construction, operation, maintenance, and remediation activities conducted will most likely generate a solid waste, and a determination must be made whether it is a hazardous waste. If a project site generates more than 220 pounds of hazardous waste in a calendar month, the HWS must be notified, and the site must comply with the small quantity generator requirements. If a project site generates more than 2200 pounds of hazardous waste in a calendar month, the HWS must be notified, and the facility must comply with the large quantity generator requirements.

Should any questions arise, please contact me at 252-364-8977.

Kind regards,

William J. Hunneke

William Hunneke
Eastern Region Compliance Supervisor

Waste Management
ENVIRONMENTAL QUALITY

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

MICHAEL SCOTT
Director

Date: February 8, 2017

To: Michael Scott, Director
Division of Waste Management

Through: Dave Lown, Head
Federal Remediation Branch

From: Marti Morgan, Federal Remediation Branch

Subject: DEQ 1664 – Updated Integrated Natural Resources Management Plan
Camp Butner Training Center, North Carolina National Guard
Durham and Granville Counties, North Carolina

The Superfund Section has reviewed the proximity of the Camp Butner Training Center (CBTC), North Carolina National Guard to CERCLIS and other sites under their jurisdiction. The Integrated Natural Resources Management Plan (INRMP) is being updated for continued implementation to conserve and protect the natural resources of the CBTC.

One site was identified within one mile of the North Carolina National Guard, Camp Butner Training Center as shown on the attached map and in the table below. The Superfund Section recommends that site files be reviewed to ensure that appropriate precautions are incorporated into any construction activities that may encounter possible munitions or munitions debris. Superfund Section files can be viewed at: https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/e-documents.

Please contact me at 919.707.8342 if you have any questions.

ID #	Site Name	Status
NC9799F4827	Camp Butner Training Camp	Open site on the Federal Remediation Branch Inventory

MRS Locations

Range Complex 2

Range Complex 1

Army National Guard Property

Hand Grenade Range

Flame Thrower Range

N

0 4,500 9,000 18,000

Feet

2020000 2030000 2040000 2050000 2060000 2070000 2080000 2090000 2100000 2110000

930000 920000 910000 900000 890000 880000 870000 860000 850000

Legend

MRS

Former Camp Butner

Notes:
MRS=Munitions Response Site

Waste Management
ENVIRONMENTAL QUALITY

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
MICHAEL SCOTT
Director

MEMORANDUM

TO: Michael Scott, Division Director through Sharon Brinkley

FROM: Drew Hammonds, Eastern District Supervisor - Solid Waste Section *Drew Hammonds*

DATE: February 21, 2017

SUBJECT: Review: Project #1664 – Durham County (Five Year Update of Integrated Natural Resources Management Plan – Camp Butner Training Site (Durham-Granville Counties**)**

The Division of Waste Management, Solid Waste Section (Section) has reviewed the environmental review for the Five Year Update of the Integrated Natural Resources Management Plan (INRMP), Camp Butner Training Site, NC Army National Guard (NCARNG), in Durham-Granville Counties, NC. Based on the information provided, the Section does not see an adverse impact on the surrounding community and likewise knows of no situations in the community, which would affect this project.

During the development, demolition and construction of any projects, the NCARNG and/or its contractors should make every feasible effort to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of this project where suitable. Any waste generated by this project that cannot be beneficially reused or recycled must be disposed of at a solid waste management facility permitted by the Division. The Section strongly recommends that the NCARNG. require all contractors to provide proof of proper disposal for all generated waste to permitted facilities.

Permitted solid waste management facilities are listed on the Division of Waste Management, Solid Waste Section portal site at: https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/solid-waste-management-annual-reports/solid-waste-permitted-facility-list

Questions regarding solid waste management for this project should be directed to Mrs. Mary Whaley, Environmental Senior Specialist, Solid Waste Section, at (919) 693-5023.

cc: Mary Whaley, Environmental Senior Specialist
Jessica Montie, Compliance Officer

State of North Carolina Department of Environmental Quality
INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: RALEIGH
Project Number: DEQ-1664 Due Date: 02/17/2017
County: DURHAM & GRANVILLE

After review of this project it has been determined that the DEQ permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Permit to construct & operate wastewater treatment facilities, non-standard sewer system extensions & sewer systems that do not discharge into state surface waters.	Application 90 days before begins construction or award of construction contracts. On-site inspection may be required. Post-application technical conference usual.	30 days (90 days)
☐	Permit to construct & operate, sewer extensions involving gravity sewers, pump stations and force mains discharging into a sewer collection system	Fast-Track Permitting program consists of the submittal of an application and an engineer's certification that the project meets all applicable State rules and Division Minimum Design Criteria.	30 days (N/A)
☐	NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begins activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility-granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later.	90-120 days (N/A)
☐	Water Use Permit	Pre-application technical conference usually necessary.	30 days (N/A)
☐	Well Construction Permit	Complete application must be received and permit issued prior to the installation of a groundwater monitoring well located on property not owned by the applicant, and for a large capacity (>100,000 gallons per day) water supply well.	7 days (15 days)
☐	Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner. On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and Federal Dredge and Fill Permit.	55 days (90 days)
☐	Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.O100 thru 2Q.0300)	Application must be submitted and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.0113).	90 days
☒	Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
☒	Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 20.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950	Please Note - The Health Hazards Control Unit (HHCU) of the N.C. Department of Health and Human Services, must be notified of plans to demolish a building, including residences for commercial or industrial expansion, even if no asbestos is present in the building.	60 days (90 days)
☒	The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres are to be disturbed. Plan must be filed with and approved by applicable Regional Office (Land Quality Section) at least 30 days before beginning activity. A NPDES Construction Stormwater permit (NCG010000) is also usually issued should design features meet minimum requirements. A fee of $65 for the first acre or any part of an acre. An express review option is available with additional fees.		20 days (30 days)
☐	Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable Stormwater conveyances and outlets.		(30 days)
☐	Sedimentation and erosion control must be addressed in accordance with _____ Local Government's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable Stormwater conveyances and outlets.		Based on Local Program
☐	Compliance with 15A NCAC 2H .0126 - NPDES Stormwater Program which regulates three types of activities: Industrial, Municipal Separate Storm Sewer System & Construction activities that disturb ≥1 acre.		30-60 days (90 days)
☐	Compliance with 15A NCAC 2H 1000 -State Stormwater Permitting Programs regulate site development and post-construction stormwater runoff control. Areas subject to these permit programs include all 20 coastal counties, and various other counties and watersheds throughout the state.		45 days (90 days)

State of North Carolina Department of Environmental Quality
INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: RALEIGH
Project Number: DEQ-1664 Due Date: 02/17/2017
County: DURHAM & GRANVILLE

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Mining Permit	On-site inspection usual. Surety bond filed with DEQ Bond amount varies with type mine and number of acres of affected land. Affected area greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
☐	Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to: prepare plans, inspect construction, and certify construction is according to DEQ approved plans. May also require a permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of $200.00 must accompany the application. An additional processing fee based on a percentage or the total project cost will be required upon completion.	30 days (60 days)
☐	Oil Refining Facilities	N/A	90-120 days (N/A)
☐	Permit to drill exploratory oil or gas well	File surety bond of $5,000 with DEQ running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to DEQ rules and regulations.	10 days N/A
☐	Geophysical Exploration Permit	Application filed with DEQ at least 10 days prior to issue of permit. Application by letter. No standard application form.	10 days N/A
☐	State Lakes Construction Permit	Application fee based on structure size is charged. Must include descriptions & drawings of structure & proof of ownership of riparian property	15-20 days N/A
☐	401 Water Quality Certification	Compliance with the T15A 02H .0500 Certifications are required whenever construction or operation of facilities will result in a discharge into navigable water as described in 33 CFR part 323.	60 days (130 days)
☒	Compliance with Catawba, Goose Creek, Jordan Lake, Randleman, Tar Pamlico or Neuse Riparian Buffer Rules is required. Buffer requirements: http://deq.nc.gov/about/divisions/water-resources/water-resources-permits/wastewater-branch/401-wetlands-buffer-permits/401-riparian-buffer-protection-program		
☐	Nutrient Offset: Loading requirements for nitrogen and phosphorus in the Neuse and Tar-Pamlico River basins, and in the Jordan and Falls Lake watersheds, as part of the nutrient-management strategies in these areas. DWR nutrient offset information: http://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/nutrient-offset-information		
☐	CAMA Permit for MAJOR development	$250.00 - $475.00 fee must accompany application	75 days (150 days)
☐	CAMA Permit for MINOR development	$100.00 fee must accompany application	22 days (25 days)
☐	Abandonment of any wells, if required must be in accordance with Title 15A. Subchapter 2C.0100.		
☐	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
☐	Plans and specifications for the construction, expansion, or alteration of a public water system must be approved by the Division of Water Resources/Public Water Supply Section prior to the award of a contract or the initiation of construction as per 15A NCAC 18C .0300 et. seq., Plans and specifications should be submitted to 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. All public water supply systems must comply with state and federal drinking water monitoring requirements. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☐	If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section at 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☐	Plans and specifications for the construction, expansion, or alteration of the _____ water system must be approved through the _____ delegated plan approval authority. Please contact them at _____ for further information.		

State of North Carolina Department of Environmental Quality
INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: RALEIGH
Project Number: DEQ-1664 Due Date: 02/17/2017
County: DURHAM & GRANVILLE

Other Comments (attach additional pages as necessary, being certain to comment authority)

Division	Initials	No comment	Comments	Date Review
DAQ	DDM	☐		2/3/17
DWR-WQROS (Aquifer & Surface)	DS &rb	☐	I have no specific comments for the subject for INRMP. National Gard staff are welcome to contact DWRs Raleigh Regional Office, attention at (919) 791-4200 if they have any questions about surface waters, ground water, wetlands, wastewater, riparian buffers, 401 permitting, how, when, requirements for reporting spills (fuel spills, chemical spills, sewer overflows etc), well construction/closure etc. & Change current references to "Division of Water Quality", and "DWQ" to "Division of Water Resources" and "DWR", where applicable, throughout document.	2/21/17 2/8/17
DWR-PWS	WAH	☒		2/16/17
DEMLR (LQ & SW)	CDA	☐		2/2/17
DWM – UST	MRP	☒		2/15/17
Other Comments		☐		/ /

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

☐ **Asheville Regional Office**
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211
Phone: 828-296-4500
Fax: 828-299-7043

☐ **Fayetteville Regional Office**
225 Green Street, Suite 714,
Fayetteville, NC 28301-5043
Phone: 910-433-3300
Fax: 910-486-0707

☐ **Mooresville Regional Office**
610 East Center Avenue, Suite 301,
Mooresville, NC 28115
Phone: 704-663-1699
Fax: 704-663-6040

☒ **Raleigh Regional Office**
3800 Barrett Drive,
Raleigh, NC 27609
Phone: 919-791-4200
Fax: 919-571-4718

☐ **Washington Regional Office**
943 Washington Square Mall,
Washington, NC 27889
Phone: 252-946-6481
Fax: 252-975-3716

☐ **Wilmington Regional Office**
127 Cardinal Drive Ext.,
Wilmington, NC 28405
Phone: 910-796-7215
Fax: 910-350-2004

☐ **Winston-Salem Regional Office**
450 Hanes Mill Road, Suite 300,
Winston-Salem, NC 27105
Phone: 336-776-9800
Fax: 336-776-9797

Department of Environmental Quality
Project Review Form

Project Number	County	Date Received	Date Response Due
DEQ # 1664	Durham and Granville	1/27/2017	2/17/2017

Environmental Review - Five-Year Update of Integrated Natural Resources Management Plan (INRMP) - Camp Butner Training Site - NC Army National Guard (NCARNG) is updated the plan and is requesting your review.

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
☐ Asheville ☐ Fayetteville ☐ Mooresville ☒ Raleigh ☐ Washington ☐ Wilmington ☐ Winston-Salem	☒ Air ☒ DWR – All Water Programs ☒ Land Quality & Stormwater Programs ☒ UST ☒ Public Water	☐ Marine Fisheries ☐ Coastal Management ☒ Waste Mgmt (Haz, solid, Inactive, Superfund & UST) ☒ Air Quality ☒ CC & PS Div. of Emergency Mgmt. ☒ Water Resources Management (Public Water, Planning & Water Quality Program) ☐ Shellfish Sanitation ☐ USFWS ☒ Parks & Recreation ☐ USACE ☐ DWR – Transportation Unit _____ ☒ Wildlife Gabriela Garrison ☐ Cultural Resources ☐ Wildlife (DOT) _____

Regional Coordinator Sign-off:	Date:	In-House Reviewer/Agency:
_____	03 February 2017	John D. Brubaker, PE, CFM, NFIP Coordinator, Risk Management, DPS

Response (check all applicable)

☐ No objection to project as proposed ☒ No comment

☐ Insufficient information to complete review ☐ Other (specify or attach comments)

Add your comments: _____

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

Department of Environmental Quality
Project Review Form

Project Number	County	Date Received	Date Response Due
DEQ # 1664	Durham and Granville	1/27/2017	2/17/2017

Environmental Review - Five-Year Update of Integrated Natural Resources Management Plan (INRMP) - Camp Butner Training Site - NC Army National Guard (NCARNG) is updated the plan and is requesting your review.

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
☐ Asheville ☐ Fayetteville ☐ Mooresville ☒ Raleigh ☐ Washington ☐ Wilmington ☐ Winston-Salem	☒ Air ☒ DWR – All Water Programs ☒ Land Quality & Stormwater Programs ☒ UST ☒ Public Water	☐ Marine Fisheries ☐ Coastal Management ☒ Waste Mgmt (Haz, solid, Inactive, Superfund & UST) ☒ Air Quality ☒ CC & PS Div. of Emergency Mgmt. ☒ Water Resources Management (Public Water, Planning & Water Quality Program) ☐ Shellfish Sanitation ☐ USFWS ☒ Parks & Recreation ☐ USACE ☐ DWR – Transportation Unit _____ ☒ Wildlife Gabriela Garrison ☐ Cultural Resources ☐ Wildlife (DOT) _____

Regional Coordinator Sign-off:	Date:	In-House Reviewer/Agency:
_____	2-15-17	Gabriela Garrison

Response (check all applicable)

☐ No objection to project as proposed

☑ No comment

☐ Insufficient information to complete review

☐ Other (specify or attach comments)

Add your comments: _____

RETURN TO:

Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

Department of Environmental Quality
Project Review Form

Project Number	County	Date Received	Date Response Due
DEQ # 1664	Durham and Granville	1/27/2017	2/17/2017

Environmental Review - Five-Year Update of Integrated Natural Resources Management Plan (INRMP) - Camp Butner Training Site - NC Army National Guard (NCARNG) is updated the plan and is requesting your review.

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
☐ Asheville ☐ Fayetteville ☐ Mooresville ☒ Raleigh ☐ Washington ☐ Wilmington ☐ Winston-Salem	☒ Air ☒ DWR – All Water Programs ☒ Land Quality & Stormwater Programs ☒ UST ☒ Public Water	☐ Marine Fisheries ☐ Coastal Management ☒ Waste Mgmt (Haz, solid, Inactive, Superfund & UST) ☒ Air Quality ☒ CC & PS Div. of Emergency Mgmt. ☒ Water Resources Management (Public Water, Planning & Water Quality Program) ☐ Shellfish Sanitation ☐ USFWS ☒ Parks & Recreation ☐ USACE ☐ DWR – Transportation Unit _____ ☒ Wildlife Gabriela Garrison ☐ Cultural Resources ☐ Wildlife (DOT) _____

Regional Coordinator Sign-off:	Date:	In-House Reviewer/Agency:
_____	_____	Justin Williamson, NCDNCR-Parks & Rec.

Response (check all applicable)

☐ No objection to project as proposed ☒ No comment

☐ Insufficient information to complete review ☐ Other (specify or attach comments)

Add your comments: _____

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

STATE OF NORTH CAROLINA
DEPARTMENT OF PUBLIC SAFETY
JOINT FORCE HEADQUARTERS
NORTH CAROLINA NATIONAL GUARD

January 17, 2017

ROY COOPER
GOVERNOR

ERIK HOOKS
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

U.S. Fish and Wildlife Service
Raleigh Field Office
Mr. Pete Benjamin, Field Supervisor
P.O. Box 33726
Raleigh, NC 27636-3726

Dear Mr. Benjamin,

The North Carolina National Guard (NCNG) is in the process of updating its Integrated Natural Resources Management Plan (INRMP) for the Camp Butner Training Site in Durham and Granville Counties, NC. The requirement to develop and implement the INRMP is contained in the Sikes Act Improvement Act (16 U.S.C. 670).

The Environmental Office of the NCARNG requests that you review this document and contact us with any comments or concerns that you may have regarding its content. Your response on or before 17 January 2017 will enable us to complete this phase in a timely manner.

Enclosed is a CD of the preliminary draft for your use.

We welcome your input and look forward to continued cooperation between our respective agencies. If you have any questions regarding the INRMP, please call me at 984-664-6268 or email at braden.a.ramage.nfg@mail.mil.

Sincerely,

Braden Ramage
Natural/Cultural Resources Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh ES Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726
March 17, 2017

Mr. Braden Ramage
NC Department of Public Safety
Joint Force Headquarters, N.C. National Guard
1636 Gold Star Drive
Raleigh, North Carolina 27607-3371

Dear Mr. Braden:

The Fish and Wildlife Service (Service) has reviewed your January 18, 2017 letter and associated document titled: "Draft Updated Integrated Natural Resources Management Plan (INRMP) 2016 – 2020 for the Camp Butner Training Site, Durham and Granville Counties, North Carolina." The INRMP will guide natural resource conservation programs on Camp Butner Training Site (CBTC) and ensure sustainability of the installation's training environment in support of the North Carolina National Guard. Our comments are provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 USC 1531 et seq.).

Federally listed species addressed in the Draft INRMP include: Dwarf wedgemussel (*Alasmidonta heterodon*; Granville County), Harperella (*Ptilimnium nodosum*; Granville County) Michaux's sumac (*Rhus michauxii*; Durham County), and smooth coneflower (*Echinacea laevigata*; Durham and Granville counties). The red-cockaded woodpecker (*Picoides borealis*) historically occurred on Falls Lake reservoir, south of CBTC but is now considered extirpated in Durham County. There are no element occurrences for the red-cockaded woodpecker in Granville County.

Objectives are expressed in the INRMP to conduct specific surveys on the installation in potential habitat for federal and state special status species every five to ten years. The latest flora and vegetation communities' survey and inventory of vertebrate and invertebrate species on CBTC were conducted in 2013. The INRMP indicates that no federally listed species, including those referenced above have been identified at CBTC.

Concurrent with the review of the CBTC INRMP, the Service issued a Federal Register Final Rule notice on January 10, 2017 announcing inclusion of the rusty-patched bumble bee (*Bombus affinis*; RPBB) as an endangered species under the Act. The effective date of the final rule will be March 21, 2017. The Service's "Rusty Patched Bumble Bee (*Bombus affinis*) Species Status Assessment Final Report, Version 1, June 2016" (SSA) indicates that RPBB was an abundant and wide-spread species with a range encompassing 31 states, including North Carolina. RPBB has disappeared from over 90 percent of previous locations where it was known to occur in the past two decades. The SSA states that "[t]he primary causes of the decline include habitat loss and degradation, pathogens, pesticides, and small population dynamics."

Most of the RPBB historic range in North Carolina extends through the mountains with three records in the piedmont region. We are aware of at least one historic element occurrence of RPBB recorded in Durham County. Very little is known about the life history and ecology of RPBB in the project area.

The INRMP promotes conservation of the diverse native plant communities on CBTC, consistent with Department of the Army guidance and the installation's training mission. CBTC uses integrated pest management to control target pest species while minimizing adverse environmental impacts to the environment and non-target species. The INRMP also promotes the control of invasive plant species that have the potential to negatively impact native ecosystems. These practices are generally expected to be beneficial to helpful insect pollinators. Based on these INRMP components, the Service believes that implementation of the updated INRMP is not likely to adversely affect the RPBB. As environmental science reveals more about pollinator ecology, we encourage the North Carolina National Guard to adapt existing best management practices to provide additional benefits for pollinators where appropriate and as practicable.

Based on the information contained in your January 18, 2017 letter and updated INRMP, we believe the document represents appropriate coordination with the Service regarding trust natural resources, including migratory birds, aquatic resources and native natural communities. We believe implementation of the updated INRMP may affect, but is not likely to adversely affect the rusty-patched bumble bee and would have no adverse effects to any other federally-listed threatened or endangered species. We believe that the requirements of section 7(a)(2) of the Act have been satisfied. We remind you that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action. Thank you for the opportunity to comment on the CBTS INRMP. If you have any questions regarding this matter, please contact Mr. John Hammond at 919-856-4520 (extension 28). Thank you for your continued cooperation with our agency.

Sincerely,

John A. Hammond

Pete Benjamin
Field Supervisor

Cc: Marshall Williams, U.S. Fish and Wildlife Service

Literature cited:

U.S. Fish and Wildlife Service. 2016. Rusty Patched Bumble Bee (*Bombus affinis*) Species Status Assessment, Final Report, Version 1. U.S. Fish and Wildlife Service, Bloomington, MN. 94 pp.

APPENDIX B

CBTS FOREST MANAGEMENT PLAN (UPDATED)

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CAMP BUTNER FOREST MANAGEMENT PLAN (2006)

Introduction and Background Information

This report is an update of the previous plan dated March 2001, for the timber resources of the Camp Butner Training Facility at Butner, North Carolina. The initial field data collection began during the months of May and June 1994 by Staff Foresters Jim Smith and Larry Such with assistance from Division of Forest Resources Technicians from Durham, Granville, and Wake Counties. Since then all the stand data with regards to timber type has been updated but more field data is needed in order to make better management decisions.

Management Objectives

The NC Division or Forest Resources recommends managing this property to maximize forest health, production, and enhance wildlife habitat while providing for protection of the water resources. It is felt that these objectives can be met on a sustainable basis while maintaining an allowable cut. Managing these resources can be accomplished along with the coordination of the NCNG troop training and activities, which take priority. Management activities such as in-stand burning, reforestation, harvesting, timber stand improvement, buffer establishment and maintenance, and proper trail, road, and culvert maintenance, must be considered to address the objectives above.

Management Concerns

Update Timber Stand Data

In order to meet the objectives above, there is a need for more detailed timber stand data such as specific stand ages, basal areas, site indexes, and current growth data. Such information is important in determining the current growth and volumes and estimating the future growth and volumes of each stand. This information can then be used to make better current/future harvesting decisions based on growth data, while maintaining a sustainable condition. Time and manpower available from the NC Division of Forest Resources to gather this needed field data is generally limited and can pose some challenges. This can be resolved by hiring summer students or a private consultant to collect the data. If the funds are not available to do this, then the NC Division of Forest Resources can gather the data however it may take 2-3 years to complete the survey.

Marketing Timber Resources

Being able to market Camp Butner's timber resources for the maximum amount has always been an issue. Many local buyers and processors have concerns over metal fragments or bullets in the timber, that could shut down their mill operations. Some local mills will not consider Camp Buter's timber because of this. This has affected they way in which timber is marketed on the property. Generally, there should be few if any metal fragments in the non-impact areas of the forest. However there is a better chance of running into metal fragments in the impact areas, which occupies most of the forest area. Earth berms at the end of the ranges will help protect the resource, but is not a guaranteed method.

It is best to market the timber resource through a competitive lump sum bid process. This usually brings the highest price and the least amount of supervision and effort on the Camp staff. Ideally this is the method that

should be used for all sales on the camp however this method can result in early termination of the contract when the buyer is shut down by the mill due to metal fragments. This could result in law suits and lengthy processes to reimburse the bidder the difference in what he cut and what he could not sell. It is felt that the competitive bid lump sum process is best used in areas where there are no metal fragments.

For timber sales that fall within impact areas, it is felt that the only way to successfully market the timber resource is to sell it by the unit or "pay as you cut". This allows the buyer to pay for each load he removes and not for timber left on the stump. In case the mill shuts the buyer down, the buyer has not lost his investment in standing timber he cannot cut. On such sales, it is extremely important to have National Guard personnel present at or near the deck to count each load that is removed from the forest. This tally should be filed and compared to the tickets submitted to be sure all loads are accounted for.

Topographic Limitations

Approximately the eastern one-third of the property contains slopes ranging from 20% to as much as 50% especially in the vicinity of Lake Butner and the major watercourses that feed the Lake. Harvesting and fireline construction within this area should be done with extreme caution to protect the integrity of the water quality as well as the aesthetics of the watershed.

Forest Practice Guidelines Related to Water Quality

All forestland disturbing activities must adhere to the Performance Standards of the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J .0101-.0209) or be subject to the requirements of the N. C. Sedimentation Pollution Control Act of 1973. Also forest best management practices can be followed to help prevent violations of the established Forest Practice Guidelines. These guidelines and best management practices can be viewed through the North Carolina Division of Forest Resources web page (address is in the appedix). Also because of the proximity of the camp to the Neuse River, the Neuse Basin rules must be followed and are very important for any land disturbing activities at Camp Butner. These general guidelines are attached.

The Allowable Cut or Harvest

There are approximately 4575 of woodland acres recognized in this report that can be managed to a greater or lesser degree for timber and wildlife production. Of these acres, there is approximately 1167 acres of hardwoods consisting of either upland or bottomland species. The remaining 3372 acres consists of pine (loblolly or Virginia) or pine/hardwood mixtures.

Since March 2001, there have been 209 acres clear-cut and 143 acres replanted or naturally regenerated at Camp Butner. Approximately 193 acres have been thinned. Those data are shown in Tables 3 and 2, respectively. Much of the timber that has been harvested and thinned has been done in an effort to reduce the incidence of pine bark beetle infestations, to remove decadent and low value stands of Virginia Pine and to replace them with Loblolly Pine. Virginia Pine is purchased by local markets only for pulpwood, a low value product. It is rare that any of it can be sold for ChipNSaw production. Loblolly, however, offers an increase in value since it is extensively used for plywood and solid wood products.

All harvests for timber and wildlife management must be made with respect to the average annual increment for Camp Butner. Timber harvests that routinely exceed the average annual increment will lead to a depletion of the timber resource. It is, therefore, important to quantify the removals of all timber to ensure that overharvesting is avoided, at least, for the long-term. Only the necessity to salvage damaged timber or to replace an inferior species should be used as a reason to overharvest.

Based on the expected yields for natural stands of loblolly pine of varying site indices and similarly

for pine plantations, and the expected yields reported for natural hardwood stands, the 4575 woodland acres at Camp Butner, if well stocked, should reasonably produce, on average, approximately 2.5 tons of wood per acre per year. These figures are based on 40-year rotations for the pine and 50 to 60 year rotations for the bottomland hardwoods. Although hardwoods appear to remain productive with longer rotations, longer rotations, will generally result in reduction of the average annual production for pine. How long pine rotations might be extended without sacrificing too much growth is a point of much contention. If pine rotations are extended substantially, then the average annual increment must be adjusted downward. Also, it is important to note that 15 % of the producing acreage is in bottomland hardwoods that produce over 17% of the average annual production. Completely excluding these bottomlands from any type of harvesting or silvicultural practice will also significantly reduce the allowable harvest at Camp Butner. These sites are the most productive at Camp Butner.

In general, sustainability of the timber resource can be achieved by limiting total harvests to the following guidelines:
All pine stands of a 40 year rotation: 48 acres / year or 240 acres for the 5 year management period.
All pine stands of a 60 year rotation: 25 acres / year or 125 acres for the 5 year management period.
All hardwoods of a 40 year rotation: 3 acres / year or 15 acres for the 5 year management period.
All hardwoods of a 60 year rotation: 5acres / year or 25 acres for the 5 year management period.
All hardwoods of a 100 year rotation: 3 acres / year or 15 acres for the 5 year management period.
All hardwood of a 120 year rotation: 3 acres / year or 15 acres for the 5 year management period.

These rotation lengths are indicated in the attached stand tables and are based on rotation ages and corresponding acres.

Use of Herbicides in Silviculture

Periodically it is important to revisit the young pine plantations that are 2-3 years of age to evaluate their need to be released from competition of primarily sweetgum and red maple. If the stocking of these plantations is low then they will need to be released or the stands will become predominantly sweetgum. It is generally accepted that the use of Arsenal AC will control sweetgum and red maple at a relatively low rate of herbicide per acre. Usually only one application is necessary for the entire rotation. The use of Arsenal AC is also touted by many game biologists to result in improved forage for turkeys and quail, since legumes tolerate the active ingredient (imazapyr)of Arsenal AC very well. Many of the younger stands that were planted in the past 4 years are positioned to be evaluated for this practice.

Additionally, there are several small areas of wisteria and kudzu that should be treated with herbicides to eliminate it from the stands. In addition to replacing the native plant species, the wisteria vines cause trees to be crooked and deformed, resulting in lower product values. One area, in Block A-2, which had a bad wisteria problem, has already been harvested. This area must be watched closely to see that any resprouting is controlled. Garlon 4 or Accord may be used to control this pest.

Prescribe Burning

Prescribe burning is desirable to reduce the losses from wildfire, to improve wildlife habitat, and possibly to restore some rare and threatened plant species. Placing the older pine stands on a 5 year burn cycle would offer a practical and low cost insurance against wildfire. While winter burning may have to be used initially on many stands that have a buildup of fuels, summer burning should be used whenever possible (generally in older pine stands) to combat the proliferation of sweetgum and other woody underbrush, including wisteria, that become unwanted components of most pine stands. Those areas that

have invasions of wisteria vines are prime areas for burning. A summer silvicultural burn will control many of the vines and provide herbaceous plants a greater opportunity to exist in the understory. Several blocks were burned this winter but there are others that need the same treatment. A list of understory burning accomplished since March 2001 has been attached.

The NC Division of Forest Resources wishes to continue the burn program and provide this fee service as the weather and manpower allows.

The Timber Resource

This report divides the Camp Butner Training property into ten blocks that coincide with the ten "sub-areas" identified on the Camp Butner (Special) map. Included is a separate stand type map for each block that illustrates the approximate shape and size of the various stands within each block. A table of data, with generic recommendations for each stand, accompanies each of the block maps. The digital version for these blocks is also available and will generally offer a greater capacity for data analyses than can be reasonably included in this report. A description of the stand types is outlined below and Figures 1, 2, and 3 offer an overview of the forest conditions at Camp Butner.

Stand Types + NCNG Butner

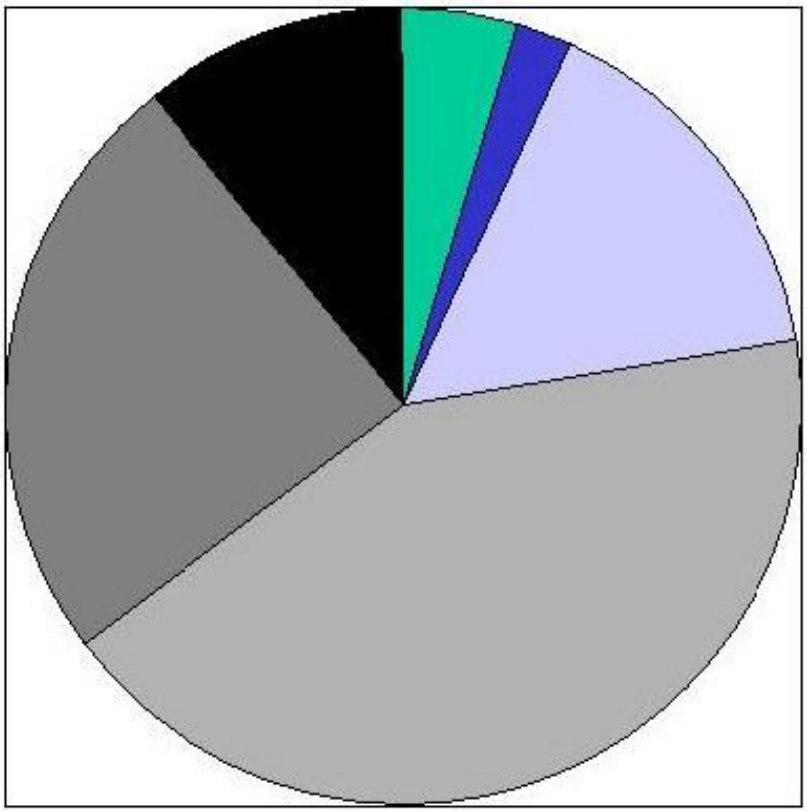
Type 1-5	These are natural pine stands of loblolly (L), shortleaf (S), or Virginia pine (V) or mixtures of these species for the various age classes indicated.
Type 6-9	These are bottomland hardwoods of various species (chiefly yellow poplar, sweetgum, willow oak, water oak and red maple) for the age classes indicated.
Type 10-13	These are upland hardwoods of various species (chiefly red oaks, chestnut oaks, white oaks, hickory, beech, yellow poplar) for the age classes indicated.
Type 14-17	These are mixed stands of pines and hardwoods (chiefly oaks) for the various age classes indicated.
Type 18-22	These are loblolly pine plantations for the various age classes indicated.
Type 23	These are old fields or pastures that have been abandoned. They are currently occupied with grasses, briers, shrubs and/or a variety of trees both pines and hardwoods of varying ages and densities
Type 24	These are open areas, such as ranges and parking lots that will not be useful for timber production.

TYPE #	**TYPE DESCRIPTION**
1	Pine (L<S<V) 10 years or less
2	Pine (L<S<V) 11-20 years
3	Pine (L<S<V) 21-30 years
4	Pine (L<S<V) 32-40 years
5	Pine (L<S<V) 41 Years +
6	Bottomland Hardwoods 10 years or less
7	Bottomland Hardwoods 11-30 years

8	Bottomland Hardwoods 31-50 years
9	Bottomland Hardwoods 51 Years +
10	Upland Hardwoods 10 years or less
11	Upland Hardwoods 11-30 years
12	Upland Hardwoods 31-50 years
13	Upland Hardwoods 51 Years +
14	Pine-Hardwood 10 years or less
15	Pine-Hardwood 11-30 years
16	Pine-Hardwood 31-50 years

TYPE #	**TYPE DESCRIPTION**
17	Pine-Hardwood 51 Years +
18	Pine Plantation 10 years or less
19	Pine Plantation 11-20 years
20	Pine Plantation 21-30 years
21	Pine Plantation 31-40 years
22	Pine Plantation 41 Years +
23	Old Fields/Pastures
24	Open Areas

Acres by Type- Figure 1



O Open Areas 225 Acres (5%)

•Old Fields 118 _4.cres (2%)

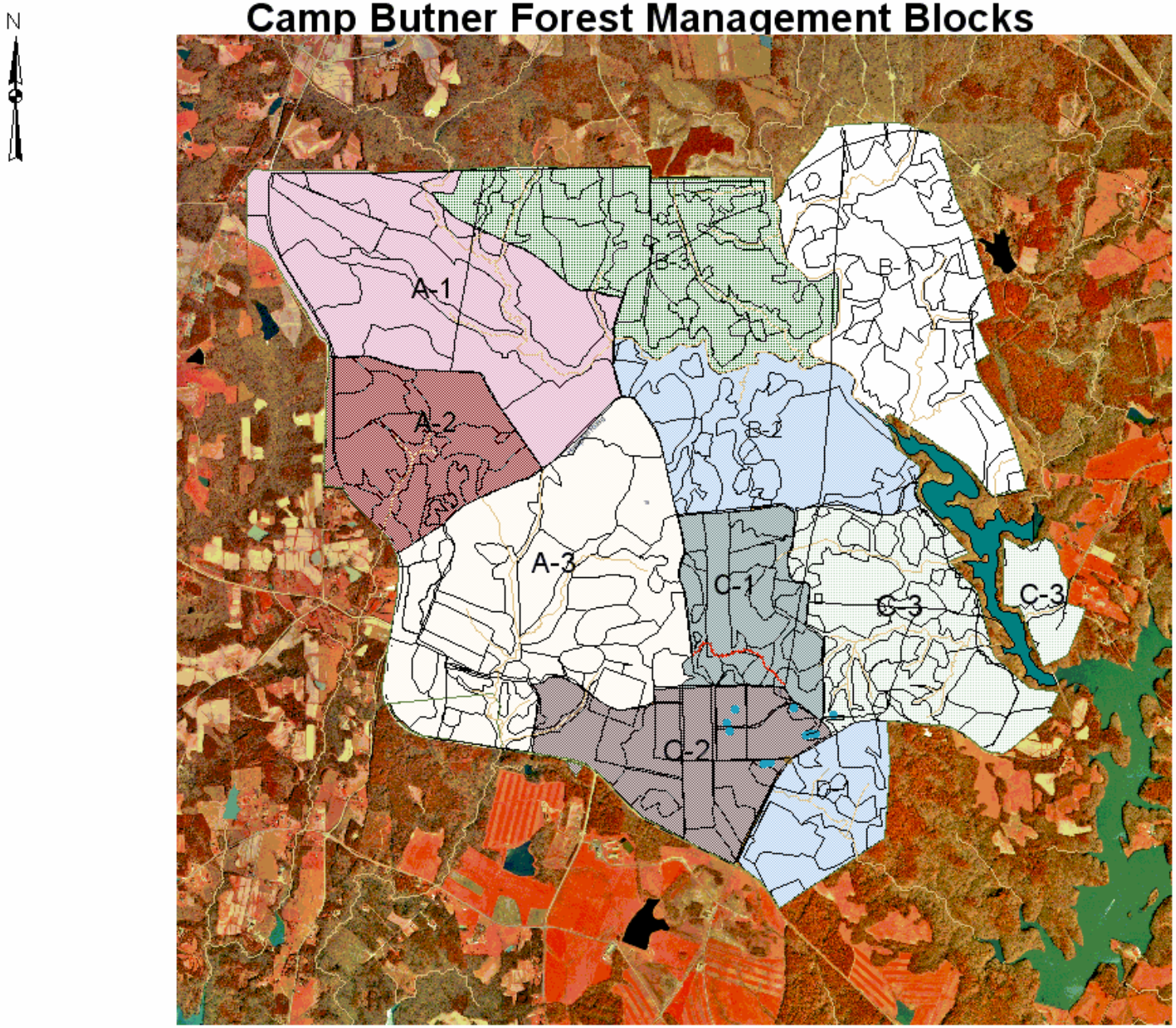
D Pine Plantation 758 Acres (16%)

D Natural Pine 2047 _4.cres (42%)

!Cl Hardwood 1188 Acres (24%)

•Mixed Hd,vd/Pine 533 _4.cres (11%)

Camp Butner Forest Management Blocks

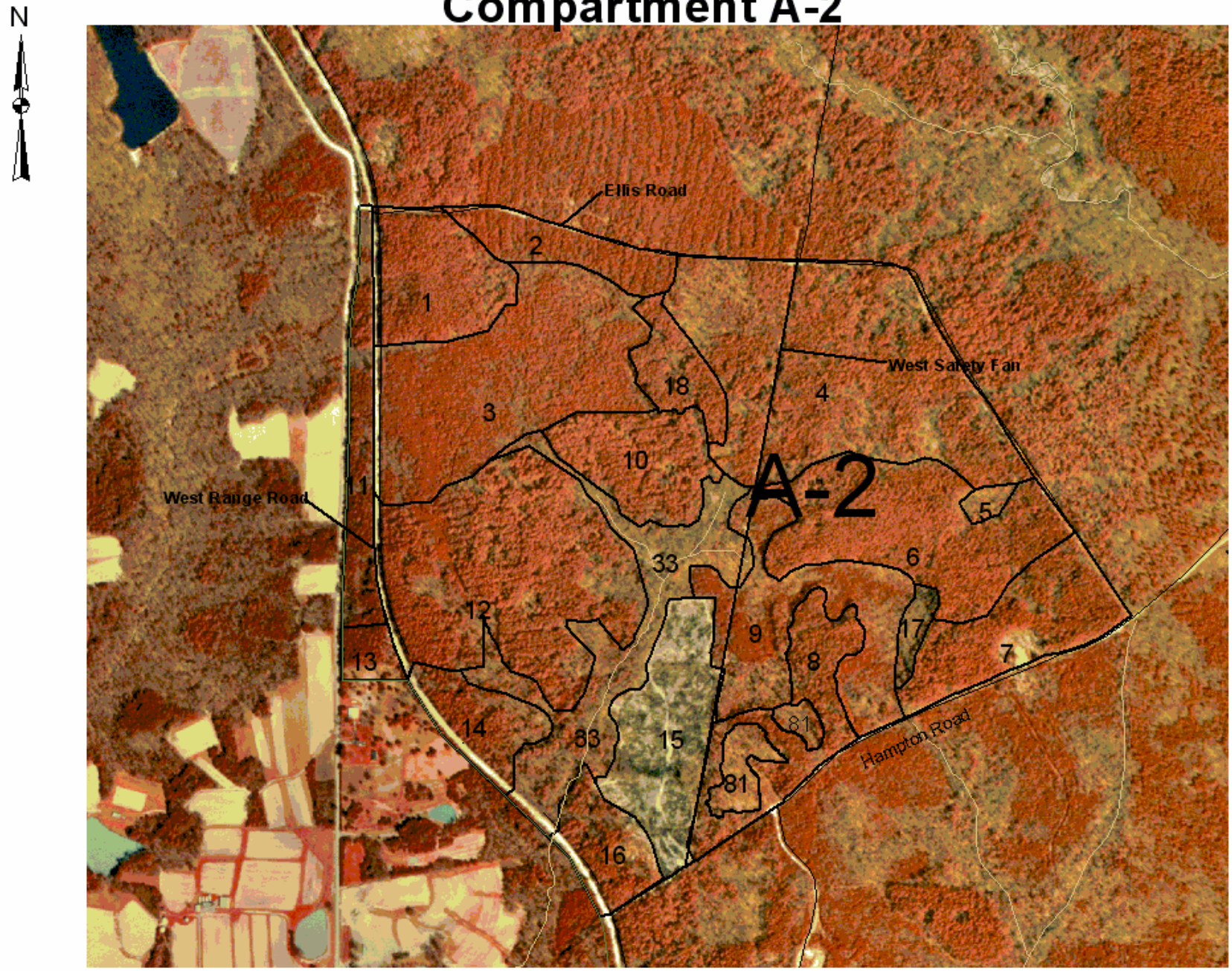


N
North Boundary Road
Boswell Road
West Safety Fan
West Range Road
Hampton Road
A-1
11
0
12
13
14
1
4
10
33
7
8
9

Block A-1

Stand # / Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendations next 5 years
1 / 40	5	Pine (Loblolly) < 10 years	2006	80-85 Loblolly Pine	67	Check for Release/Growth
2 / 60	6	Bottomland Hardwoods < 10 years	2003	85 Loblolly Pine	16.5	Let grow
4 / 40	2	Pine (L,S,V) 11-20 Years	1979	80-85 Loblolly Pine	32.6	Let grow / Prescribe Burn
7 / 40	4	Pine (L,S,V) 31-40 Years	1950	80-85 Loblolly Pine	74.5	Let grow / Prescribe Burn
8 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	6.7	Let grow / Prescribe Burn
9 / 40	4	Pine (L<SV) 31-40 years	?	80-85 Loblolly Pine	76.1	Let grow / Prescribe Burn
10 / 40	5	Pine(L,S,V)>41 years	1956	80-85 Loblolly Pine	122.6	Check for Harvest / or Prescribe Burn
11 / 40	5	Pine(L,S,V)> 41 years	?	80-85 Loblolly Pine	61	Check for Harvest / or Prescribe Burn
12 / 40	3	Pine (L,S,V) 11-20 Years	?	80-85 Loblolly Pine	58	Check for Thinning/ Prescribe Burn
13 / 40	5	Pine (L,S,V) >41 Years	?	80-85 Loblolly Pine	10.4	Check for Harvest / or Prescribe Burn
14 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	40.5	Check for Thinning/ Prescribe Burn
33 / 60	9	Bottomland Hardwoods 51 Years +	?	90-100 Yellow Poplar	109	Selection Harvest and Watershed Buffer
Total					**674.5**	

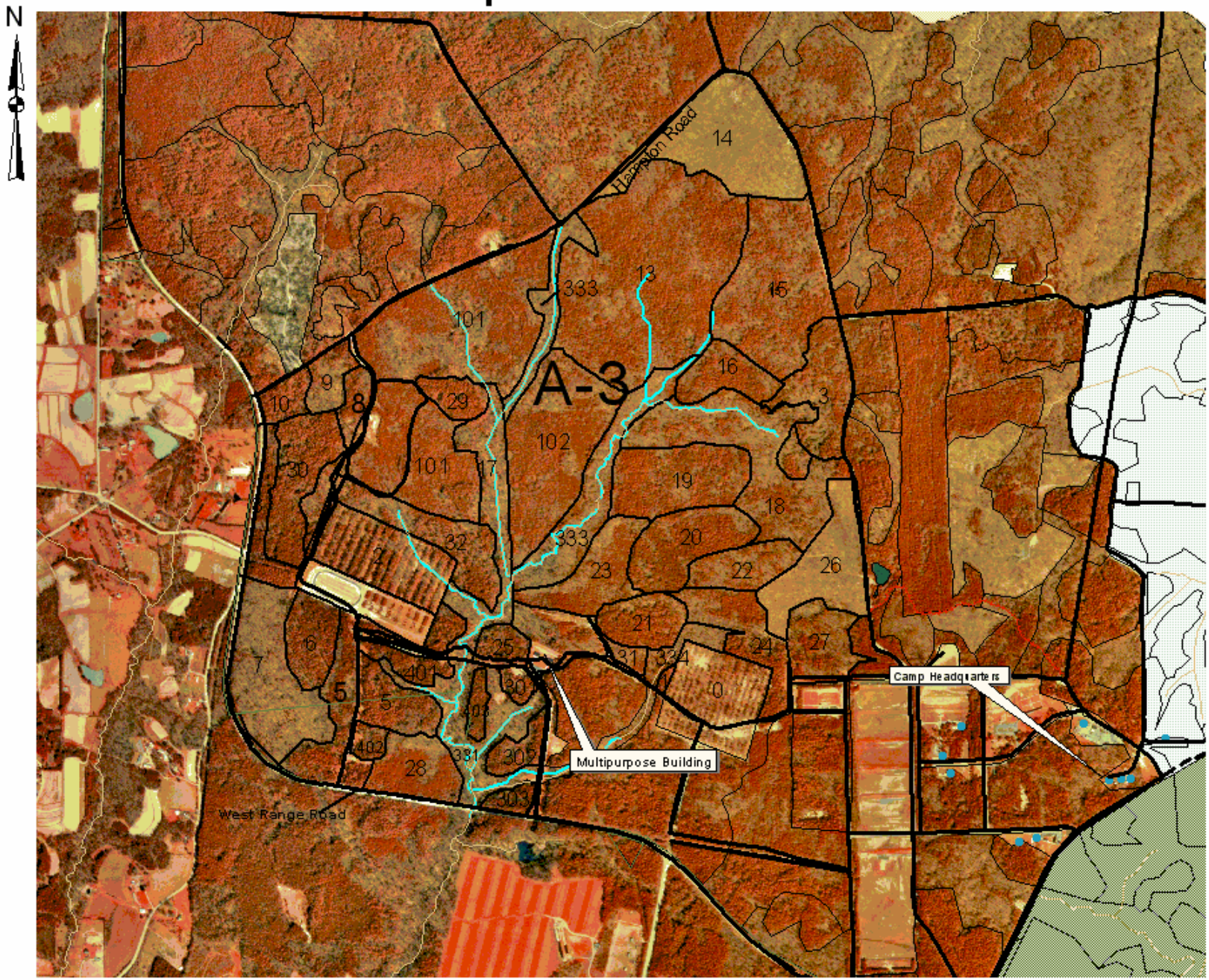
Compartment A-2



Block A-2

Stand#/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	14.5	Check for Harvest
2 / 40	19	Pine Plantation 11-20 Years	1979	80-85 Loblolly Pine	8.3	Prescribe Burn (Winter)
3 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	35.7	Check Growth for Harvest
4 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	50.5	Check Growth for Harvest
5 / 100	13	Upland Hdwds >51years	?	80-85 Loblolly Pine	1.2	Wildlife Habitat--PROTECT
6 / 40	5	Pine(L,S)>41 years	?	80-85 Loblolly Pine	27.1	Prescribe Burn
7 / 40	4	Pine(L,S,V) 31-40 years	?	80-85 Loblolly Pine	16.0	Check Growth / Prescribe Burn
8 / 40	18	Pine Plantation 10years or less	2001	80-85 Loblolly Pine	13.4	Let Grow
9 / 40	2	Pine(L,S,V) 11-20 years	1984	80-85 Loblolly Pine	22.2	Check for Thinning/ Prescribe Burn
10 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	12.7	Check for Harvest
11 / 60	6	Bottomland Hardwood	2003	80-85 Loblolly Pine	9.4	Let Grow
12 / 40	4	Pine(L,S,V) 31-40 years	?	80-85 Loblolly Pine	42	Check Growth / Prescribe Burn
13 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	2.7	Check Growth, Let Grow
14 / 60	5	Pine (L,S,V)> 41 Years	?	70-75 Loblolly Pine	8.7	Check for Harvest
15 / 40	18	Pine Plantation < 10 years	1998	80-85 Loblolly Pine	17.9	Let Grow
16 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	8.0	Check for Thinning
17 / 100	8	Bottomland Hardwoods 31-50 years	?	80-85 Loblolly Pine	2.1	Wildlife Habitat
18 / 40	18	Pine Plantation < 10 years	2000	80-85 Loblolly Pine	6.5	Let Grow
33 / 100	9	Bottomland Hardwoods 51 years +	?	85-90 Loblolly Pine	23.5	Watershed Buffer & Wildlife Habitat
81 / 100	12	Upland Hdwds 31-50 years	?	80 Loblolly Pine	4.8	Wildlife Habitat
Totals					**327.7**	

Compartment A3



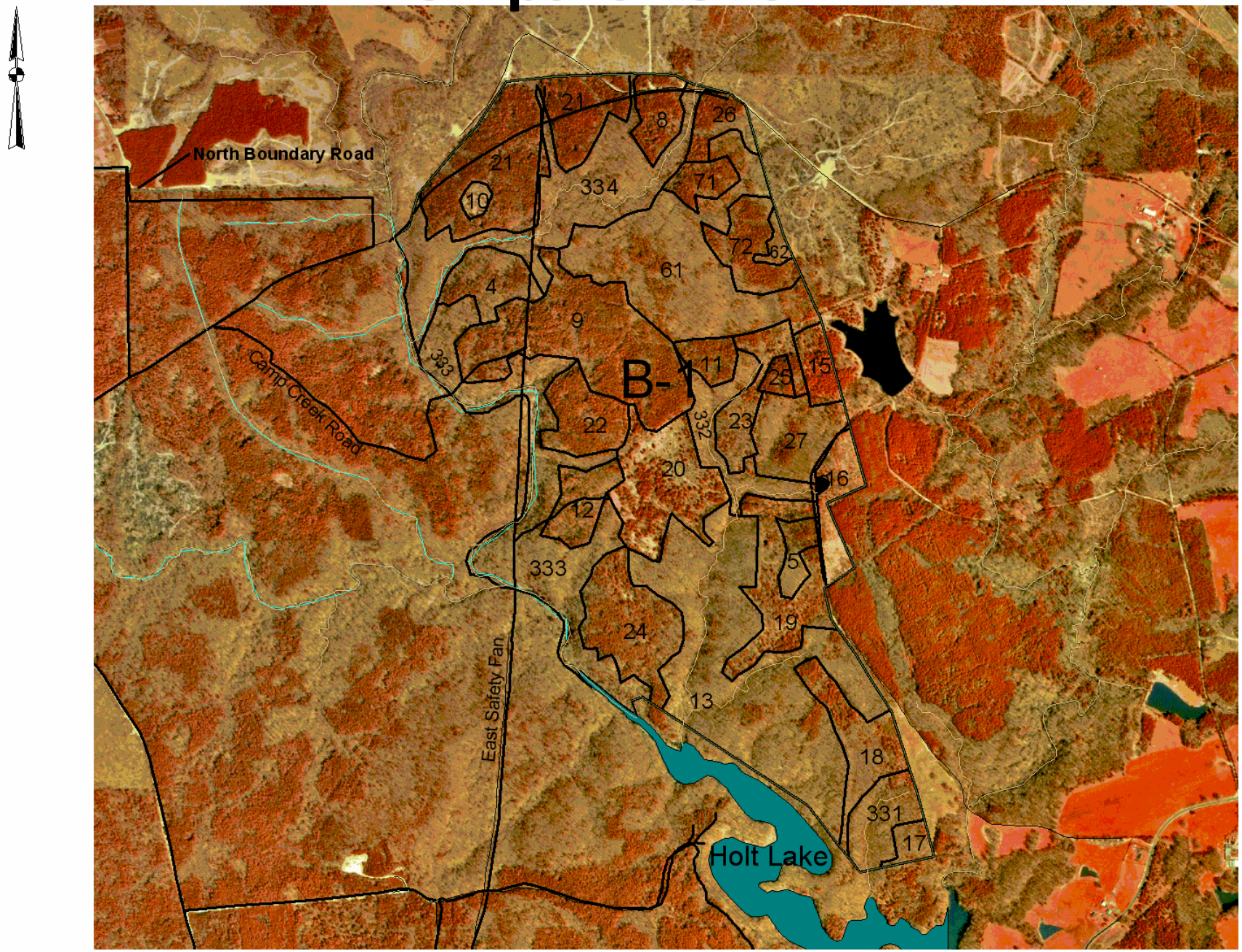
Block A-3

Stand #/ Rotation	Stand Type	Description	Estab.Date	Site Index	ACRES	General Recommendation
1 / 40	5	Pine (L,S,V) >41 Years	?	80-85 Loblolly Pine	0.8	Check growth for Harvest
2 / 40	5	Pine(L,S,V)>41 Years	?	85-90 LoblollyPine	24.4	Clearcut Mature Timber/Regenerate Naturally
3 / 40	1	Pine (Loblolly) <10 years	2003	80-85 LoblollyPine	17.7	Let Grow / Check for Release
5 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	28.8	Check for Thinning/ Prescribe Burn
6 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	11.2	Check Growth for Harvest
7 / 120	13	Upland Hdwds 51 Years +	?	70-75 Red Oak	32.6	Check Growth for Harvest
8 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	20.0	Check Growth for Harvest
9 / 120	13	Upland Hdwds 51 Years +	?	70-75 Red Oak	6.8	Check Growth for Harvest
10 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	6.2	Check Growth for Thinning
13 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	84.1	Check for Thinning/ Prescribe Burn
14 / 40	18	Pine Plantation (L)<10 years	1995	80-85 LoblollyPine	35.7	Let Grow / Check for Release
15 / 60	16	Pine-Hdwd 31-50 Years	?	70-80 LoblollyPine	40.7	Check for Thinning/ Prescribe Burn
16 / 60	5	Pine (L,S,V) >41 Years	?	70-75 LoblollyPine	14	Check Growth for Harvest
17 / 100	9/13	Bottomland & Upland Hdwds 51 +	?	85-90YellowPoplar	21.5	Watershed Buffer & Wildlife Habitat/ Selection Harvest
18 / 80	8/12	Bottom/Upland Hdwds 31-50 Yrs	?	85-90YellowPoplar	39.3	Check Growth for Thinning
19 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	23.5	Check for Thinning/ Prescribe Burn
20 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	18.9	Check Growth for Harvest
21 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	10.9	Check Growth for Harvest
22 / 100	12/4	Upland Hdwds 31-50 Yrs. / Pine (L,S,V) 31-50 Yrs.	?	80-85 LoblollyPine	11.0	Check Growth for Harvest

Block A-3

Stand #/ Rotation	Stand Type	Desription	Estab.Date	Site Index	Acres	General Recommendation
23 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	16.2	Check Growth for Harvest
24 / 40	4	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	16.8	Check Growth for Harvest
25 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	5.3	Check Natural stocking, Let Grow
26 / 40	19	Pine Plantation (L)<10 years	1995	80-85 LoblollyPine	23.0	Let Grow / Check for Release
27 / 40	16	Pine-Hdwd 31-50 Years	?	85-90 YellowPoplar	13.5	Check Growth/ No Treatment Needed Next 10 Years
28 / 40	15	Pine-Hdwd(11-30 Years)	?	80-85 LoblollyPine	13.7	Check Growth
29 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	6	Check for Thinning/ Prescribe Burn
30 / 40	1	Pine(l)<10 years	2001	80-85 LoblollyPine	18.6	Let Grow / Check for Release
31 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	2.4	Check Growth for Harvest
32 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	23.6	Check Growth for Harvest
101 / 40	19	Pine Plantation 11-21 years	?	80-85 LoblollyPine	87.9	Check for Thinning/ Prescribe Burn
102 / 40	19	Pine Plantation 11-21 years	?	80-85 LoblollyPine	38.6	Check for Thinning/ Prescribe Burn
301 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	2.9	Check Growth / Prescribe Burn
302 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	6.1	Check Growth / Prescribe Burn
303 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	3.7	Check Growth / Prescribe Burn
331 / 60	8	Bottomland Hdwds 31-50 Yrs.	?	100+ YellowPoplar	23.3	Watershed Buffer and Wildlife Habitat /Selection Harvest
332 / 60	8	Bottomland Hdwds 31-50 yrs.	?	100 Yellow Poplar	8.9	Let Grow/ Watershed Buffer and Wildlife Habitat
333 / 60	8	Bottomland Hdwds 31-50 Yrs.	?	100+ YellowPoplar	22.5	Watershed Buffer and Wildlife Habitat /Selection Harvest
334 / 100	9	Bottomland Hdwds 51 years +	?	80-85 LoblollyPine	5.4	Watershed Buffer and Wildlife Habitat /Selection Harvest
401 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 LoblollyPine	5.5	Check Growth for Harvest
402 / 40	5	Pine(L,S,V) >41 years	?	80-85 LoblollyPine	3.0	Check Growth for Harvest
403 / 40	18	Pine (L,S,V) <10 Years	2003	80-85 LoblollyPine	3.2	Let Grow / Check for Release
Totals					**798**	

Compartment B-1



Block B-1

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
4 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	12.0	Check Growth for Harvest
5 / 120	11	Upland Hdwds 11-30 Years	?	70-75 Red Oak	5.4	Check Growth/ No Treatment Needed Next 10 Years
8 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	9.2	Check Growth for Thinning/ Prescribe Burn
9 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	49.3	Check Growth for Thinning/ Prescribe Burn
10 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	2.1	Check Stocking and Reforest Where Needed
11 / 40	16	Pine-Hdwd 31-50 Years	?	80-85 Loblolly Pine	5.5	Check Growth for Harvest
12 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	10.2	Check Growth for Harvest
13 / 120	12	Upland Hdwds 31-50 Years	?	70-75 Red Oak	90.0	Check Grwoth for TSI / Wildlife Habitat
15 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	6.4	Check Growth for Harvest
16 / 60	23	Old Fields/Pastures	?	N/A	10.1	Check Stocking and Reforest Where Needed
17 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	3.7	Check Stocking and Reforest Where Needed
18 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	16.2	Check Stocking and Reforest Where Needed
19 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	22.9	Check Stocking and Reforest Where Needed
20 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	27.6	Check Stocking and Reforest Where Needed
21 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	47.2	Check Stocking and Reforest Where Needed
22 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	13.7	Check Growth for Thinning/ Prescribe Burn

Block B-1

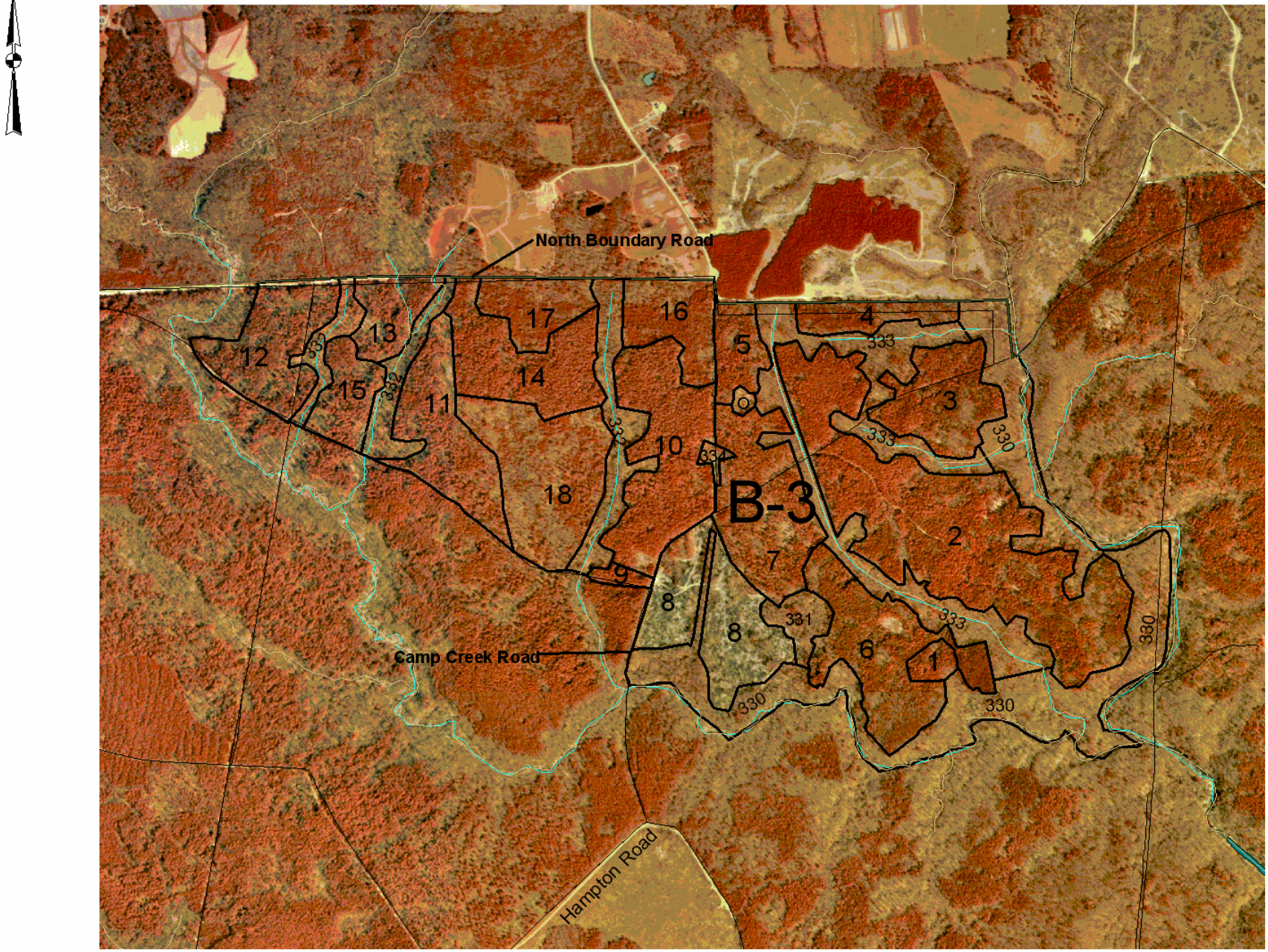
Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
23 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	12.9	Check Stocking and Reforest Where Needed
24 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	23.6	Check Growth for Harvest
25 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	2.5	Check Growth for Thinning/ Prescribe Burn
26 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	7.4	Check Growth for Thinning/ Prescribe Burn
27 / 120	12	Upland Hdwds 31-50 Years	?	75-75 Red Oak	16.4	Check Grwoth for TSI / Wildlife Habitat
61 / 120	12	Upland Hdwds 31-50 Years	?	70-75 Red Oak	57.1	Check Grwoth for TSI / Wildlife Habitat
62 / 120	12	Upland Hdwds 31-50 Years	?	70-75 Red Oak	2.3	Check Grwoth for TSI / Wildlife Habitat
71 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	6.1	Check Growth for Harvest
72 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	13.3	Check Growth for Harvest
331 / 100	8	Bottomland Hardwoods 31-50 Years	?	85-90 Yellow Poplar	12.5	Check Growth, Thin if Possible
332 / 100	8	Bottomland Hardwoods 31-50 Years	?	85-90 Yellow Poplar	15.3	Check Growth, Thin, if Possible
333 / 100	9	Bottomland Hardwoods 51 years +	?	85-90 Loblolly Pine	58.8	Watershed Buffer / Wildlife Habitat, Check Growth Selection Harvest
334 / 100	8	Bottomland Hardwoods 31-50 Years	?	85-90 Yellow Poplar	48.1	Watershed Buffer / Wildlife Habitat, Check Growth Selection Harvest
Totals					**512.4**	

Holt Lake
39
41
18
N

Block B-2

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 60	3	Pine (L,S,V) 21-30 Years	?	75-80 Loblolly Pine	18.9	Check Growth for Thinning/ Prescribe Burn
2 / 60	3	Pine(L,S,V) 21-30 years	?	75-80 Loblolly Pine	2.4	Check Growth for Thinning/ Prescribe Burn
3 / 60	4/5	Pine (L,S,V) 31-40 Years / Pine (L,S,V) >41 Years	?	75-85 Loblolly Pine	37.3	Check Growth for Thinning/ Prescribe Burn
4 / 40	4/5	Pine(L,S,V) 31-49 Years/Pine (L,S,V) >41 Years	?	85-90 Loblolly Pine	6.2	Check Growth for Thinning/ Prescribe Burn
5 / 60	16	Pine-Hdwd 31-50 Years	?	75-80 Loblolly Pine	23.9	Check Growth for Harvest
6 / 60	21	Loblolly Pine Plantation	?	75-85 Loblolly Pine	11.5	Check Growth for Thinning/ Prescribe Burn
7 / 40	18	Pine Plantation(L)<10 years	2000	85 Loblolly	5.7	Let grow
8 / 60	21	Pine Plantation 31-40 years	?	75-85 Loblolly Pine	8.5	Check Growth for Thinning/ Prescribe Burn
9 / 60	5	Pine(L,S) >41 Years	?	75-85 Loblolly Pine	4.6	Harvest (Virginia Pine)
10 / 60	16/17	Pine-Hdwd(31-50 years)/(51 Years +	?	75 Loblolly Pine	133	Selection Harvest, Wildlife Habitat/Watershed Buffer
11 / 60	15	Pine-Hdwd 11-30 years	?	80 Loblolly Pine	10.9	Let grow
12 / 60	5	Pine(L,S,V)> 41 years	?	75-85 Loblolly Pine	20.2	Check Growth for Harvest
13 / 60	4	Pine(L,S,) 31-40 years	?	80 Loblolly Pine	15.2	Check Growth for Thinning/ Prescribe Burn
14 / 120	12	Upland Hdwds 31-50 years	?	70-75 Loblolly Pine	3.6	Watershed Buffer/Wildlife Habitat
15 / 60	18	Pine Plantation <10 years	2003	75-80 Loblolly Pine	1.7	TSI release Longleaf, Let Grow
16 / 60	18	Pine Plantation <10 years	1999	75-80 Loblolly Pine	9.5	Let Grow
17 / 60	18	Loblolly Pine Plantation<10 Yrs	2001	80 Loblolly Pine	3.9	Check growth, Let Grow
18 / 60	18	Loblolly Pine Plantation<10 Yrs	2001	80 Loblolly Pine	3.2	Check growth, Let Grow
19 / 60	18	Loblolly Pine Plantation	2001	75-85 Loblolly Pine	3.7	Check growth, Let Grow
20 / 40	18	Pine Plantation(L)<10 Yrs.	1998	80-85 Loblolly Pine	1.5	Check growth, Let Grow
331 / 100	9	Bottomland Hardwoods 51 yrs+	?	85-90 YellowPoplar	12.5	Selection Harvest , Watershed Buffer/Wildlife Habitat
332 / 60	9	Bottomland Hardwoods 51 yrs+	?	90-100Yellow Poplar	91.7	Selection Harvest , Watershed Buffer/Wildlife Habitat
Totals					**418.2**	

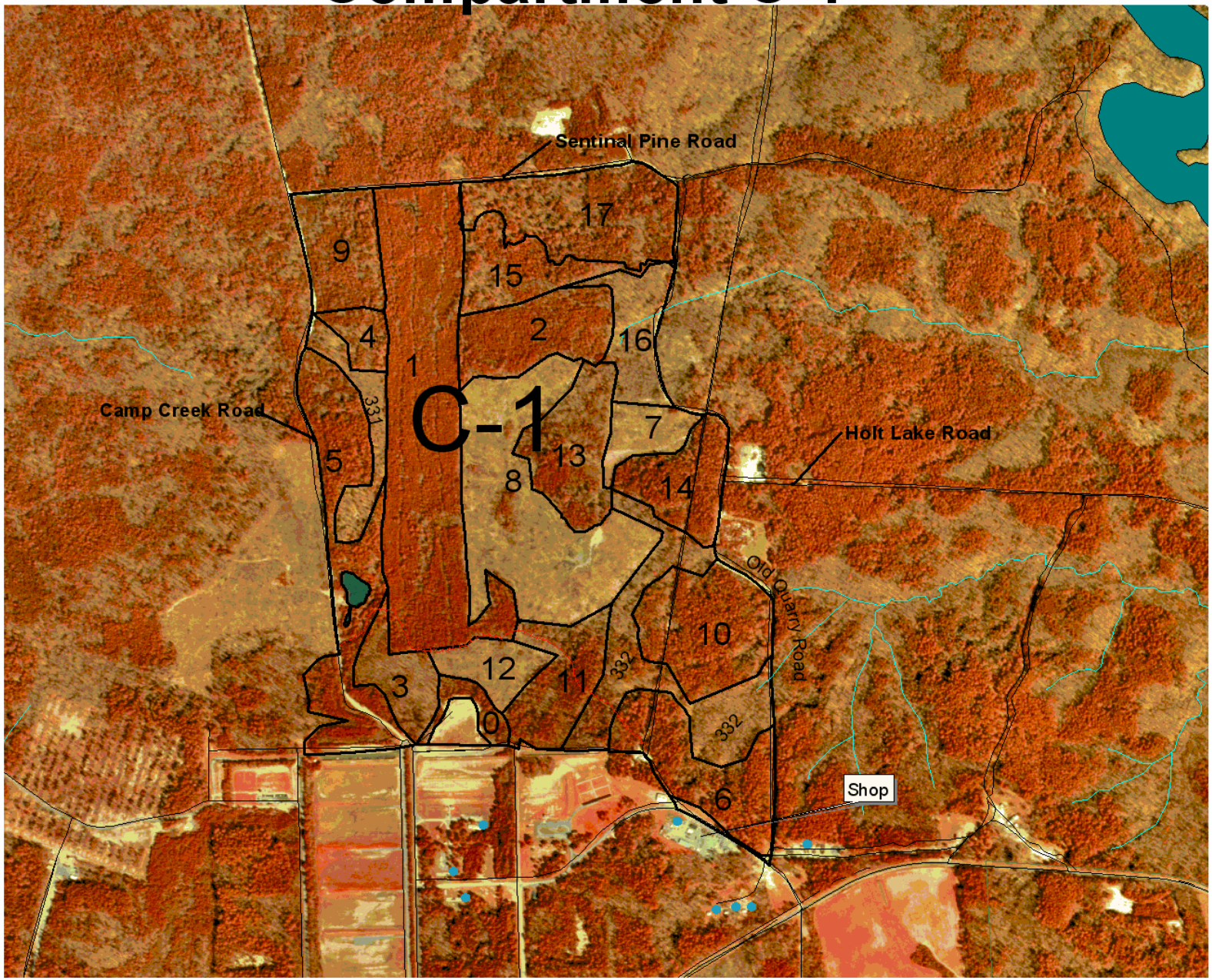
Compartment B-3



Block B-3

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
0	23	Fields/Pastures/ArchSite	?	80 Loblolly Pine	1.0	Protect
1 / 60	5	Pine (L<S<V) >41 Years	1960	80 Loblolly Pine	3.2	Check Growth for Harvest
2 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	85.3	Check Growth / Prescribe Burn
3 / 60	5	Pine (L,S,V) 21-30 Years	?	75-80 Loblolly Pine	20.2	Check Growth for Harvest
4 / 60	5	Pine (L,S,V) >41 Years	?	75-80 Loblolly Pine	8.9	Check Growth for Harvest
5 / 60	5	Pine (L,S,V) >41 Years	?	75-80 Loblolly Pine	8.8	Check Growth for Harvest
6 / 60	18	Loblolly Pine Plantation<10	2000	75-80 Loblolly Pine	33.1	Check Growth for release
7 / 60	4	Pine(L,S,V) 31-40 years	?	75-85 Loblolly Pine	30.2	Check Growth / Prescribe Burn
8 / 40	18	Loblolly Pine Plantation<10	1998	80-85 Loblolly Pine	30.2	Check Growth for release
9 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	2.1	Check Growth for Thinning
10 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	34.1	Check Growth for Thinning/ Prescribe Burn
11 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	24.7	Check Growth for Thinning/ Prescribe Burn
12 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	23.2	Check Growth for Thinning/ Prescribe Burn
13 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	10.8	Check Growth for Thinning/ Prescribe Burn
14 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	25.4	Check Growth for Thinning/ Prescribe Burn
15 / 60	16	Pine-Hdwd(31-50 years)	?	75-85 Loblolly Pine	10.9	Check Growth for Harvest
16 / 60	15	Pine-Hdwd 11-30 Years	?	75-85 Loblolly Pine	15.1	Check Growth, Let Grow/Prescribe Burn
17 / 60	15	Pine-Hdwd 11-30 Years	?	75-85 Loblolly Pine	12.4	Check Growth, Let Grow/Prescribe Burn
18 / 60	15	Pine-Hdwd 11-30 Years	?	75-85 Loblolly Pine	34.0	Check Growth, Let Grow/Prescribe Burn
330 / 100	9	Bottomland Hardwoods 51 years +	?	90-100 Yellow Poplar	82.1	Selection Harvest , Watershed Buffer/Wildlife Habitat
331 / 100	9	Bottomland Hardwoods 51 years+	?	90-100 Yellow Poplar	6.1	Selection Harvest , Watershed Buffer/Wildlife Habitat
332 / 100	9	Bottomland Hardwoods 51 years+	?	90-100 Yellow Poplar	31.0	Selection Harvest , Watershed Buffer/Wildlife Habitat
333 / 60	9	Bottomland Hardwoods 51 years+	?	90-95 Yellow Poplar	46.4	Selection Harvest , Watershed Buffer/Wildlife Habitat
334 / 60	9	Bottomland Hardwoods 51 Years +	?	90-95 Yellow Poplar	1.4	Selection Harvest , Watershed Buffer/Wildlife Habitat
Totals					**580**	

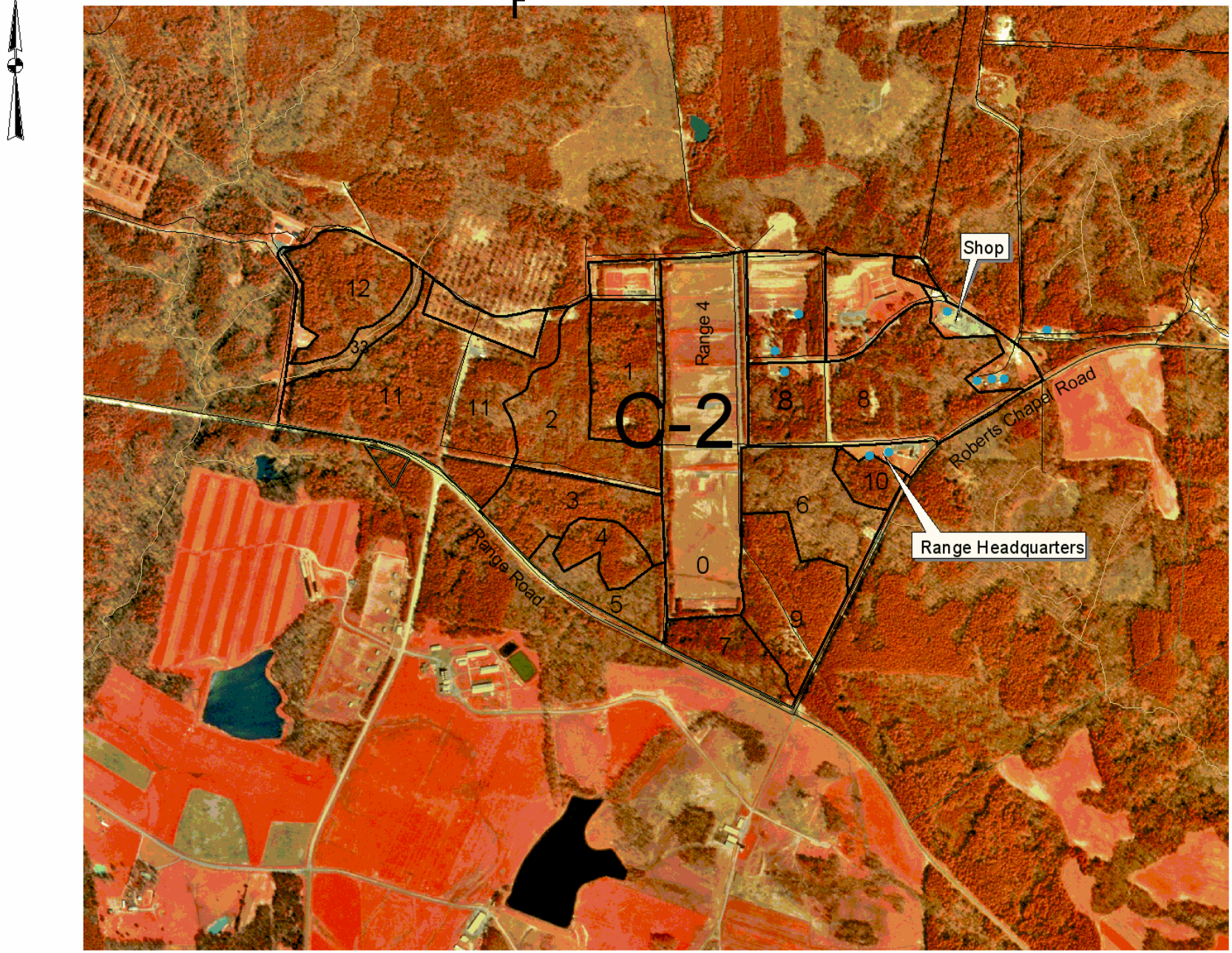
Compartment C-1



Block C-1

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
0	5	Pine(L,S,V)> 41 Years	?	75-80 Loblolly Pine	2.7	Leave as Berm for Pistol Range
1 / 60	20	Pine Plantation(L) 21-30 Years	?	75-80 Loblolly Pine	42.6	Check Growth, Prescribe Burn
2 / 60	19	Pine Plantation (L)11-20 Years	?	75-80 Loblolly Pine	11.8	Check Growth for Thinning, Prescribe Burn
3 / 100	9	Upland Hdwds 51 Years +	?	85-90 Yellow Poplar	6.5	Check Growth for Harvest
4 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	3.3	Check Growth for Harvest
5 / 60	4	Pine(L,S,V) 31-40 years	?	75-80 Loblolly Pine	21.7	Check Growth for Thinning, Prescribe Burn
6 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	14.1	Check Growth for Thinning, Prescribe Burn
7 / 60	19	Pine Plantation(L)10-20 years	1996	75-80 Loblolly Pine	4.9	Check Growth, Let Grow
8 / 60	19	Pine Plantation(L)10-20 years	1996	75-80 Loblolly Pine	30.9	Check Growth, Let Grow
9 / 60	1	Pine (L,S,V) <10 Years	2001	75-85 Loblolly Pine	10.1	Check Growth, Let Grow
10 / 40	16	Pine-Hdwd 31-50 Years	?	80-85 Loblolly Pine	15.6	Check Growth, Let Grow, Prescribe Burn
11 / 60	5	Pine(L,S,V) >41 Years	?	75-80 Loblolly Pine	10.0	Check Growth, Let Grow, Prescribe Burn
12 / 60	19	Pine Plantation(L)10-20 years	1996	75-80 Loblolly Pine	5.4	Check Growth, Let Grow
13 / 60	15	Pine-Hdwd(11-30 years)	?	75-80 Loblolly Pine	11.4	Check Growth for Thinning, Prescribe Burn
14 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	9.4	Check Growth for Thinning, Prescribe Burn
15 / 40	17	Pine-Hdwd 51 years +	?	80-85 Loblolly Pine	9.3	Check Growth for Harvest
16 / 60	17	Pine-Hdwd 51 years+	?	75-85 Loblolly Pine	8.1	Check Growth for Harvest
17 / 40	18	Pine Plantation(L)<10 years	2003	75-85 Loblolly Pine	17.9	Check Growth for Release
331 / 100	9	Bottomland Hardwoods 51 Years +	?	85-90 Yellow Poplar	6.2	Selective Harvests and Wildlife Habitat
332 / 100	8	Bottomland Hardwoods 31-50 years	?	80-90 Yellow Poplar	17.8	Watershed Buffer & Wildlife Habitat, Select Harvest
Totals					**310**	

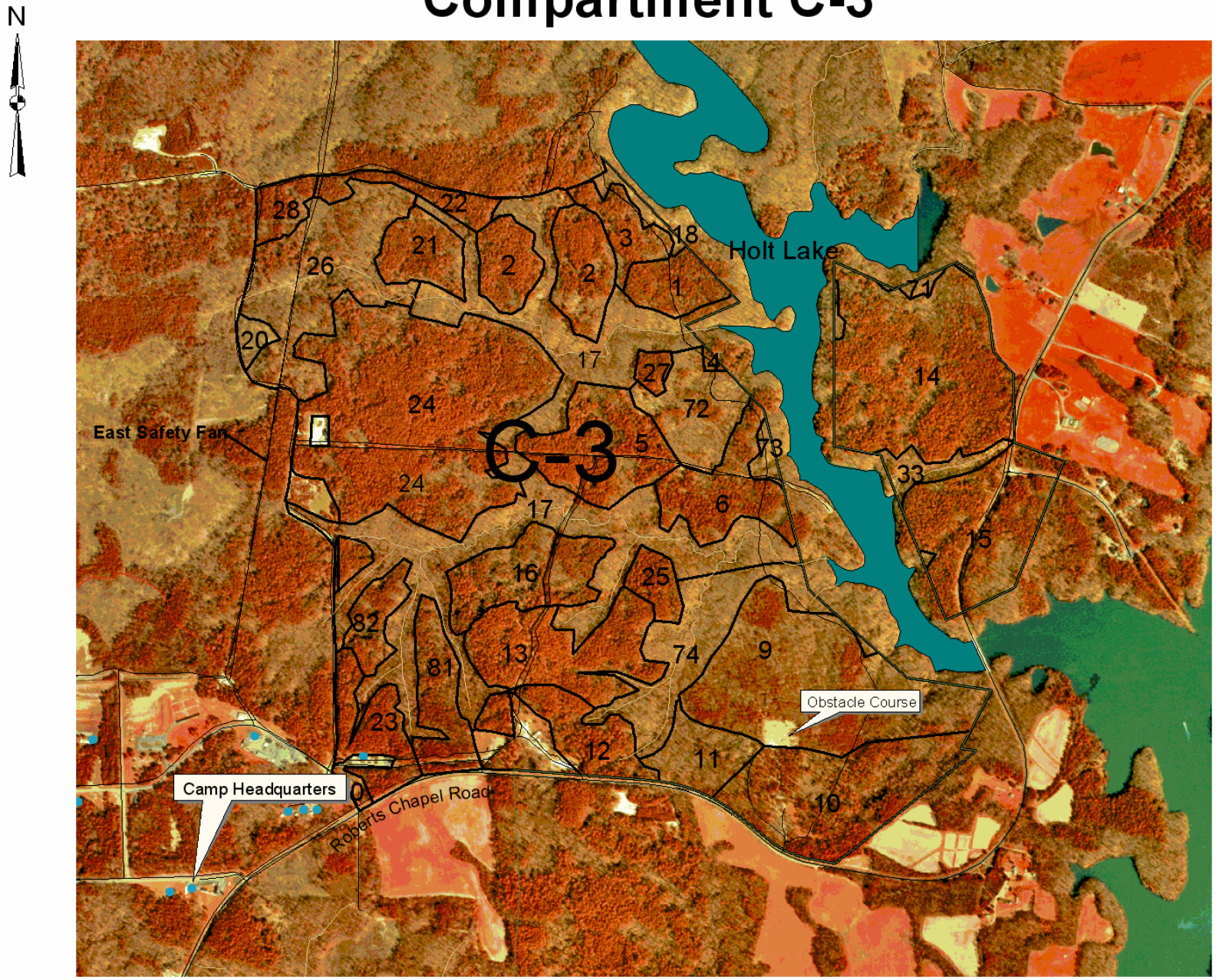
Compartment C-2



Block C-2

Stand #/ Rotation	Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 606	5	Pine (L,S,V) >41 Years	?	75-80 Loblolly Pine	18.8	Check Growth for Harvest
2 / 40	2	Pine (L,S,V) 11-20 Years	?	80-85 Loblolly Pine	23.3	Check Growth for Thinning, Prescribe Burn
3 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	17.9	Check Growth, Prescribe Burn
4 / 40	4	Pine(L,S,V) 31-40 Years	?	80-85 Loblolly Pine	7.6	Check Growth, Prescribe Burn
5 / 120	13	Upland Hdwds 51 Years +	?	70-75 Loblolly Pine	10.3	Wildlife Habitat
6 / 40	9/13	Upland &Bottomland Hardwoods 51 years+	?	85-90 Loblolly Pine	20.5	Wildlife Habitat/ Watershed Buffer, Select Harvest
7 / 60	5	Pine(L,S,V) 41 Years +	?	75-80 Loblolly Pine	10.9	Check Growth for Thinning and Prescribe Burn
8 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	43.4	Check Growth for Selection Harvest
9 / 40	4	Pine(L,S,V) 41 Year +	?	80-85 Loblolly Pine	21.8	Check Growth, Prescribe Burn
10 / 60	5	Pine(L,S,V) 41 years +	?	75-80 Loblolly Pine	5.0	Thin for Aesthetics near Office
11 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	52.3	Check Growth , Prescribe Burn
12 / 40	5	Pine(L,S,V) 41 years +	?	80-85 Loblolly Pine	19.2	Check Growth for Thinning, Prescribe Burn
13 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	1.5	Check Growth, Let Grow
33 / 100	9	Bottomland Hardwoods 51 years +	?	80-85 Loblolly Pine	5.0	Watershed Buffer and Wildlife Habitat
Totals					**260.4**	

Compartment C-3

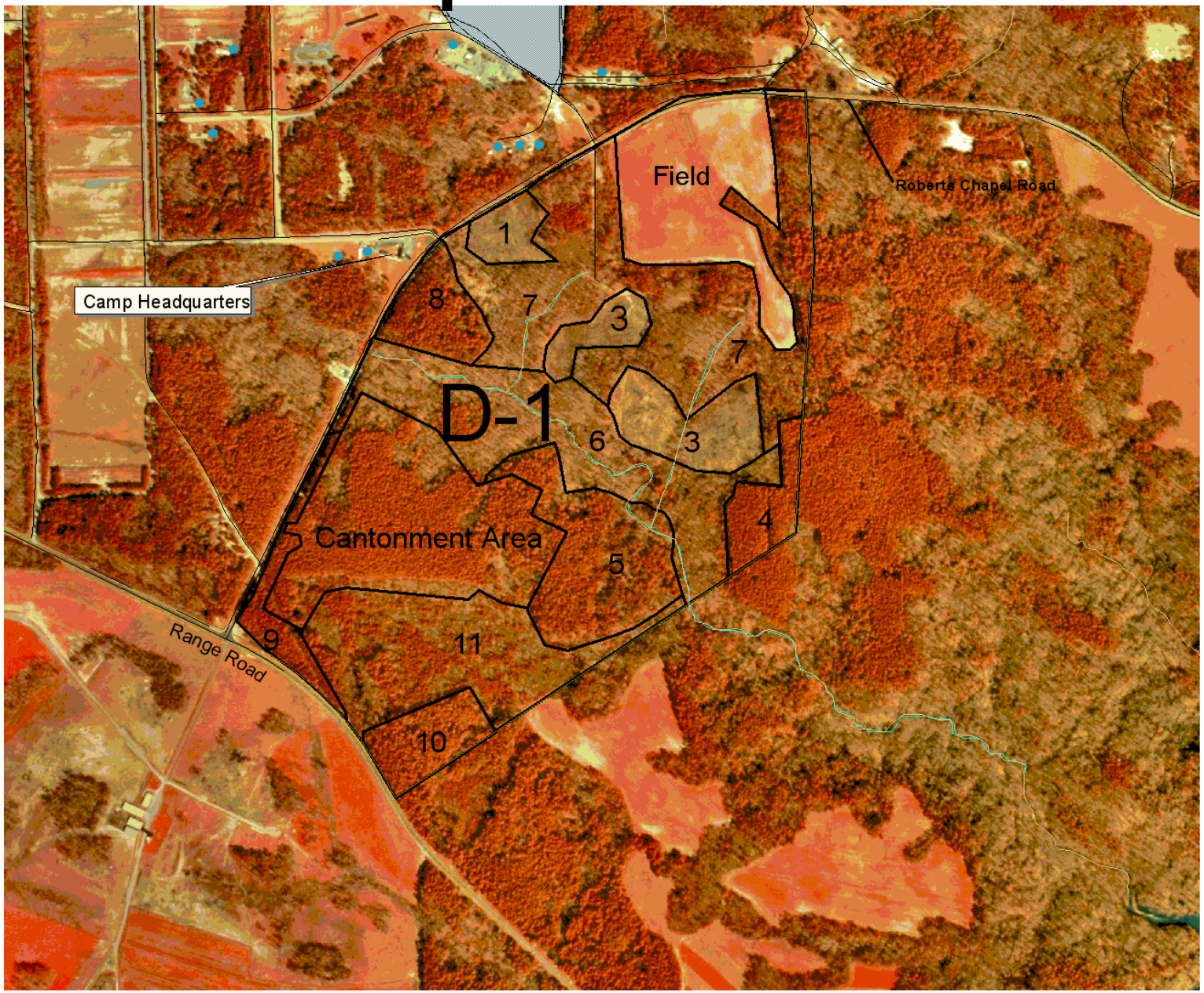


Block C-3

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 60	18	Pine Plantation(L)<10 years	1999	75-85 Loblolly Pine	7.2	Check Growth, Let Grow
2 / 60	21	Pine Plantation 31-40 Years		75-80 Loblolly Pine	17.4	Check Growth, Let Grow
3 / 60	4	Pine (L,S,V) 31-40 Years		75-85 Loblolly Pine	6.8	Check Growth, Prescribe Burn
4 / 60	5	Pine (L,S,V) 41 Years +		75-85 Loblolly Pine	0.5	Check Growth for Harvest
5 / 60	5	Pine(L) 41 Years +		80 Loblolly	17.9	Check Growth, Prescribe Burn
6 / 60	16	Pine-Hdwd 31-50 years		75-80 Loblolly	14.1	Check Growth for Selection Harvest of Pine
9 / 60	15	Pine-Hdwd 11-30 years		75-80 Loblolly Pine	44.5	Harvest Virginia Pine, Crop Tree Release
10 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	29.4	Check Growth for Harvest
11 / 120	13	Upland Hdwds 51 years +		70-75 Loblolly Pine	8.7	Wildlife Habitat
12 / 60	5	Pine(L,S,V) 41 years +		75-80 Loblolly Pine	11.5	Check Growth, Prescribe Burn
13 / 60	21	Pine Plantation 31-40 years		75-80 Loblolly Pine	21.5	Check Growth, Prescribe Burn
14 / 60	5	Pine (L,S,V) 41 Years +		75-85 Loblolly Pine	44.0	Check Growth for Harvest
15 / 60	1	Pine (L,S,V) <10 Years	2003	75-85 Loblolly Pine	25.5	Check Natural Estab, Harvest Seedtrees
16 / 40	18	Loblolly Pine Plantation< 10 Yrs.	2000	80-85 Loblolly Pine	15.8	Check Growth,Let Grow
17 / 40	9/13	Upland & Bottomland Hdwds 51+		90100YellowPoplar	81.0	Wildlife Habitat/ Watershed Buffer, Select Harvest
18 / 40	9/13	Upland & Bottomland Hdwds 51 +		90-100 Yellow Poplar	2.1	Watershed Buffer-Protect
20 / 60	18	Pine Plantation < 10 Years	1996	75-80 Loblolly Pine	2.0	Check Growth, Let Grow
21 / 60	18	Pine Plantation(L)<10 years	1999	75-80 Loblolly Pine	8.4	Check Growth, Let Grow
22 / 60	5	Pine(L,S) 41 years+		80 Loblolly Pine	5.7	Check Growth for Harvest
23 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	10.7	Check Growth for Harvest
24 / 60	21	Pine(L,S,V) 41 Years +		75-80 Loblolly Pine	67.2	Check Growth, Prescribe Burn
25 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	4.3	Check Growth for Harvest
26 / 60	17	Pine-Hdwd 51 Years +		75-85 Loblolly Pine	30.0	Check Growth for Harvest
27 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	1.9	Check Growth for Harvest
28 / 60	18	Pine Plantation < 10 years	1999	75-80 Loblolly Pine	4.5	Let Grow
33 / 100	9	Bottomland Hardwoods 51 Yrs.+		90-100 Yellow Poplar	4.4	Wildlife Habitat/Watershed Buffer, Selection Harvest
71 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	1.7	Wildlife Habitat/Watershed Buffer
72 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	13.0	Check for Harvest and Watershed Buffer
73 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	1.7	Wildlife Habitat/Watershed Buffer
74 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	20.1	Wildlife Habitat/Watershed Buffer, Selection Harvest

81 / 60	18	Pine Plantation(L)<10 years	1999	75-80 Loblolly Pine	11.0	Check Growth, Let Grow
82 / 60	18	Pine Plantation(L)<10 years	1999	75-80 Loblolly Pine	7.9	Check Growth for Release, Let Grow
Totals					**542.6**	

Compartment D-1



Block D-1

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 60	18	Pine Plantation(L) <10 years	1998	75-80 loblolly Pine	3.4	Check Growth, Let Grow
3 / 40	18	Pine Plantation (L)<10 years	1998	80-85 Loblolly Pine	12.5	Check Growth, Let Grow
4 / 40	22	Pine Plantation(L)>40 years	?	85 Loblolly Pine	5.3	Check Growth for Thinning
5 / 60	5	Pine(L,S,V)41 Years +	?	75-80 Loblolly Pine	16.8	Check Growth for Thinning or Seed Tree Harvest
6 / 60	9/13	Upland & Bottomland Hardwoods 51 Years +	?	85-90 Yellow Poplar	27.8	Wildlife Habitat/ Watershed Buffer, Selection Harvest
7 / 120	13	Upland Hdwds 51 years +	?	75-80 Loblolly Pine	43.7	Check for Harvest
8 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	6.7	Check for Harvest
9 / 60	4	Pine(L.,S,V) 31-40 years	?	75-80 Loblolly Pine	5	Aesthetic Buffer, Let Grow
10 / 40	5	Pine(L,S,V) 41 Years +	?	80-85 Loblolly Pine	6.4	Check Growth for Thinning, Prescribe Burn
11 / 40	16	Pine-Hdwd(31-50 Years)	?	85-90 Loblolly Pine	24.2	Wildlife Habitat, Selection Harvest
Totals					**151.7**	

Table 1 Areas Prescribed Burned (understory) since March 2001

Block	Stand #	Action	Acres
A3	102	Understory Burn Winter 2002	38.6
A3	29	Understory Burn Winter 2002	6
A3	101	Understory Burn Winter 2002	88
A1	10	Understory Burn Winter 2002	42
A1	9	Understory Burn Winter 2002	76
A1	7	Understory Burn Winter 2002	75
A1	8	Understory Burn Winter 2002	7
A1	13	Understory Burn Winter 2002	10.4
A1	4	Understory Burn Winter 2004	32.6
A1	10	Understory Burn Winter 2004	80
A1	14	Understory Burn Winter 2004	41
A1	12	Understory Burn Winter 2004	46
A1	N.Range	Understory Burn Winter 2004	34
A1	1	Understory Burn Winter 2004	50
A1	11	Understory Burn Winter 2004	61
A1	13	Understory Burn Winter 2004	5
B3	12	Understory Burn Winter 2004	20
C1	4	Understory Burn Winter 2004	3.3
C1	331	Understory Burn Winter 2004	6

C1	5	Understory Burn Winter 2004	18
C1	3	Understory Burn Winter 2004	6.5
C1	12	Understory Burn Winter 2004	5.4
Block	**Stand#**	**Action**	**Acres**
C1	11	Understory Burn Winter 2004	10
C1	332	Understory Burn Winter 2004	8
C1	6	Understory Burn Winter 2004	4
C1	10	Understory Burn Winter 2004	5
C1	8	Understory Burn Winter 2004	30
C1	14	Understory Burn Winter 2004	6
C1	7	Understory Burn Winter 2004	5
C1	13	Understory Burn Winter 2004	11.4
C1	1	Understory Burn Winter 2004	43
C1	2	Understory Burn Winter 2004	11.8
C1	16	Understory Burn Winter 2004	8
C1	15	Understory Burn Winter 2004	9.3
Total			**903.3**

Table 2. Areas Thinned Since March 2001

Block	Stand #	Action	Acres
C1	1	First Row Thinning 2001	42.6
C1	5	First Row Thinning 2001	21.7
C3	12	Shelterwood Thinning 2001	11.8
A3	15	Selection Thinning 2002	40.7
A3	301	Shelterwood Thinning 2002	2.8
A3	302	Shelterwood Thinning 2002	6.1
A3	303	Shelterwood Thinning 2002	3.6
A2	13	Shelterwood Thinning 2003	2.7
A2	1	Shelterwood Thinning 2003	14.5
C2	9	Shelterwood Thinning 2003	21.7
C3	15	Seedtree Thinning 2003	25.5
Totals			**193.7**

Table 3. Stands Final Harvest and Planted or Cleared Since March 2001

Block	Stand#	Description	Action	Acres	Date
A-1	1	80-85 Loblolly Pine	Planted Loblolly Pine Elite Family Mix	67	2005
A-1	11/12	Clear	Final harvest and cleared for camp use	34	2005
A-1	2	85 Loblolly Pine/Hardwood	Natural Regeneration Loblolly/Hardwoods	16.5	2003
A-2	11	85 Loblolly Pine/Hardwood	Natural Regeneration Loblolly/Hardwoods	9.4	2003
A-3	3	80-85 Loblolly Pine	Planted Loblolly Pine 2nd Gen	17.7	2003
A-3	403	80-85 Loblolly Pine	Planted Loblolly Pine 2nd Gen	3.1	2003
B-2	15	Longleaf Pine	Planted to Longleaf Pine Cont.	1.7	2003
C-1	9	Loblolly Pine	Final Harvest and Regenerated Naturally	10.1	2001
C-1	17	80-85 Loblolly Pine	Planted to Loblolly Pine 2nd Gen	17.9	2003
D-1	9/11	Clear	Final harvest and cleared for camp use	32	2005

Total Acres: Planted 107.4
Natural Regeneration 36
Cleared for camp use 66

Appendix

FORESTRY *Leaflets*

North Carolina Division of Forest Resources

FM-34 **APRIL 2004**

A Guide to Implementing Neuse River Basin and Tar-Pamlico River Basin Riparian Buffer Rules for Forest Management Activities

Additional rule information is available on the 'Water Quality' portion of the N.C. Division of Forest Resources Web site www.dfr.state.nc.us and the Non-Point Source (NPS) Planning Unit portion of the N.C. Division of Water Quality Web site http://h2o.enr.state.nc.us/nps/ or by contacting staff from either agency, or DENR Regional offices.

WHERE TO APPLY THESE RIVER BASIN RIPARIAN BUFFER RULES

✓ **The Neuse River Basin and Tar-Pamlico River Basin "Riparian Buffer Rules" apply to perennial and intermittent streams, ponds, lakes, and estuaries located in either river basin, and which are approximately shown on the most recent version of either an NRCS soil survey map or a USGS 1:24000 (7½ minute) quad topographic map.**

✘ **The Neuse River or Tar-Pamlico River Riparian Buffer Rules do not apply to the following waterbodies:**

- ✘ Any "surface waters" that do not appear on either of the above named soils or topographic maps
- ✘ Any ephemeral streams (sometimes referred to as saddles, swales, gullies, or stormwater channels)
- ✘ Man-made ditches or canals that are not intended for water navigation or boat access
- ✘ Man-made ponds and lakes that are located outside natural drainage ways

Seek advice from a professional trained in stream identification when determining 'buffer rule' applicability. Modified streams may look like ditches, but still require implementing these river basin riparian buffer rules. This Leaflet is not intended to provide legal advice or final interpretation of the Neuse River or Tar-Pamlico River riparian buffer rules.
On waterbodies where the river basin riparian buffer rules do not apply, ***an SMZ is still required*** to comply with the Forest Practices Guidelines Related to Water Quality (FPGs).

REQUIRED RIVER BASIN RIPARIAN BUFFER WIDTH and ZONES

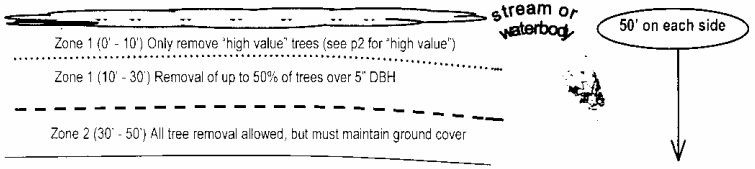
The buffer is made up of two "zones" that together equal a 50-foot wide strip of land:

Zone 1 - For streams: Zone 1 begins at the most landward limit of the top of bank, or the rooted vegetation, and extends towards the land for 30 feet on all sides.

Zone 1 - For ponds, lakes, reservoirs: Zone 1 begins at the most landward limit of the normal water level, or the rooted vegetation, and extends towards the land for 30 feet.

Zone 1 - For the 20 Coastal NC counties: Zone 1 begins at the most landward limit of the following options, whichever is more restrictive *(see a,b,c below)* and extends toward the land for 30 feet:
(a) the normal high water level, or **(b)** the normal water level, or
(c) the landward limit of coastal wetlands as defined by NC Div. of Coastal Management

Zone 2 - For all sites: Zone 2 begins at the outer edge of Zone 1 and extends outward 20 feet and shall consist of a stable, vegetated area. Ground cover must allow water infiltration and diffusion.



TIMBER HARVESTING IN THE RIPARIAN BUFFER

Selective timber harvesting is only allowed to occur in the 50 foot buffer if:

1) A forest management plan for the property is written or approved by a Registered Forester, **or**
2) The property is enrolled in that county's present-use valuation program for forestry use.

All of Zone 1 (total of 30 feet with 'Inner' & 'Outer' areas defined below)

Allowed Tree removal, provided that disturbance to soil and residual vegetation is minimized.

Allowed with Restrictions **Tracked or wheeled vehicles are not permitted except at stream crossings designed, constructed, and maintained in accordance with FPG .0203**

Not Allowed Soil disturbing site preparation activities

Zone 1 - Inner 10 feet (land immediately adjacent to the stream or waterbody)

Allowed Removal of individual "High Value" trees

Allowed with Restrictions
- "High Value" Pine trees are defined as any tree with a DBH of 14" and greater **or** a stump diameter of 18" and greater
- "High Value" Hardwood and Wetland trees are defined as any tree with a DBH of 16" and greater, **or** a stump diameter 24" and greater

Not Allowed **Removal of any tree with exposed primary roots visible in the streambank.**
- It is recommended to mark/flag residual "leave" trees to make sure they are protected

Zone 1 - Outer 20 feet (land adjoining the inner 10 feet area)

Allowed
- Limited amount of timber removal
- Remaining trees left standing should be as evenly spaced as possible.

Allowed with Restrictions Harvest of no more than 50% of the trees over 5" DBH
- Re-entry for natural forest is allowed every 15 years.
- Re-entry for plantation forest is allowed every 5 years.

Not Allowed Removal of trees 5" DBH and smaller

All of Zone 2 (outermost 20 feet of the entire riparian buffer)

There are no tree harvesting or site prep restrictions in Zone 2, so long as there is sufficient ground cover maintained to provide for diffusion and infiltration of water runoff. ***All activities must still comply with the N.C. FPGs.***

OTHER FORESTRY ACTIVITIES IN THE RIPARIAN BUFFER

Forestry Activities Allowed in the Entire 50-foot Riparian Buffer

- \ Individual trees may be treated to maintain or improve their health, form, or vigor.
- \ Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation. These practices must be approved by the Division of Forest Resources for a specific site. The Division of Forest Resources must notify the Division of Water Quality of all approvals.
- \ Removal of individual trees that are in danger of causing damage to structures or human life.

Forestry Activities Allowed with Restrictions, in the Entire 50-foot Riparian Buffer

- ✓ Access roads and skid trails only allowed for temporary and permanent stream crossings, which are established in accordance with FPG .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.
- ✓ Timber felling shall be directed away from the stream or waterbody.
- ✓ Skidding shall be directed away from the stream or waterbody and shall be done in a manner that minimizes soil disturbance and prevents rutting or the creation of channels.
- ✓ Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the buffer shall be allowed provided that soil disturbance is minimized. Planting shall consist primarily of native species.
- ✓ Application of fertilizer only allowed as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stands shall be conducted so that the chemicals are not applied directly to or allowed to drift into buffer.

Forestry Activities Not Allowed in the 50-foot Riparian Buffer

- ✘ NO logging decks or sawmill sites placed in the buffer.
- ✘ NO high intensity prescribed burns.

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APPENDIX C

RECORD OF ENVIRONMENTAL CONSIDERATION

(REC)

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Enviro tracking #	ARNG ENVIRONMENTAL CHECKLIST	State ARNG
		NC

PART – A PROJECT INFORMATION

1. Project name: Integrated Natural Resource Management Plan for Camp Butner Training Site

2. Project number: (MILCON if applicable) | 3. Date prepared: 05 April 2019

4. Description and location of the project/proposed action.

a. Location (Include a detailed map if applicable):

Camp Butner, NC

b. Description:

Implementation of the NC Natural Resource Management Plan for Camp Butner Training Site

c. The proposed action will involve (check all that apply):

☐ Training activities/areas ☐ Construction ☒ Natural resource management
☐ Maintenance/repair/rehabilitation ☐ Real estate action ☐ Environmental plans/surveys
☐ Innovative readiness training project
☐ Other (Explain):

d. Project size in acres: *(if applicable)* Acres of proposed new surface disturbance: *(if applicable)*

5. Start date of proposed action (dd-mmm-yy): FY 2019 *NOTE: this must be a future date.*

6. Programmed fiscal year: FY 19

7. End date (if applicable): FY 24

PART B – DECISION ANALYSIS GUIDE

To use a categorical exclusion, the project must satisfy the following three screening criteria: no segmentation, no exceptional circumstances and a qualifying categorical exclusion that covers the project. The following decision tree will guide the application and documentation of these three screening criteria. The criteria were extracted from 32 CFR Section 651.29 and represent the most common screening conditions experienced in the ARNG. NOTE: Each question in Part B must have an applicable block checked for concurrence with REC.

1. Is this action segmented (the scope of the action must include the consideration of connected, cumulative, and similar actions)? ☐ Yes (go to #30) ☒ No (go to #2)

2. Is there reasonable likelihood of significant environmental effects (direct, indirect, and cumulative)? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
☐ Yes (go to #30) ☒ No (go to #3)

3. Is there a reasonable likelihood of significant effects on public health, safety or the environment? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
☐ Yes (go to #30) ☒ No (go to #4)

4. Is there an imposition of uncertain or unique environmental risks? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. ☐ Yes (go to #30) ☒ No (go to #5)

5. Is the project of greater scope or size than is normal for the category of action? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
☐ Yes (go to #30) ☒ No (go to #6)

6. Does the project introduce or employ unproven technology? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. ☐ Yes (go to #30) ☒ No (go to #7)

7. Will there be reportable releases of hazardous or toxic substances as specified in 40 CFR Part 302? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
☐ Yes (go to #30) ☒ No (go to #8)

8. If proposed action is in a non-attainment or maintenance area, will air emissions exceed de minimus levels or otherwise require a formal Clean Air Act (CAA) conformity determination? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
☐ Yes (go to #30) ☐ No (go to #9) ☒ N/A (go to #9)

9. Will the project have effects on the quality of the environment that are likely to be highly controversial? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
☐ Yes (go to #30) ☒ No (go to #10)

10. Will the project establish a precedent (or make decisions in principle) for future or subsequent actions that are reasonably likely to have future significant effects? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. ☐ Yes (go to #30) ☒ No (go to #11)

11. Has federal funding been secured for the Innovative Readiness Training (IRT) project?
☒ Not applicable (go to #13) ☐ Yes (go to #13) ☐ No (go to #12)

12. NOTE: IRT projects not currently funded can secure approved NEPA documentation. However, once funding is secured State ARNG is required to coordinate with ARNG-ILE-T to complete natural and cultural surveys via proponent funding. ☐ Confirmed (go to #27)

13. Do you have a species list from the U.S. Fish and Wildlife Service that is less than 90 days old?
☒ Yes (go to #14) ☞ Date of list: Granville: 6/27/2018, Durham: 10/5/2018 ☐ No (update species list, return to #13)

14. In reviewing the species list, what determination was made by the State ARNG?
- ☐ No species present (go to #16)
- ☒ No affect (go to #16)
- ☐ May affect but not likely to adversely affect ☞ Date of USFWS concurrence: (go to #16)
- ☐ May affect likely to adversely affect (go to #15)

15. Does an existing biological opinion cover the action? ☐ Yes ☞ Date of BO: N/A (go to #16) ☐ No (go to #30)

16. Have the Endangered Species Act, Section 7 requirements been completed?
☒ Yes ☞ Date of documentation: 04/05/2019 (go to #17) ☐ No (complete documentation, return to #16)

17. Does the project involve an undertaking to a building or structure that is 50 years of age or older?
☐ Yes (go to #18) ☒ No (go to #20)

18. Has the building or structure been surveyed for the National Register of Historic Places?
☐ Yes (go to #19) ☐ No (complete inventory, return to #18)

19. Is the building or structure eligible for or listed on the National Register of Historic Places?
☐ Yes (go to #20) ☐ No (go to #20)

20. Does the action involve ground disturbing activities? ☐ Yes (go to #21) ☐ No (go to #22)

21. Has an archaeological inventory or research been completed to determine if there are any archaeological resources present? ☐ Yes (go to #22) ☐ No (complete inventory, return to #21)

22. In reviewing the undertaking, under the National Historic Preservation Act (NHPA) (for both above and below ground resources), what determination was made by the State ARNG?
- ☒ No 106 undertaking; no additional consultation required under NHPA (go to question #27)
- ☐ No properties affected ☞ Date of SHPO concurrence: (go to #24)
- ☐ No adverse effect ☞ Date of SHPO concurrence: (go to #24)
- ☐ Adverse effect (go to #23)

23. Has the State ARNG addressed the adverse effect?
☐ Yes (place date of MOA or existing PA and explanation of stipulations below, go to #24) ☐ No (go to #30)

23a. Date of MOA or PA and explanation:

24. Per DoDI 4710.02 did the state ARNG determine that tribal consultation was necessary for this project?
☒ Yes (go to #25) ☐ No (Provide reason in block below, go to #27)

24a. Reason for no consultation:

25. Did the Tribes express an interest or respond with concerns about the project?
☐ Yes (go to #26) ☒ No ☞ Date of MFR: 01/10/2017 (go to #27)

26. Has the State ARNG addressed the Tribal concerns?
☐ Yes (place date of MOU or explanation in box below, go to #27) ☐ No (address concerns, return to #26)

26a. Date of MOU or explanation of how State addressed tribal concerns:

27. Does the project involve an unresolved effect on areas having special designation or recognition such as those listed below? For any yes responses go to #30 otherwise go to #28. If any No response is a result of negotiated and/or previously resolved effects please describe resolution in box 27a below.

Type	Unresolved Effects?	Type	Unresolved Effects?
a. Prime/Unique Farmland	☐ Yes ☒ No	e. Wild/Scenic River	☐ Yes ☒ No
b. Wilderness Area/National Park	☐ Yes ☒ No	f. Coastal Zones	☐ Yes ☒ No
c. Sole-Source Aquifer	☐ Yes ☒ No	g. 100-Year Floodplains	☐ Yes ☒ No
d. Wetlands	☐ Yes ☒ No	h. National Wildlife Refuges	☐ Yes ☒ No
27a. Resolution:			

28. Is this project addressed in a separate EA or EIS review?
☒ Yes (complete information below, go to Part C, Determination) ☐ No (go to #29)
Document Title: Environmental Assessment with FNSI
Lead Agency: NCARNG
Date of Decision Document: 9/28/2001

29. Does the project meet at least one of the categorical exclusions listed in 32 CFR 651 App B?
☐ Yes (complete information below, go to Part C, Determination) ☐ No (go to #30)
Primary CAT EX code:
Reason why CAT EX code applies:

30. At this time your project has not met all the qualifications for using a categorical exclusion under 32 CFR 651. Unless the scope of the project is changed, it will require an Environmental Assessment or possibly an Environmental Impact Statement. If you feel this is in error, please call your NEPA Regional Manager to discuss. If needed, go to Part C Determination.

Additional information (if needed):

Enviro tracking #	**ARNG RECORD OF ENVIRONMENTAL CONSIDERATION**	State ARNG
		NC

1. Project name: Integrated Natural Resource Management Plan for Camp Butner Training Site
2. Project number: (MILCON if applicable) | 3. Date prepared: 05 April 2019
4. Start date of proposed action (dd-mmm-yy): FY 2019 *NOTE: this must be a future date.*
5. Programmed fiscal year: FY 19
6. End date (if applicable): FY 24
7. Description and location of the project/proposed action.

a. Location (Include a detailed map if applicable):

Camp Butner, NC

b. Description:

Implementation of the NC Natural Resource Management Plan for Camp Butner Training Site

8. Choose one of the following:

☒ An existing environmental assessment* adequately covers the scope of this project. Attach FNSI if EA was completed by another federal agency (non-ARNG).
Date of EA (dd-mmm-yy): 9/28/2001 Lead Agency: NCARNG
☐ An existing environmental impact statement* adequately covers the scope of this project.
Date of EIS (dd-mmm-yy): Lead Agency:
☐ After reviewing the screening criteria and completing the ARNG environmental checklist, this project qualifies for a categorical exclusion (select below).
CAT EX Code:
CAT EX Code:
CAT EX Code:
☐ This project is exempt from NEPA requirements under the provisions of:
Cite superseding law:
**Copies of the referenced environmental assessment or environmental impact statement can be found in the ARNG Environmental Office within each state.*

9. Remarks (if needed):

Signature of Proponent (requestor)
Name: Braden Ramage
Date:

Vickie A. Dudick
Signature of Environmental Program Manager
Name: Vickie A. Dudick
Date:

Proponent Information

10. Proponent: ARNG
11. Address: 1636 Gold Star Drive, Raleigh, NC
12. POC: CFMO-DEM
13. Comm. voice:
14. Proponent POC e-mail:

PART C – DETERMINATION

On the basis of this initial evaluation the following is appropriate:

☐ In accordance with 32 CFR 651 Appendix B, the proposed action qualifies for a categorical exclusion that does not require a record of environmental consideration.
☒ A record of environmental consideration.
☐ An environmental assessment.
☐ A notice of intent to prepare an environmental impact statement.

Signature of Proponent (requestor)
Name: Braden Ramage
Date:

Vickie A. Dudick
Signature of Environmental Program Manager
Name: Vickie A. Dudick
Date:

Other concurrence (as needed):

R. D. Newton
Signature
Name: LTC Rodney D. Newton
Title/Division:
Date:

Signature
Name:
Title/Division:
Date:

Signature
Name:
Title/Division:
Date:

Signature
Name:
Title/Division:
Date:

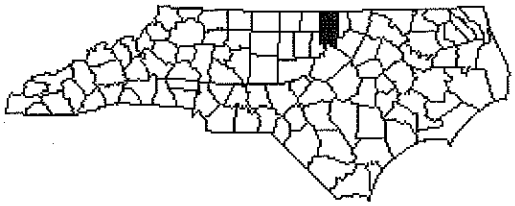
Signature
Name:
Title/Division:
Date:

Signature
Name:
Title/Division:
Date:

U.S. Fish & Wildlife Service

Endangered Species, Threatened Species,Federal Species of Concern, and Candidate Species,

Granville County, North Carolina



Updated: 06-27-2018

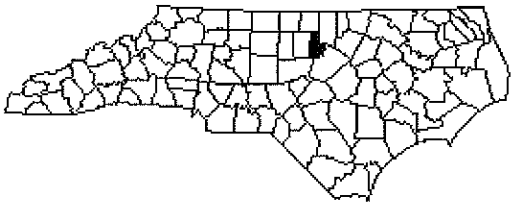
Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Carolina madtom Range by Basin	*Noturus furiosus*	ARS	Current
Neuse River waterdog Range by basin	*Necturus lewisi*	ARS	Current
Invertebrate:			
Atlantic pigtoe Range by Basin	*Fusconaia masoni*	ARS	Current
Brook floater	*Alasmidonta varicosa*	ARS	Current
Chowanoke crayfish	*Orconectes virginiensis*	ARS	Obscure
Dwarf wedgemussel Range by basin	*Alasmidonta heterodon*	E	Current
Green floater	*Lasmigona subviridis*	ARS	Current
Yellow lance Range by basin	*Elliptio lanceolata*	T	Current
Vascular Plant:			
Harperella	*Ptilimnium nodosum*	E	Current
Smooth coneflower	*Echinacea laevigata*	E	Current
Nonvascular Plant:			
Lichen:			

Definitions of Federal Status Codes:
E = endangered. A taxon "in danger of extinction throughout all or a significant portion of its range."
T = threatened. A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
C = candidate. A taxon under consideration for official listing for which there is sufficient information to support listing. (Formerly "C1" candidate species.)
BGPA =Bald and Golden Eagle Protection Act. See below.
ARS = At Risk Species. Species that are Petitioned, Candidates or Proposed for Listing under the Endangered

U.S. Fish & Wildlife Service

Endangered Species, Threatened Species,Federal Species of Concern, and Candidate Species,

Durham County, North Carolina



Updated: 10-05-2018

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Carolina madtom Range by Basin	*Noturus furiosus*	ARS	Current
Neuse River waterdog Range by basin	*Necturus lewisi*	ARS	Current
Invertebrate:			
Atlantic pigtoe Range by Basin	*Fusconaia masoni*	ARS	Current
Dwarf wedgemusselRange by basin	*Alasmidonta heterodon*	E	Current
Green floater	*Lasmigona subviridis*	ARS	Current
Septima's clubtail	*Gomphus septima*	ARS	Historic
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Current
Smooth coneflower	*Echinacea laevigata*	E	Current
Nonvascular Plant:			
Lichen:			

Definitions of Federal Status Codes:
E = endangered. A taxon "in danger of extinction throughout all or a significant portion of its range."
T = threatened. A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
C = candidate. A taxon under consideration for official listing for which there is sufficient information to support listing. (Formerly "C1" candidate species.)
BGPA =Bald and Golden Eagle Protection Act. See below.
ARS = At Risk Species. Species that are Petitioned, Candidates or Proposed for Listing under the Endangered Species Act. Consultation under Section 7(a)(2) of the ESA is not required for Candidate or Proposed species; although a Conference, as described under Section 7(a)(4) of the ESA is recommended for actions affecting species proposed for listing.

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APPENDIX D

RTLA MONITORING PROTOCOLS

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PROTOCOLS FOR MONITORING BENTHIC MACROINVERTEBRATE COMMUNITIES

Macroinvertebrate diversity provides a reliable index of stream health and quality. The aquatic insects of three orders (Ephemeroptera - mayflies, Plecoptera- stoneflies, and Trichoptera - caddisflies) are used in what is called an EPT index. The species of these orders are characteristic of high-quality streams. Healthy streams support a more diverse fauna than polluted or disturbed ones. Therefore, the number of different species found at a given site is indicative of stream quality.

The two main stream systems on CBTS are Knap of Reeds Creek (a portion of which was dammed to create Holt Lake) and Camp Creek. Benthic macroinvertebrates are collected annually on a segment of each stream. The time of year when collecting takes place is not critical, but should be consistent from year to year. It is probably most convenient to inventory these plots in the summer, when LCTA core plot monitoring is being conducted.

Sampling locations must include riffle areas with a rocky or gravelly substrate. Riffles harbor the highest diversity of species. Because they are well-oxygenated, the species found there tend to be those most sensitive to environmental conditions. If possible, the sampling area should include a variety of other microhabitats, such as leaf packs[1], sediments at the bottom of pools, aquatic vegetation, and root mats beneath overhanging banks. These will contain different types of macroinvertebrates, and can be sampled based on their availability.

Because the same stream section will be sampled each year, it is important that the sampling procedures at each site are consistent from year to year. Care should be taken to make a detailed record of the microhabitats sampled and the specific collection methods used. For instance: "1 m^2 kick sample from riffle with 3' x 3' kick net, 2 handfuls of leaf pack, and one 1-m sweep of a net under the root mat at the west bank." The same habitats (assuming they still exist at the site) and methods should be used at that location in the following years. To ensure that the same sampling location is used in sequential years, a GPS reading should be taken, and any useful landmarks should be noted on the Macroinvertebrate Survey Datasheet (Figure 1). It may be helpful to place a permanent marker at the site to aid in relocation.

Equipment Needed:

- 3' x 3' kick net or D-frame dip net, with a $^1/_{16}$-inch mesh
- long-handled net (if sampling habitats other than riffles) - if you are using D-frame dip for the riffle sampling, it can be used for this also
- sieve bucket (optional)
- waterproof wading boots
- shallow white dissecting trays
- tweezers and clear plastic pipets

If identifying in the lab:

- plastic or glass containers with tight-fitting lids
- 70% isopropyl alcohol, or full-strength denatured ethanol

[1] clumps of leaves and other organic material that become trapped behind large rocks or logs, or under streambanks

Site Information

Begin by filling out the information concerning the stream's physical attributes on page one of the Macroinvertebrate Survey Datasheet (Figure 1). For the stream description, include the type of substrate, whether the stream section is straight or winding, a description of the banks, forest type and approximate percent canopy cover, and the kinds of aquatic vegetation present, if any.

Sampling Methods:

These methods have been adapted from the Adopt-a-Stream Foundation's *Streamkeeper's Field Guide* (available at www.streamkeeper.org).

Riffles. Collect the sample near the head of the riffle (the upstream end, just below the preceding pool). Place the net beneath the area you wish to sample. Angle the top of the net downstream, and anchor the bottom of the net in the stream bottom to prevent any organisms from escaping. Disturb a 1 m^2 area by kicking up the substrate for about one minute.[2] Remove the net and gently scrape its contents into a white tray with a shallow layer of stream water. (If using a D-frame dip net, you will have to composite several samples in different areas until approximately 1 m^2 has been sampled.)

Leaf Packs. Select older material that has begun to decompose. Pick a handful or two and place into a white tray with stream water. If you have a sieve bucket, the material may be placed in it and washed to separate the organisms from the substrate. Otherwise, each leaf will need to be examined individually to detect the organisms.

Aquatic Plants, Root Mats, and Bottom Sediments. Use a long-handled net to sample these habitats. Make a sweep through vegetation growing in or hanging into the water, and under root mats overhanging the stream bank. Empty the net into a white tray, using care to scrape out all the contents. When collecting muck from the bottom of a pool, a sieve bucket is useful for sifting silt from the sample. The organisms can be picked out of the muck by hand in a white tray, although this is more tedious work.

Visual Inspection. Macroinvertebrates can also be hand-picked with tweezers from the surfaces of rocks and woody debris. You may want to finish by performing a 2-minute search to detect any species that were not found using the other methods. Make sure to record the time taken for a visual search and the kinds of substrate examined.

Sorting and Identification

There are many keys available for identifying macroinvertebrates. The *Streamkeeper's Field Guide* and the *Save Our Streams Monitor's Guide to Aquatic Macroinvertebrates* (available from the Isaac Walton League at ww.iwla.org) both include a dichotomous key**.**

[2] You may decide to first rub the larger rocks clean in the running water directly in front of the net. Place these rocks outside the sampling area before beginning to kick up the stream bottom.

Identifying in the lab. Bringing the macroinvertebrates back to a lab allows you to take more time examining them, use a microscope for magnification, or perhaps have someone more experienced identify them. If desired, the organisms can often be keyed out to genus or species if sufficient time is taken. However, they must be preserved until they are examined. Even if you will be doing the identification in the lab, it is generally best to sort your samples in the field. The macroinvertebrates are much easier to separate from the silt and debris when they are alive and moving. Place them in containers with either 70% isopropyl alcohol or full-strength denatured ethanol, and secure the lids tightly. Store the containers in a cool, dark place until you are ready to work with them.

Identifying in the field. Identifying the macroinvertebrates at the field site allows you to release them back into the stream when you are through. It is less likely that you will be able to identify to the level of genus or species, but you should be able to discern between different taxa within the same general group. Using tweezers and a pipet, pick out organisms from the white trays and place them into separate stream water-filled containers based on type. An ice-cube tray works well for this purpose. The objective is to separate the invertebrates into major groups and determine the number of distinct taxa within each group. Page two of the Macroinvertebrate Survey Datasheet lists the major taxonomic groups. If you are unable to place any of the organisms into a group, you can preserve the specimen as described above and bring it to a lab for further study. Record the number of individuals and number of different taxa for each group on page two of the Macroinvertebrate Survey Datasheet. Several blank spaces are provided at the bottom of the sheet for any organisms not listed.

Interpretation of Results

On page one of the Macroinvertebrate Survey datasheet, select the EPT value category which applies. Calculate the EPT richness (total number of mayfly, stonefly, and caddisfly taxa) and taxa richness (total number of all taxa). In general, streams with a higher taxa richness are healthier than those with less diversity, and an EPT richness between 8 to 12 is considered favorable. Unfortunately, it is difficult to make any definite conclusions about stream health from the results of this type of survey. The macroinvertebrate community is affected by many variables that are unrelated to pollutants, such as velocity, depth, temperature, and the types of organic material available as food sources. Therefore, species diversity will vary somewhat from stream to stream, regardless of water quality. Still, examining survey data over a period of several years may provide invaluable insights. Each year, the macroinvertebrate data for each sampling location should be compared to those from previous years. This will indicate whether the condition of the stream has improved, declined, or remained stable. If any significant declines in diversity are detected, the sample site should be further investigated with more comprehensive water quality tests.

Camp Butner LCTA Special Use Plots

Macroinvertebrate Survey Datasheet

Page 1

Stream: _____

UTMs: _____ N, _____ E

Directions to Location: _____

_____

_____

Date: _____ Water Temp: ___

Time: _____ Avg. Depth: _____

Field Technicians: _____ Avg. Velocity: _____

Site Description: _____

_____

_____

EPT value:

Check which applies	Stoneflies	Mayflies	Caddisflies	Stream Quality
	present	present	present	excellent
	absent	present	present	good
	absent	absent	present	fair
	absent	absent	absent	poor

Richness:

EPT richness (total number of mayfly, stonefly, and caddisfliy taxa) _____

Taxa Richness (total number af all macroinvertebrate taxa) _____

Notes: _____

_____

_____

_____

_____

_____

Camp Butner LCTA Special Use Plots

Macroinvertebrate Survey Datasheet - page 2

Page 2

Stream: _____ Date: _____

Order or Class	Family or Suborder	Common Name	# of indivs.	# of Taxa
Ephemeroptera		Mayflies		
Plecoptera		Stoneflies		
Trichoptera		Caddisflies		
Diptera	Chironomidae	Midges		
	Tipulidae	Craneflies		
	Simuliidae	Blackflies		
	Athericidae	Watersnipe Flies		
		Other True Flies		
Megaloptera	Corydalidae	Dobsonflies		
	Corydalidae	Fishflies		
	Sialidae	Alderflies		
Coleoptera	Psephenidae	Water Pennies		
	Elmidae	Riffle Beetles		
		Other Beetles		
Odonata	Zygoptera	Damselflies		
	Anisoptera	Dragonflies		
Isopoda		Sowbugs		
Amphipoda		Scuds		
Decapoda		Crayfish		
Gastropoda		Snails		
Bivalvia		Clams and Mussels		
Hirudinea		Leeches		
Oligochaeta		Aquatic Worms		
Turbellaria		Planarians		
		Total		

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APPENDIX E

NEUSE RIVER BASIN RULES

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CONTENTS

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North Carolina
Department of Environment and Natural Resources
Division of Water Quality
Nonpoint Source Management Program

Riparian Buffer Protection Rules for the Neuse and Tar-Pamlico River Basins

On Dec. 9, 1999, the North Carolina Environmental Management Commission adopted rules to protect 50-foot wide riparian, or waterside, buffers along waterways in the Neuse and Tar-Pamlico River Basins. These buffers remove nitrogen, phosphorus, and other pollutants from rainwater that flows into the basins' waterways, protecting the waterways from surrounding land uses. The rules are part of larger nutrient reduction strategies for each basin. In the **Neuse River basin,** the rules have been effective as temporary rules since **July 22, 1997**. In the **Tar-Pamlico basin**, temporary rules took effect on **Jan. 1, 2000**.

In both basins, the rules will be effective as permanent rules on Aug. 1, 2000, pending review by the General Assembly during the summer.

The main rule, referred to as the buffer *protection* rule, requires that up to 50 feet of riparian area be protected and maintained on the banks of waterways in the basin. **This rule does not require establishment of new buffers unless the existing use of the buffer changes.** Diffuse flow of stormwater that runs into the buffer must be maintained.

Here are some frequently asked questions followed by answers that further explain the rules.

Q: What waters in the basins require buffers?

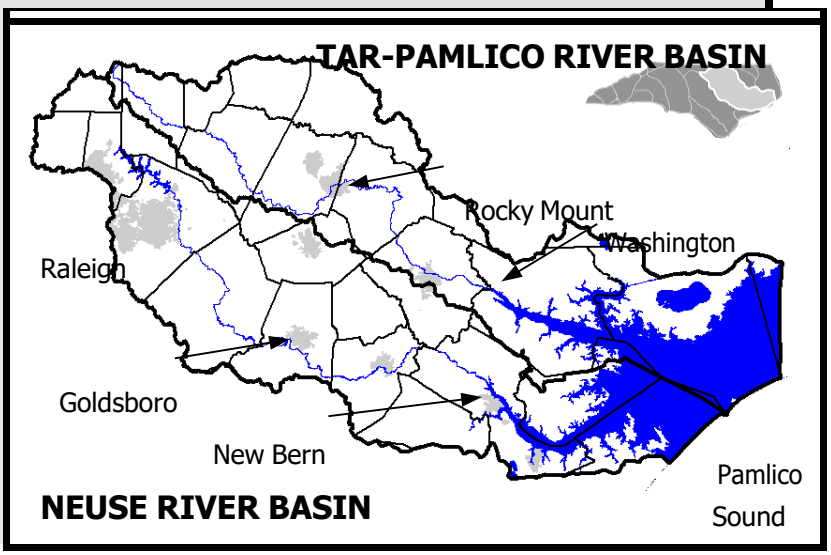
A: Intermittent and perennial streams, lakes, ponds and estuarine waters that are shown on the most recent version of either a county soil survey map prepared by the Natural Resources Conservation Service or a 1:24,000 scale topographic map prepared by the U.S. Geologic Survey, and that exist on the ground.

Q: Are there any waters that don't have to be buffered?

A: Yes. The rule does not apply to the following waters: ditches and manmade conveyances other than modified natural streams unless they are constructed for navigation and/or boat access; manmade ponds and lakes located outside natural drainageways; and ephemeral (stormwater) streams.

Q: What does it mean to protect the buffer?

A: The first 30 feet (zone 1) of the buffer is to remain essentially undisturbed. The



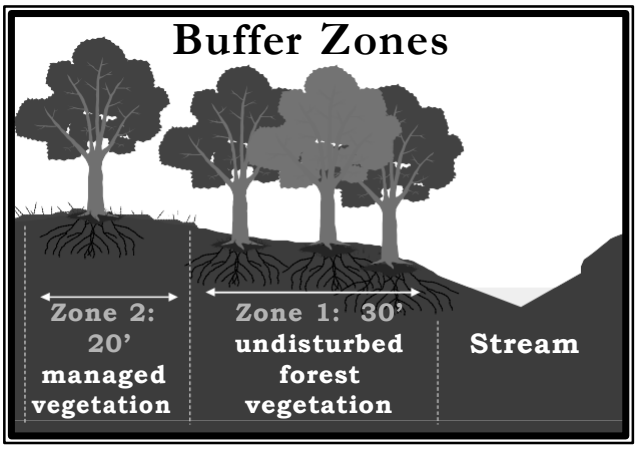
landward 20 feet (zone 2) is to be vegetated, but certain uses would be allowed in this zone.

Q: Are existing activities within 50 feet of waterways exempt from the rules?

A: Yes. The footprint of existing, ongoing uses is exempt. These uses include, but are not limited to: agriculture; buildings; industrial, commercial, and transportation facilities; maintained lawns; utility lines; and on-site wastewater systems.

Q: What activities are allowed in the buffer?

A: The rule includes a table of uses. In it, specific activities are listed as *exempt*, *allowable*, *allowable with mitigation*, or *prohibited*. *Exempt* activities require no prior approval. *Allowable* and *allowable with mitigation* mean that approval must be obtained from the Division of Water Quality beforehand. The approval process will require a showing of no practical alternatives to the impact, and that the impact will be minimized. If it is *allowable with mitigation*, a greater amount of buffer must be established elsewhere to offset impacts. A separate buffer **mitigation rule** establishes requirements for activities that are *allowable with mitigation*. *Prohibited* activities are not allowed, however, a variance may be sought if one thinks that complying with the rule will cause practical difficulties or unnecessary hardships. If an activity is not listed in the table, then it is prohibited.



Q: What are some common activities listed in the table of uses?

A: The following are brief explanations of only some activities listed in the table - you will want to read and understand the rule before you begin any activity in a buffer:

- Driveway crossings on single-family residential lots that disturb less than 25 feet along the buffer are *exempt*.
- Maintenance of existing ditches through the buffer is *exempt* provided that water quality impacts are minimized.
- Grading and revegetation in zone 2 only is *exempt* if disturbed areas are stabilized, the health of vegetation in zone 1 is not compromised, and diffuse flow is reestablished.
- Road intrusions into the buffer are *allowable with mitigation*.
- Road crossings of a waterbody that impact less than 40 feet of the buffer are *exempt*. Wider crossings that are less than 150 feet wide are *allowable*, and those over 150 feet wide are *allowable with mitigation*.
- New ponds in drainageways are *allowable* if a 50-foot buffer is established around the new ponds, or *allowable with mitigation* if a new buffer is not established.
- Fertilizer application is *prohibited*, except for one-time application to establish replanted vegetation.
- Some management of vegetation is *exempt*, such as periodic mowing and harvesting of plant products in zone 2 only, planting to enhance the buffer, pruning provided that the health and function of the vegetation is not compromised, removal of understory nuisance vegetation as defined in the rule, and removal of individual trees that endanger structures or human life.
- Water dependent structures as defined in the rules are *allowable*.
- Utilities vary from *exempt* to *allowable with mitigation*, depending on type, size, and location.

The public is encouraged to read and understand the buffer rules before beginning any activities within buffers in the Basin. For more information or to obtain a copy of the rules, please contact Division of Water Quality staff at a Regional Office (see below). The rules can also be viewed or downloaded from the DWQ web site at http://h2o.enr.state.nc.us/nps/tarp.htm.

DENR Washington Regional Office (252) 946-6481
Location and mail address: 943 Washington Square Mall, Washington, NC 27889

DENR Raleigh Regional Office (919) 571-4700
Location: 3800 Barrett Drive, Suite 101, Raleigh, NC
Mail address: 1628 Mail Service Center, Raleigh, NC 27699-1628

FORESTRY Leaflets
North Carolina Forest Service

November 2015 *WQ-11*

A Guide to Implementing Neuse River Basin and Tar-Pamlico River Basin Riparian Buffer Rules for Forest Management Activities

Additional rule information is available on the N.C. Forest Service Web site www.ncforestservice.gov.

Where to Apply These Buffer Rules

The Neuse River Basin and Tar-Pamlico River Basin 'Riparian Buffer Rules' apply to perennial streams, intermittent streams, ponds, lakes, and estuaries located in either river basin, and which are approximately shown on the most recently published versions of either a NRCS soil survey map or USGS 1:24000 (7.5 minute) quad topographic map.

The Neuse River and Tar-Pamlico River Riparian Buffer Rules do not apply to the following waterbodies:

- ***x*** Any "surface waters" that do not appear on either of the above-named soils or topographic maps.
- ***x*** Any ephemeral streams (sometimes referred to as sloughs, swales, gullies or stormwater channels).
- ***x*** Man-made ditches or canals that are not intended for water navigation or boat access.
- ***x*** Man-made ponds and lakes that are located outside natural drainage ways.

Seek advice from a professional trained in stream identification and determination when assessing 'buffer rule' applicability. Modified streams may look like ditches but still require these riparian buffer rules. This Leaflet is not intended to provide legal advice or final interpretation of these buffer rules.
A SMZ is still required in all cases along intermittent streams, perennial streams and perennial waterbodies as mandated by the statewide rules known as the "Forest Practices Guidelines Related to Water Quality" (FPGs).

Required Buffer Zones and Widths

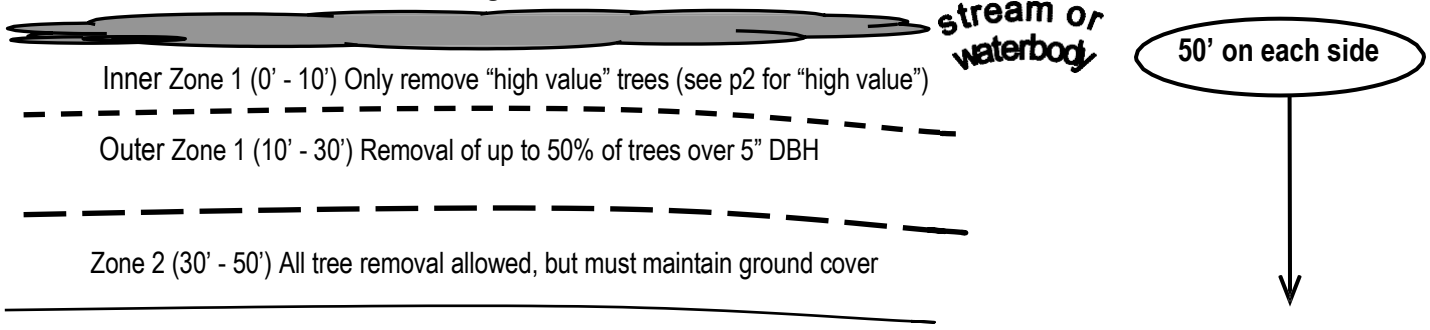
The buffer area is made up of two zones that together equal a 50-foot wide buffer that must be "measured horizontally on a line perpendicular to the surface water."

Zone 1 - For streams: Zone 1 begins at the most landward limit of the top of bank, or the rooted vegetation, and extends towards the land for 30 feet on all sides.

Zone 1 - For ponds, lakes, reservoirs: Zone 1 begins at the most landward limit of the normal water level, or the rooted vegetation, and extends towards the land for 30 feet.

Zone 1 - For the 20 Coastal NC counties: Zone 1 begins at the most landward limit of the normal high water level or the normal water level, as appropriate; and extends towards the land for 30 feet.

Zone 2 - For all sites: Zone 2 begins at the outer edge of Zone 1 and extends outward 20 feet and shall consist of a stable, vegetated area. Ground cover must allow water infiltration and diffusion.



Timber Harvesting In The Riparian Buffer

Selective timber harvesting is only allowed to occur in the 50 foot buffer if:

1) A forest management plan for the property is prepared or approved by a Registered Forester, **or**
2) The property is enrolled in that county's Present-Use Tax Valuation Program for forestry use.

All of Zone 1: 0 ft. to 30 ft. (Includes 'Inner' & 'Outer' areas defined below)

Allowed Tree removal, provided that disturbance to soil and residual vegetation is minimized.

Allowed with Restrictions **Tracked or wheeled vehicles are not permitted except at stream crossings designed, constructed, and maintained in accordance with FPG .0203**

Not Allowed No soil-disturbing site preparation activities.

Zone 1 - Inner 10 feet: 0' to 10' (land immediately adjacent to the stream or waterbody)

Allowed Removal of individual "High Value" trees.

Allowed with Restrictions
- "High Value" Pine trees are defined as any tree with a DBH of 14" and greater **or** a stump diameter of 18" and greater.
- "High Value" Hardwood and Wetland trees are defined as any tree with a DBH of 16" and greater, **or** a stump diameter 24" and greater.

Not Allowed **No removal of any tree with exposed primary roots visible in the streambank**
- It is recommended to mark/flag residual "leave" trees to make sure they are protected.

Zone 1 - Outer 20 feet: 10' to 30' (land adjoining the inner 10 feet area)

Allowed
- Limited amount of timber removal.
- Remaining trees left standing should be as evenly spaced as possible.

Allowed with Restrictions Harvest of no more than 50% of the trees over 5" DBH:
- Re-entry for natural forest is allowed every 15 years.
- Re-entry for plantation forest is allowed every 5 years.

Not Allowed No removal of trees 5" DBH and smaller.

All of Zone 2: 30 ft. to 50 ft. (The outermost 20 feet of the entire riparian buffer)

There are no tree harvesting or site-prep restrictions in Zone 2, so long as there is sufficient ground cover maintained to provide for diffusion and infiltration of water runoff. **All activities must still comply with the North Carolina FPGs.**

Other Forestry Activities In The Riparian Buffer

Forestry Activities Allowed in the Entire 50-foot Riparian Buffer

- ✓ Individual trees may be treated to maintain or improve their health, form, or vigor.
- ✓ Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation. These practices must be approved by the N.C. Forest Service for a specific site. The N.C. Forest Service must notify the Division of Water Resources of all approvals.
- ✓ Removal of individual trees that are in danger of causing damage to structures or human life.

Forestry Activities Allowed with Restrictions in the Entire 50-foot Riparian Buffer

- ▪ Access roads and skid trails only allowed for temporary and permanent stream crossings, which are established in accordance with FPG .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.
- ▪ Timber felling shall be directed away from the stream or waterbody.
- ▪ Skidding shall be directed away from the stream or waterbody and shall be done in a manner that minimizes soil disturbance and prevents rutting or the creation of channels.
- ▪ Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the buffer shall be allowed provided that soil disturbance is minimized. Plantings shall consist primarily of native species.
- ▪ Application of fertilizer only allowed as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stands shall be conducted so that the chemicals are not applied directly to or allowed to drift into buffer.

Forestry Activities Not Allowed in the 50-foot Riparian Buffer

- ✗ NO logging decks or sawmill sites placed in the buffer.
- ✗ NO high intensity prescribed burns.

15A NCAC 02B .0202 DEFINITIONS

The definition of any word or phrase used in this Section shall be the same as given in G.S. 143, Article 21. The following words and phrases, which are not defined in this article, shall be interpreted as follows:

(1) Acute toxicity to aquatic life means lethality or other harmful effects sustained by either resident aquatic populations or indicator species used as test organisms in a controlled toxicity test due to a short-term exposure (relative to the life cycle of the organism) to a specific chemical or mixture of chemicals (as in an effluent). Short-term exposure for acute tests is generally 96 hours or less. Acute toxicity shall be determined using the following procedures:
   (a) for specific chemical constituents or compounds, acceptable levels shall be equivalent to a concentration of one-half or less of the Final Acute Value (FAV) as determined according to "Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Life and its Uses" published by the Environmental Protection Agency and referenced in the Federal Register (50 FR 30784, July 29, 1985) which is hereby incorporated by reference including any subsequent amendments.
   (b) for specific chemical constituents or compounds for which values described under Subparagraph (1)(a) of this Rule can not be determined, acceptable levels shall be equivalent to a concentration of one-third or less of the lowest available LC50 value.
   (c) for effluents, acceptable levels are defined as no statistically measurable lethality (99 percent confidence level using Students t test) during a specified exposure period. Concentrations of exposure shall be determined on a case-by-case basis.
   (d) in instances where detailed dose response data indicate that levels of acute toxicity are significantly different from those defined in this Rule, the Director may determine on a case-by-case basis an alternate acceptable level through statistical analyses of the dose response curve.

(2) Acute to Chronic Ratio (ACR) means the ratio of acute toxicity expressed as an LC50 for a specific toxicant or an effluent to the chronic value for the same toxicant or effluent.

(3) Agricultural uses include the use of waters for stock watering, irrigation, and other farm purposes.

(4) Applicator means any person, firm, corporation, wholesaler, retailer, distributor, any local, state, or federal governmental agency, or any other person who applies fertilizer to the land of a consumer or client or to land they own or to land which they lease or otherwise hold rights.

(5) Approved treatment, as applied to water supplies, means treatment accepted as satisfactory by the Division of Environmental Health or Division of Water Quality.

(6) Average (except bacterial) means arithmetical average and includes the analytical results of all samples taken during the specified period; all sampling shall be done as to obtain the most representative sample under prevailing conditions:
   (a) Daily Average for dissolved oxygen, shall be of at least four samples;
   (b) Weekly Average means the average of all daily composite samples obtained during the calendar week. If only one grab sample is taken each day, the weekly average is the average of all daily grab samples. A minimum of three daily grab samples is needed to calculate a weekly average.
   (c) Monthly Average means the average of all daily composites (or grab samples if only one per day) obtained during the calendar month.

   The definitions in this Paragraph do not affect the monitoring requirements for NPDES permits but rather shall be used by the Division along with other methodologies in determining violations of water quality standards. Arithmetical averages as defined by this Section, and not confidence limits nor other statistical descriptions, shall be used in all calculations of limitations which require the use of averages pursuant to this Section and 40 CFR 122.41(l)(4)(iii).

(7) Best Management Practice (BMP) means a structural or nonstructural management-based practice used singularly or in combination to reduce nonpoint source inputs to receiving waters in order to achieve water quality protection goals.

(8) Best usage of waters as specified for each class means those uses as determined by the Environmental Management Commission in accordance with the provisions of G.S. 143-214.1.

(9) Bioaccumulation factor (BAF) is a unitless value that describes the degree to which substances are taken up or accumulated into tissues of aquatic organisms from water directly and from food or other ingested materials containing the accumulated substances, and is usually measured as a ratio of a substance's

concentration in tissue versus its concentration in water in situations where exposure to the substance is occurring from both water and the food chain.

(10) Bioconcentration factor (BCF) is a unitless value that describes the degree to which substances are absorbed or concentrated into tissues of aquatic organisms from water directly and is usually measured as a ratio of substance's concentration in tissue versus its concentration in water in situations where exposure to the substance is occurring from water only.

(11) Biological integrity means the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions.

(12) Buffer means a natural or vegetated area through which stormwater runoff flows in a diffuse manner so that the runoff does not become channelized and which provides for infiltration of the runoff and filtering of pollutants. The buffer shall be measured landward from the normal pool elevation of impounded structures and from the bank of each side of streams or rivers.

(13) Built-upon area means that portion of a development project that is covered by impervious or partially impervious cover including buildings, pavement, gravel areas (e.g. roads, parking lots, paths), recreation facilities (e.g. tennis courts), etc. (Note: Wooden slatted decks and the water area of a swimming pool are considered pervious.)

(14) Chronic toxicity to aquatic life means any harmful effect sustained by either resident aquatic populations or indicator species used as test organisms in a controlled toxicity test due to long-term exposure (relative to the life cycle of the organism) or exposure during a substantial portion of the duration of a sensitive period of the life cycle to a specific chemical substance or mixture of chemicals (as in an effluent). In absence of extended periods of exposure, early life stage or reproductive toxicity tests may be used to define chronic impacts.

(15) Chronic value for aquatic life means the geometric mean of two concentrations identified in a controlled toxicity test as the No Observable Effect Concentration (NOEC) and the Lowest Observable Effect Concentration (LOEC).

(16) Cluster development means the grouping of buildings in order to conserve land resources and provide for innovation in the design of the project including minimizing stormwater runoff impacts. This term includes nonresidential development as well as single-family residential and multi-family developments. For the purpose of Sections .0100, .0200 and .0300 of this Subchapter, planned unit developments and mixed use development shall be considered as cluster development.

(17) Commercial applicator means any person, firm, corporation, wholesaler, retailer, distributor or any other person who for hire or compensation applies fertilizer to the land of a consumer or client.

(18) Concentrations are the mass of a substance per volume of water and for the purposes of this Section shall be expressed as milligrams per liter (mg/l), micrograms per liter (ug/l), or nanograms per liter (ng/l).

(19) Contiguous refers to those wetlands landward of the mean high water line or normal water level and within 575 feet of classified surface waters which appear as solid blue lines on the most recently published versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps.

(20) Critical area means the area adjacent to a water supply intake or reservoir where risk associated with pollution is greater than from the remaining portions of the watershed. The critical area is defined as extending either 1/2 mile from the normal pool elevation of the reservoir in which the intake is located or to the ridge line of the watershed (whichever comes first); or 1/2 mile upstream from and draining to the intake (or other appropriate downstream location associated with the water supply) located directly in the stream or river (run-of-the-river), or to the ridge line of the watershed (whichever comes first). Since WS-I watersheds are essentially undeveloped, establishment of a critical area is not required. Local governments may extend the critical area as needed. Major landmarks such as highways or property lines may be used to delineate the outer boundary of the critical area if these landmarks are immediately adjacent to the appropriate outer boundary of 1/2 mile. The Commission may adopt a different critical area size during the reclassification process.

(21) Cropland means agricultural land that is not covered by a certified animal waste management plan and is used for growing corn, grains, oilseed crops, cotton, forages, tobacco, beans, or other vegetables or fruits.

(22) Designated Nonpoint Source Agency means those agencies specified by the Governor in the North Carolina Nonpoint Source Management Program, as approved by the Environmental Protection Agency.

(23) Development means any land disturbing activity which adds to or changes the amount of impervious or partially impervious cover on a land area or which otherwise decreases the infiltration of precipitation into the soil.

(24) Director means the Director of the Division of Water Quality.

(25) Discharge is the addition of any man-induced waste effluent either directly or indirectly to state surface waters.

(26) Division means the Division of Water Quality or its successors.

(27) Domestic wastewater discharge means the discharge of sewage, non-process industrial wastewater, other domestic wastewater or any combination of these items. Domestic wastewater includes, but is not limited to, liquid waste generated by domestic water using fixtures and appliances, from any residence, place of business, or place of public assembly even if it contains no sewage. Examples of domestic wastewater include once-through non-contact cooling water, seafood packing facility discharges and wastewater from restaurants.

(28) Effluent channel means a discernable confined and discrete conveyance which is used for transporting treated wastewater to a receiving stream or other body of water as provided in Rule .0215 of this Section.

(29) Existing development, for projects that do not require a state permit, shall be defined as those projects that are built or those projects that at a minimum have established a vested right under North Carolina zoning law as of the effective date of the local government water supply ordinance, or such earlier time that an affected local government's ordinances shall specify, based on at least one of the following criteria:

(a) substantial expenditures of resources (time, labor, money) based on a good faith reliance upon having received a valid local government approval to proceed with the project, or

(b) having an outstanding valid building permit in compliance with G.S. 153A-344.1 or G.S. 160A-385.1, or

(c) having an approved site specific or phased development plan in compliance with G.S. 153A-344.1 or G.S. 160A-385.1.

For projects that require a state permit, such as landfills, NPDES wastewater discharges, land application of residuals and road construction activities, existing development shall be defined as those projects that are built or those projects for which a state permit was issued prior to August 3, 1992.

(30) Existing uses mean uses actually attained in the water body, in a significant and not incidental manner, on or after November 28, 1975, whether or not they are included in the water quality standards, which either have been actually available to the public or are uses deemed attainable by the Environmental Management Commission. At a minimum, uses shall be deemed attainable if they can be achieved by the imposition of effluent limits and cost-effective and reasonable best management practices (BMPs) for nonpoint source control.

(31) Family subdivision means a division of a tract of land:

(a) to convey the resulting parcels, with the exception of parcels retained by the grantor, to a relative or relatives as a gift or for nominal consideration, but only if no more than one parcel is conveyed by the grantor from the tract to any one relative; or

(b) to divide land from a common ancestor among tenants in common, all of whom inherited by intestacy or by will.

(32) Fertilizer means any substance containing nitrogen or phosphorus which is used primarily for its plant food content.

(33) Fishing means the taking of fish by sport or commercial methods as well as the consumption of fish or shellfish or the propagation of fish and such other aquatic life as is necessary to provide a suitable environment for fish.

(34) Forest vegetation means the plants of an area which grow together in disturbed or undisturbed conditions in various wooded plant communities in any combination of trees, saplings, shrubs, vines and herbaceous plants. This includes mature and successional forests as well as cutover stands.

(35) Freshwater means all waters that under natural conditions would have a chloride ion content of 500 mg/l or less.

(36) Industrial discharge means the discharge of industrial process treated wastewater or wastewater other than sewage. Stormwater shall not be considered to be an industrial wastewater unless it is contaminated with industrial wastewater. Industrial discharge includes:

(a) wastewater resulting from any process of industry or manufacture, or from the development of any natural resource;

(b) wastewater resulting from processes of trade or business, including wastewater from laundromats and car washes, but not wastewater from restaurants; or

(c) wastewater discharged from a municipal wastewater treatment plant requiring a pretreatment program.

(37) Land-disturbing activity means any use of the land that results in a change in the natural cover or topography that may cause or contribute to sedimentation.

(38) LC50 means that concentration of a toxic substance which is lethal (or immobilizing, if appropriate) to 50 percent of the organisms tested during a specified exposure period. The LC50 concentration for toxic materials shall be determined for sensitive species as defined by Subparagraph (43) of this Rule under aquatic conditions characteristic of the receiving waters.

(39) Local government means a city or county in singular or plural as defined in G.S. 160A-1(2) and G.S. 158A-10.

(40) Lower piedmont and coastal plain waters mean those waters of the Catawba River Basin below Lookout Shoals Dam; the Yadkin River Basin below the junction of the Forsyth, Yadkin, and Davie County lines; and all of the waters of Cape Fear, Lumber, Roanoke, Neuse, Tar-Pamlico, Chowan, Pasquotank, and White Oak River Basins; except tidal salt waters which are assigned S classifications.

(41) MF is an abbreviation for the membrane filter procedure for bacteriological analysis.

(42) Major variance means a variance from the minimum statewide watershed protection rules that results in the relaxation, by a factor greater than five percent of any buffer, density or built-upon area requirement under the high density option; any variation in the design, maintenance or operation requirements of a wet detention pond or other approved stormwater management system; or relaxation by a factor greater than 10 percent, of any management requirement under the low density option.

(43) Minor variance means a variance from the minimum statewide watershed protection rules that results in a relaxation, by a factor of up to five percent of any buffer, density or built-upon area requirement under the high density option; or that results in a relaxation by a factor up to 10 percent, of any management requirement under the low density option.

(44) Mixing zone means a region of the receiving water in the vicinity of a discharge within which dispersion and dilution of constituents in the discharge occurs and such zones shall be subject to conditions established in accordance with 15A NCAC 2B .0204(b).

(45) Mountain and upper piedmont waters mean all of the waters of the Hiwassee; Little Tennessee, including the Savannah River drainage area; French Broad; Broad; New; and Watauga River Basins; and those portions of the Catawba River Basin above Lookout Shoals Dam and the Yadkin River Basin above the junction of the Forsyth, Yadkin, and Davie County lines.

(46) Nonconforming lot of record means a lot described by a plat or a deed that was recorded prior to the effective date of local watershed regulations (or their amendments) that does not meet the minimum lot-size or other development requirements of Rule .0211 of this Subchapter.

(47) Nonpoint source pollution means pollution which enters waters mainly as a result of precipitation and subsequent runoff from lands which have been disturbed by man's activities and includes all sources of water pollution which are not required to have a permit in accordance with G.S. 143-215.1(c).

(48) Non-process discharge means industrial effluent not directly resulting from the manufacturing process. An example would be non-contact cooling water from a compressor.

(49) Nutrient sensitive waters mean those waters which are so designated in the classification schedule in order to limit the discharge of nutrients (usually nitrogen and phosphorus). They are designated by "NSW" following the water classification.

(50) Offensive condition means any condition or conditions resulting from the presence of sewage, industrial wastes or other wastes within the waters of the state or along the shorelines thereof which shall either directly or indirectly cause foul or noxious odors, unsightly conditions, or breeding of abnormally large quantities of mosquitoes or other insect pests, or shall damage private or public water supplies or other structures, result in the development of gases which destroy or damage surrounding property, herbage or grasses, or which may cause the impairment of taste, such as from fish flesh tainting, or affect the health of any person residing or working in the area.

(51) Primary Nursery Areas (PNAs) are tidal saltwaters which provide essential habitat for the early development of commercially important fish and shellfish and are so designated by the Marine Fisheries Commission.

(52) Primary recreation includes swimming, skin diving, skiing, and similar uses involving human body contact with water where such activities take place in an organized or on a frequent basis.

(53) Protected area means the area adjoining and upstream of the critical area in a WS-IV water supply in which protection measures are required. The boundaries of the protected areas are defined as within five miles of the normal pool elevation of the reservoir and draining to water supply reservoirs (measured from the normal pool elevation) or to the ridge line of the watershed (whichever comes first); or 10 miles upstream and draining to the intake located directly in the stream or river (run-of-the-river), or to the ridge line of the watershed (whichever comes first). Local governments may extend the protected area. Major landmarks such as highways or property lines may be used to delineate the outer boundary of the protected area if these landmarks are immediately adjacent to the appropriate outer boundary of five or 10 miles. In some cases the protected area shall encompass the entire watershed. The Commission may adopt a different protected area size during the reclassification process.

(54) Residential development means buildings for residence such as attached and detached single family dwellings, apartment complexes, condominiums, townhouses, cottages, and their associated outbuildings such as garages, storage buildings, and gazebos.

(55) Residuals means any solid or demisolid waste generated from a wastewater treatment plant, water treatment plant or air pollution control facility permitted under the authority of the Environmental Management Commission.

(56) Riparian area means an area that is adjacent to a body of water.

(57) Secondary recreation includes wading, boating, other uses not involving human body contact with water, and activities involving human body contact with water where such activities take place on an infrequent, unorganized, or incidental basis.

(58) Sensitive species for aquatic toxicity testing is any species utilized in procedures accepted by the Commission or its designee in accordance with Rule .0103 of this Subchapter, or the following genera:

(a) Daphnia;
(b) Ceriodaphnia;
(c) Salmo;
(d) Pimephales;
(e) Mysidopsis;
(f) Champia;
(g) Cyprinodon;
(h) Arbacia;
(i) Penaeus;
(j) Menidia;
(k) Notropis;
(l) Salvelinus;
(m) Oncorhynchus;
(n) Selenastrum;
(o) Chironomus;
(p) Hyalella;
(q) Lumbriculus.

(59) Shellfish culture includes the use of waters for the propagation, storage and gathering of oysters, clams, and other shellfish for market purposes.

(60) Stormwater collection system means any conduit, pipe, channel, curb or gutter for the primary purpose of transporting (not treating) runoff. A stormwater collection system does not include vegetated swales, swales stabilized with armoring or alternative methods where natural topography prevents the use of vegetated swales (subject to case-by-case review), curb outlet systems or pipes used to carry drainage underneath built-upon surfaces that are associated with development controlled by the provisions of 15A NCAC 2H .1003(c)(1).

(61) Source of water supply for drinking, culinary or food-processing purposes means any source, either public or private, the waters from which are used for human consumption, or used in connection with the processing of milk, beverages, food, or other purpose which requires water suitable for human consumption.

(62) Swamp waters mean those waters which are classified by the Environmental Management Commission and which are topographically located so as to generally have very low velocities and other characteristics

which are different from adjacent streams draining steeper topography. They are designated by "Sw" following the water classification.

(63) Tidal salt waters mean all tidal waters which are classified by the Environmental Management Commission which generally have a natural chloride ion content in excess of 500 parts per million and include all waters assigned S classifications.

(64) Toxic substance or toxicant means any substance or combination of substances (including disease-causing agents), which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, has the potential to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions or suppression in reproduction or growth) or physical deformities in such organisms or their offspring.

(65) Trout waters are those waters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis. These waters shall be classified by the Commission after considering the requirements of Rule .0101(b) and (c) of this Subchapter and include all waters designated by "Tr" in the water classification.

(66) Waste disposal includes the use of waters for disposal of sewage, industrial waste or other waste after approved treatment.

(67) Water dependent structures are those structures for which the use requires access or proximity to or siting within surface waters to fulfill its basic purpose, such as boat ramps, boat houses, docks and bulkheads. Ancillary facilities such as restaurants, outlets for boat supplies, parking lots and commercial boat storage areas are not water dependent structures.

(68) Water quality based effluent limits and best management practices are limitations or best management practices developed by the Division for the purpose of protecting water quality standards and best usage of surface waters consistent with the requirements of G.S. 143-214.1 and the Federal Water Pollution Control Act as amended.

(69) Waters with quality higher than the standards means all waters for which the determination of waste load allocations (pursuant to Rule .0206 of this Section) indicates that water quality is sufficiently greater than that defined by the standards such that significant pollutant loading capacity still exists in those waters.

(70) Watershed means the entire land area contributing surface drainage to a specific point. For the purpose of the water supply protection rules in 15A NCAC 2B .0104 and .0211 local governments may use major landmarks such as highways or property lines to delineate the outer boundary of the drainage area if these landmarks are immediately adjacent to the ridgeline.

(71) Wetlands are "waters" as defined by G.S. 143-212(6) and are areas that are inundated or saturated by an accumulation of surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands classified as waters of the state are restricted to waters of the United States as defined by 33 CFR 328.3 and 40 CFR 230.3.

History Note: *Authority G.S. 143-214.1; 143-215.3(a)(1);*
Eff. February 1, 1976;
Amended Eff. August 1, 1995; February 1, 1993; August 3, 1992; August 1, 1990;
RRC Objection Eff. July 18, 1996 due to lack of authority and ambiguity;
Amended Eff. August 1, 1998; October 1, 1996.

15A NCAC 02B .0232 NEUSE RIVER BASIN- NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: BASIN NUTRIENT REDUCTION GOAL

(a) Pursuant to 1995 (Reg. Sess., 1996) N.C. Session Laws, c. 572, the Environmental Management Commission hereby establishes the goal of reducing the average annual load of nitrogen delivered to the Neuse River Estuary from point and nonpoint sources by a minimum of 30 percent of the average annual load for the period 1991 through 1995 by the year 2001. All waters of the Neuse River Basin have been supplementally classified as Nutrient Sensitive Waters (NSW) pursuant to 15A NCAC 2B .0223. The following rules shall be implemented in accordance with 15A NCAC 2B .0223 in all waters of the Neuse River Basin:

(1) Rule .0233 for protection and maintenance of riparian areas,
(2) Rule .0234 for wastewater discharges,
(3) Rule .0235 for urban stormwater management,
(4) Rules .0236 and .0238 for agricultural nitrogen reduction,
(5) Rule .0239 for nutrient management, and
(6) Rule .0240 for nitrogen offset fees.

(b) Failure to meet requirements of Rules .0233, .0234, .0235, .0236, .0238, .0239, and .0240 of this Section may result in imposition of enforcement measures as authorized by G.S. 143-215.6A (civil penalties), G.S. 143-215.6B (criminal penalties), and G.S. 143-215.6C (injunctive relief).

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.1; 143-215.3(a)(1); 143-215.6A; 143-215.6B; 143-215.6C;*
Eff. August 1, 1998.

15A NCAC 02B .0233 NEUSE RIVER BASIN: NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: PROTECTION AND MAINTENANCE OF EXISTING RIPARIAN BUFFERS

The following is the management strategy for maintaining and protecting existing riparian buffers in the Neuse River Basin.

(1) PURPOSE. The purpose of this Rule shall be to protect and preserve existing riparian buffers in the Neuse River Basin to maintain their nutrient removal functions.

(2) DEFINITIONS. For the purpose of this Rule, these terms shall be defined as follows:

(a) 'Channel' means a natural water-carrying trough cut vertically into low areas of the land surface by erosive action of concentrated flowing water or a ditch or canal excavated for the flow of water. (current definition in Forest Practice Guidelines Related to Water Quality, 15A NCAC 01I .0102)

(b) 'DBH' means Diameter at Breast Height of a tree, which is measured at 4.5 feet above ground surface level.

(c) 'Ditch or canal' means a man-made channel other than a modified natural stream constructed for drainage purposes that is typically dug through inter-stream divide areas. A ditch or canal may have flows that are perennial, intermittent, or ephemeral and may exhibit hydrological and biological characteristics similar to perennial or intermittent streams.

(d) 'Ephemeral (stormwater) stream' means a feature that carries only stormwater in direct response to precipitation with water flowing only during and shortly after large precipitation events. An ephemeral stream may or may not have a well-defined channel, the aquatic bed is always above the water table, and stormwater runoff is the primary source of water. An ephemeral stream typically lacks the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.

(e) 'Forest plantation' means an area of planted trees that may be conifers (pines) or hardwoods. On a plantation, the intended crop trees are planted rather than naturally regenerated from seed on the site, coppice (sprouting), or seed that is blown or carried into the site.

(f) 'High Value Tree' means a tree that meets or exceeds the following standards: for pine species, 14-inch DBH or greater or 18-inch or greater stump diameter; and, for hardwoods and wetland species, 16-inch DBH or greater or 24-inch or greater stump diameter.

(g) 'Intermittent stream' means a well-defined channel that contains water for only part of the year, typically during winter and spring when the aquatic bed is below the water table. The flow may be heavily supplemented by stormwater runoff. An intermittent stream often lacks the biological and hydrological characteristics commonly associated with the conveyance of water.

(h) 'Modified natural stream' means an on-site channelization or relocation of a stream channel and subsequent relocation of the intermittent or perennial flow as evidenced by topographic alterations in the immediate watershed. A modified natural stream must have the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.

(i) 'Perennial stream' means a well-defined channel that contains water year round during a year of normal rainfall with the aquatic bed located below the water table for most of the year. Groundwater is the primary source of water for a perennial stream, but it also carries stormwater runoff. A perennial stream exhibits the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.

(j) 'Perennial waterbody' means a natural or man-made basin that stores surface water permanently at depths sufficient to preclude growth of rooted plants, including lakes, ponds, sounds, non-stream estuaries and ocean. For the purpose of the State=s riparian buffer protection program, the waterbody must be part of a natural drainageway (i.e., connected by surface flow to a stream).

(k) 'Stream' means a body of concentrated flowing water in a natural low area or natural channel on the land surface.

(l) 'Surface water' means all waters of the state as defined in G.S. 143-212 except underground waters.

(m) 'Tree' means a woody plant with a DBH equal to or exceeding five inches.

(3) APPLICABILITY. This Rule shall apply to 50-foot wide riparian buffers directly adjacent to surface waters in the Neuse River Basin (intermittent streams, perennial streams, lakes, ponds, and estuaries), excluding wetlands. Except as described in Sub-Item (4)(a)(iii) of this Rule, wetlands adjacent to surface waters or within 50 feet of surface waters shall be considered as part of the riparian buffer but are regulated pursuant to 15A NCAC 02H .0506. The riparian buffers protected by this Rule shall be measured pursuant to Item (4) of this Rule. For the purpose of this Rule, a surface water shall be present if the feature is approximately shown on either the most recent version of the soil survey map prepared by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). Riparian buffers adjacent to surface waters that do not appear on either of the maps shall not be subject to this Rule. Riparian buffers adjacent to surface waters that appear on the maps shall be subject to this Rule unless one of the following applies.

(a) EXEMPTION WHEN AN ON-SITE DETERMINATION SHOWS THAT SURFACE WATERS ARE NOT PRESENT. When a landowner or other affected party believes that the maps have inaccurately depicted surface waters, he or she shall consult the Division or the appropriate delegated local authority. Upon request, the Division or delegated local authority shall make on-site determinations. Any disputes over on-site determinations shall be referred to the Director in writing. A determination of the Director as to the accuracy or application of the maps is subject to review as provided in Articles 3 and 4 of G.S. 150B. Surface waters that appear on the maps shall not be subject to this Rule if an on-site determination shows that they fall into one of the following categories.

(i) Ditches and manmade conveyances other than modified natural streams unless constructed for navigation or boat access.

(ii) Manmade ponds and lakes that are located outside natural drainage ways.

(iii) Ephemeral (stormwater) streams.

(b) EXEMPTION WHEN EXISTING USES ARE PRESENT AND ONGOING. This Rule shall not apply to portions of the riparian buffer where a use is existing and ongoing according to the following:

(i) A use shall be considered existing if it was present within the riparian buffer as of July 22, 1997. Existing uses shall include, but not be limited to, agriculture, buildings, industrial facilities, commercial areas, transportation facilities, maintained lawns, utility lines and on-site sanitary sewage systems. Only the portion of the riparian buffer that contains the footprint of the existing use is exempt from this Rule. Activities necessary to maintain uses are allowed provided that no additional vegetation is removed from Zone 1 except that grazed or trampled by livestock and existing diffuse flow is maintained. Grading and revegetating Zone 2 is allowed provided that the health of the vegetation in Zone 1 is not compromised, the ground is stabilized and existing diffuse flow is maintained.

(ii) At the time an existing use is proposed to be converted to another use, this Rule shall apply. An existing use shall be considered to be converted to another use if any of the following applies:

(A) Impervious surface is added to the riparian buffer in locations where it did not exist previously.

(B) An agricultural operation within the riparian buffer is converted to a non-agricultural use.

(C) A lawn within the riparian buffer ceases to be maintained.

(4) ZONES OF THE RIPARIAN BUFFER. The protected riparian buffer shall have two zones as follows:

(a) Zone 1 shall consist of a vegetated area that is undisturbed except for uses provided for in Item (6) of this Rule. The location of Zone 1 shall be as follows:

(i) For intermittent and perennial streams, Zone 1 shall begin at the most landward limit of the top of bank or the rooted herbaceous vegetation and extend landward a distance of 30 feet on all sides of the surface water, measured horizontally on a line perpendicular to the surface water.

(ii) For ponds, lakes and reservoirs located within a natural drainage way, Zone 1 shall begin at the most landward limit of the normal water level or the rooted herbaceous vegetation and extend landward a distance of 30 feet, measured horizontally on a line perpendicular to the surface water.

(iii) For surface waters within the 20 Coastal Counties (defined in 15A NCAC 02B .0202) within the jurisdiction of the Division of Coastal Management, Zone 1 shall begin at the most landward limit of:

(A) the normal high water level;

(B) the normal water level; or

(C) the landward limit of coastal wetlands as defined by the Division of Coastal Management;

and extend landward a distance of 30 feet, measured horizontally on a line perpendicular to the surface water, whichever is more restrictive.

(b) Zone 2 shall consist of a stable, vegetated area that is undisturbed except for activities and uses provided for in Item (6) of this Rule. Grading and revegetating Zone 2 is allowed provided that the health of the vegetation in Zone 1 is not compromised. Zone 2 shall begin at the outer edge of Zone 1 and extend landward 20 feet as measured horizontally on a line perpendicular to the surface water. The combined width of Zones 1 and 2 shall be 50 feet on all sides of the surface water.

(5) DIFFUSE FLOW REQUIREMENT. Diffuse flow of runoff shall be maintained in the riparian buffer by dispersing concentrated flow and reestablishing vegetation.

(a) Concentrated runoff from new ditches or manmade conveyances shall be converted to diffuse flow before the runoff enters the Zone 2 of the riparian buffer.

(b) Periodic corrective action to restore diffuse flow shall be taken if necessary to impede the formation of erosion gullies.

(6) TABLE OF USES. The following chart sets out the uses and their designation under this Rule as exempt, allowable, allowable with mitigation, or prohibited. The requirements for each category are given in Item (7) of this Rule.

	Exempt	Allowable	Allowable with Mitigation	Prohibited
Airport facilities: • Airport facilities that impact equal to or less than 150 linear feet or one-third of an acre of riparian buffer • Airport facilities that impact greater than 150 linear feet or one-third of an acre of riparian buffer		X	X	
Archaeological activities	X			
Bridges		X		
Dam maintenance activities	X			
Drainage ditches, roadside ditches and stormwater outfalls through riparian buffers: • Existing drainage ditches, roadside ditches, and stormwater outfalls provided that they are managed to minimize the sediment, nutrients and other pollution that convey to waterbodies • New drainage ditches, roadside ditches and stormwater outfalls provided that a stormwater management facility	X	X		

is installed to control nitrogen and attenuate flow before the conveyance discharges through the riparian buffer • New drainage ditches, roadside ditches and stormwater outfalls that do not provide control for nitrogen before discharging through the riparian buffer • Excavation of the streambed in order to bring it to the same elevation as the invert of a ditch				X X
Drainage of a pond in a natural drainage way provided that a new riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the new channel	X			
Driveway crossings of streams and other surface waters subject to this Rule: • Driveway crossings on single family residential lots that disturb equal to or less than 25 linear feet or 2, 500 square feet of riparian buffer • Driveway crossings on single family residential lots that disturb greater than 25 linear feet or 2,500 square feet of riparian buffer • In a subdivision that cumulatively disturb equal to or less than 150 linear feet or one-third of an acre of riparian buffer • In a subdivision that cumulatively disturb greater than 150 linear feet or one-third of an acre of riparian buffer	X	X X	X	
Fences provided that disturbance is minimized and installation does not result in removal of forest vegetation	X			
Forest harvesting - see Item (11) of this Rule				
Fertilizer application: • One-time fertilizer application to establish replanted vegetation • Ongoing fertilizer application	X			X
Grading and revegetation in Zone 2 only provided that diffuse flow and the health of existing vegetation in Zone 1 is not compromised and disturbed areas are stabilized	X			
Greenway/hiking trails		X		
Historic preservation	X			
Landfills as defined by G.S. 130A-290				X
Mining activities: • Mining activities that are covered by the Mining Act provided that new riparian buffers that meet the requirements of Items (4) and (5) of this Rule are established adjacent to the relocated channels • Mining activities that are not covered by the Mining Act OR where new riparian buffers that meet the requirements or Items (4) and (5) of this Rule are not established adjacent to the relocated channels • Wastewater or mining dewatering wells with approved NPDES permit	X	X	X	
Non-electric utility lines: • Impacts other than perpendicular crossings in Zone 2 only[3]		X		

• Impacts other than perpendicular crossings in Zone 1[3]			X	
Non-electric utility line perpendicular crossing of streams and other surface waters subject to this Rule[3]: • Perpendicular crossings that disturb equal to or less than 40 linear feet of riparian buffer with a maintenance corridor equal to or less than 10 feet in width • Perpendicular crossings that disturb greater than 40 linear feet of riparian buffer with a maintenance corridor greater than 10 feet in width • Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer with a maintenance corridor equal to or less than 10 feet in width • Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer with a maintenance corridor greater than 10 feet in width • Perpendicular crossings that disturb greater than 150 linear feet of riparian buffer	X	X X	X X	
On-site sanitary sewage systems - new ones that use ground absorption				X
Overhead electric utility lines: • Impacts other than perpendicular crossings in Zone 2 only[3] • Impacts other than perpendicular crossings in Zone 1 [1,2,3]	X X			
Overhead electric utility line perpendicular crossings of streams and other surface waters subject to this Rule[3] • Perpendicular crossings that disturb equal to or less than 150 linear feet of riparian buffer [1] • Perpendicular crossings that disturb greater than 150 linear feet of riparian buffer [1, 2]	X	X		
Periodic maintenance of modified natural streams such as canals and a grassed travelway on one side of the surface water when alternative forms of maintenance access are not practical		X		

[1] Provided that, in Zone 1, all of the following BMPs for overhead utility lines are used. If all of these BMPs are not used, then the overhead utility lines shall require a no practical alternatives evaluation by the Division.

- A minimum zone of 10 feet wide immediately adjacent to the water body shall be managed such that only vegetation that poses a hazard or has the potential to grow tall enough to interfere with the line is removed.
- Woody vegetation shall be cleared by hand. No land grubbing or grading is allowed.
- Vegetative root systems shall be left intact to maintain the integrity of the soil. Stumps shall remain where trees are cut.
- Rip rap shall not be used unless it is necessary to stabilize a tower.
- No fertilizer shall be used other than a one-time application to re-establish vegetation.
- Construction activities shall minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
- Active measures shall be taken after construction and during routine maintenance to ensure diffuse flow of stormwater through the buffer.
- In wetlands, mats shall be utilized to minimize soil disturbance.

[2] Provided that poles or towers shall not be installed within 10 feet of a water body unless the Division completes a no practical alternatives evaluation.

[3] Perpendicular crossings are those that intersect the surface water at an angle between 75 degrees and 105 degrees.

	Exempt	Allowable	Allowable with Mitigation	Prohibited
Playground equipment: • Playground equipment on single family lots provided that installation and use does not result in removal of vegetation • Playground equipment installed on lands other than single-family lots or that requires removal of vegetation	X	X		
Ponds in natural drainage ways, excluding dry ponds: • New ponds provided that a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the pond • New ponds where a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is NOT established adjacent to the pond		X	X	
Protection of existing structures, facilities and streambanks when this requires additional disturbance of the riparian buffer or the stream channel		X		
Railroad impacts other than crossings of streams and other surface waters subject to this Rule			X	
Railroad crossings of streams and other surface waters subject to this Rule: • Railroad crossings that impact equal to or less than 40 linear feet of riparian buffer • Railroad crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet or one-third of an acre of riparian buffer • Railroad crossings that impact greater than 150 linear feet or one-third of an acre of riparian buffer	X	X	X	
Removal of previous fill or debris provided that diffuse flow is maintained and any vegetation removed is restored	X			
Road impacts other than crossings of streams and other surface waters subject to this Rule			X	
Road crossings of streams and other surface waters subject to this Rule: • Road crossings that impact equal to or less than 40 linear feet of riparian buffer • Road crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet or one-third of an acre of riparian buffer • Road crossings that impact greater than 150 linear feet or one-third of an acre of riparian buffer	X	X	X	
Scientific studies and stream gauging	X			
Stormwater management ponds excluding dry ponds: • New stormwater management ponds provided that a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the pond • New stormwater management ponds where a riparian		X	X	

buffer that meets the requirements of Items (4) and (5) of this Rule is NOT established adjacent to the pond				
Stream restoration	X			
Streambank stabilization		X		
Temporary roads: • Temporary roads that disturb less than or equal to 2,500 square feet provided that vegetation is restored within six months of initial disturbance • Temporary roads that disturb greater than 2,500 square feet provided that vegetation is restored within six months of initial disturbance • Temporary roads used for bridge construction or replacement provided that restoration activities, such as soil stabilization and revegetation, are conducted immediately after construction	X	X X		
Temporary sediment and erosion control devices: • In Zone 2 only provided that the vegetation in Zone 1 is not compromised and that discharge is released as diffuse flow in accordance with Item (5) of this Rule • In Zones 1 and 2 to control impacts associated with uses approved by the Division or that have received a variance provided that sediment and erosion control for upland areas is addressed to the maximum extent practical outside the buffer • In-stream temporary erosion and sediment control measures for work within a stream channel	X X	X		
Underground electric utility lines: • Impacts other than perpendicular crossings in Zone 2 only[3] • Impacts other than perpendicular crossings in Zone 1[3,4]	X X			
Underground electric utility line perpendicular crossings of streams and other surface waters subject to this Rule:[3] • Perpendicular crossings that disturb less than or equal to 40 linear feet of riparian buffer[3,4] • Perpendicular crossings that disturb greater than 40 linear feet of riparian buffer[3,4]	X	X		

[4] Provided that, in Zone 1, all of the following BMPs for underground utility lines are used. If all of these BMPs are not used, then the underground utility line shall require a no practical alternatives evaluation by the Division.

- Woody vegetation shall be cleared by hand. No land grubbing or grading is allowed.
- Vegetative root systems shall be left intact to maintain the integrity of the soil. Stumps shall remain, except in the trench, where trees are cut.
- Underground cables shall be installed by vibratory plow or trenching.
- The trench shall be backfilled with the excavated soil material immediately following cable installation.
- No fertilizer shall be used other than a one-time application to re-establish vegetation.
- Construction activities shall minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
- Active measures shall be taken after construction and during routine maintenance to ensure diffuse flow of stormwater through the buffer.
- In wetlands, mats shall be utilized to minimize soil disturbance.

	Exempt	Allowable	Allowable with	Prohibited

			Mitigation	
Vegetation management: • Emergency fire control measures provided that topography is restored • Periodic mowing and harvesting of plant products in Zone 2 only • Planting vegetation to enhance the riparian buffer • Pruning forest vegetation provided that the health and function of the forest vegetation is not compromised • Removal of individual trees which are in danger of causing damage to dwellings, other structures or human life • Removal of poison ivy • Removal of understory nuisance vegetation as defined in: Smith, Cherri L. 1998. Exotic Plant Guidelines. Department of Environment and Natural Resources. Division of Parks and Recreation. Raleigh, NC. Guideline #30	X X X X X X X			
Water dependent structures as defined in 15A NCAC 02B .0202		X		
Water supply reservoirs: • New reservoirs provided that a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the reservoir • New reservoirs where a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is NOT established adjacent to the reservoir		X	X	
Water wells	X			
Wetland restoration	X			

(7) REQUIREMENTS FOR CATEGORIES OF USES. Uses designated as exempt, allowable, allowable with mitigation and prohibited in Item (6) of this Rule shall have the following requirements:

(a) EXEMPT. Uses designated as exempt are allowed within the riparian buffer. Exempt uses shall be designed, constructed and maintained to minimize soil disturbance and to provide the maximum water quality protection practicable. In addition, exempt uses shall meet requirements listed in Item (6) of this Rule for the specific use.

(b) ALLOWABLE. Uses designated as allowable may proceed within the riparian buffer provided that there are no practical alternatives to the requested use pursuant to Item (8) of this Rule. These uses require written authorization from the Division or the delegated local authority.

(c) ALLOWABLE WITH MITIGATION. Uses designated as allowable with mitigation may proceed within the riparian buffer provided that there are no practical alternatives to the requested use pursuant to Item (8) of this Rule and an appropriate mitigation strategy has been approved pursuant to Item (10) of this Rule. These uses require written authorization from the Division or the delegated local authority.

(d) PROHIBITED. Uses designated as prohibited may not proceed within the riparian buffer unless a variance is granted pursuant to Item (9) of this Rule. Mitigation may be required as one condition of a variance approval.

(8) DETERMINATION OF "NO PRACTICAL ALTERNATIVES." Persons who wish to undertake uses designated as allowable or allowable with mitigation shall submit a request for a "no practical alternatives" determination to the Division or to the delegated local authority. The applicant shall certify that the criteria identified in Sub-Item (8)(a) of this Rule are met. The Division or the

delegated local authority shall grant an Authorization Certificate upon a "no practical alternatives" determination. The procedure for making an Authorization Certificate shall be as follows:

(a) For any request for an Authorization Certificate, the Division or the delegated local authority shall review the entire project and make a finding of fact as to whether the following requirements have been met in support of a "no practical alternatives" determination:
    (i) The basic project purpose cannot be practically accomplished in a manner that would better minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    (ii) The use cannot practically be reduced in size or density, reconfigured or redesigned to better minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    (iii) Best management practices shall be used if necessary to minimize disturbance, preserve aquatic life and habitat, and protect water quality.

(b) Requests for an Authorization Certificate shall be reviewed and either approved or denied within 60 days of receipt of a complete submission based on the criteria in Sub-Item (8)(a) of this Rule by either the Division or the delegated local authority. Failure to issue an approval or denial within 60 days shall constitute that the applicant has demonstrated "no practical alternatives." The Division or the delegated local authority may attach conditions to the Authorization Certificate that support the purpose, spirit and intent of the riparian buffer protection program. Complete submissions shall include the following:
    (i) The name, address and phone number of the applicant;
    (ii) The nature of the activity to be conducted by the applicant;
    (iii) The location of the activity, including the jurisdiction;
    (iv) A map of sufficient detail to accurately delineate the boundaries of the land to be utilized in carrying out the activity, the location and dimensions of any disturbance in riparian buffers associated with the activity, and the extent of riparian buffers on the land;
    (v) An explanation of why this plan for the activity cannot be practically accomplished, reduced or reconfigured to better minimize disturbance to the riparian buffer, preserve aquatic life and habitat and protect water quality; and
    (vi) Plans for any best management practices proposed to be used to control the impacts associated with the activity.

(c) Any disputes over determinations regarding Authorization Certificates shall be referred to the Director for a decision. The Director's decision is subject to review as provided in Articles 3 and 4 of G.S. 150B.

(9) VARIANCES. Persons who wish to undertake uses designated as prohibited may pursue a variance. The Division or the appropriate delegated local authority may grant minor variances. The variance request procedure shall be as follows:

(a) For any variance request, the Division or the delegated local authority shall make a finding of fact as to whether the following requirements have been met:
    (i) There are practical difficulties or unnecessary hardships that prevent compliance with the strict letter of the riparian buffer protection requirements. Practical difficulties or unnecessary hardships shall be evaluated in accordance with the following:
        (A) If the applicant complies with the provisions of this Rule, he/she can secure no reasonable return from, nor make reasonable use of, his/her property. Merely proving that the variance would permit a greater profit from the property shall not be considered adequate justification for a variance. Moreover, the Division or delegated local authority shall consider whether the variance is the minimum possible deviation from the terms of this Rule that shall make reasonable use of the property possible.
        (B) The hardship results from application of this Rule to the property rather than from other factors such as deed restrictions or other hardship.

(C) The hardship is due to the physical nature of the applicant's property, such as its size, shape, or topography, which is different from that of neighboring property.

(D) The applicant did not cause the hardship by knowingly or unknowingly violating this Rule.

(E) The applicant did not purchase the property after the effective date of this Rule, and then requesting an appeal.

(F) The hardship is unique to the applicant's property, rather than the result of conditions that are widespread. If other properties are equally subject to the hardship created in the restriction, then granting a variance would be a special privilege denied to others, and would not promote equal justice;

(ii) The variance is in harmony with the general purpose and intent of the State's riparian buffer protection requirements and preserves its spirit; and

(iii) In granting the variance, the public safety and welfare have been assured water quality has been protected, and substantial justice has been done.

(b) MINOR VARIANCES. A minor variance request pertains to activities that are proposed only to impact any portion of Zone 2 of the riparian buffer. Minor variance requests shall be reviewed and approved based on the criteria in Sub-Item (9)(a) of this Rule by the either the Division or the delegated local authority pursuant to G.S. 153A Article 18, or G.S. 160A-Article 19. The Division or the delegated local authority may attach conditions to the variance approval that support the purpose, spirit and intent of the riparian buffer protection program. Requests for appeals of decisions made by the Division shall be made to the Office of Administrative Hearings. Request for appeals made by the delegated local authority shall be made to the appropriate Board of Adjustment under G.S. 160A-388 or G.S. 153A-345.

(c) MAJOR VARIANCES. A major variance request pertains to activities that are proposed to impact any portion of Zone 1 or any portion of both Zones 1 and 2 of the riparian buffer. If the Division or the delegated local authority has determined that a major variance request meets the requirements in Sub-Item (9)(a) of this Rule, then it shall prepare a preliminary finding and submit it to the Commission. Preliminary findings on major variance requests shall be reviewed by the Commission within 90 days after receipt by the Director. Requests for appeals of determinations that the requirements of Sub-Item (9)(a) of this Rule have not been met shall be made to the Office of Administrative Hearings for determinations made by the Division or the appropriate Board of Adjustments under G.S. 160A-388 or G.S. 153A-345 for determinations made by the delegated local authority. The purpose of the Commission's review is to determine if it agrees that the requirements in Sub-Item (9)(a) of this Rule have been met. Requests for appeals of decisions made by the Commission shall be made to the Office of Administrative Hearings. The following actions shall be taken depending on the Commission's decision on the major variance request:

(i) Upon the Commission's approval, the Division or the delegated local authority shall issue a final decision granting the major variance.

(ii) Upon the Commission's approval with conditions or stipulations, the Division or the delegated local authority shall issue a final decision, which includes these conditions or stipulations.

(iii) Upon the Commission's denial, the Division or the delegated local authority shall issue a final decision denying the major variance.

(10) MITIGATION. Persons who wish to undertake uses designated as allowable with mitigation shall meet the following requirements in order to proceed with their proposed use.

(a) Obtain a determination of "no practical alternatives" to the proposed use pursuant to Item (8) of this Rule.

(b) Obtain approval for a mitigation proposal pursuant to 15A NCAC 02B .0242.

(11) REQUIREMENTS SPECIFIC TO FOREST HARVESTING. The following requirements shall apply for forest harvesting operations and practices.

(a) The following measures shall apply in the entire riparian buffer:

(i) Logging decks and sawmill sites shall not be placed in the riparian buffer.

(ii) Access roads and skid trails shall be prohibited except for temporary and permanent stream crossings established in accordance with 15A NCAC 01I .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.

(iii) Timber felling shall be directed away from the stream or water body.

(iv) Skidding shall be directed away from the stream or water body and shall be done in a manner that minimizes soil disturbance and prevents the creation of channels or ruts.

(v) Individual trees may be treated to maintain or improve their health, form or vigor.

(vi) Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation shall be allowed. These practices must be approved by the Division of Forest Resources for a specific site. The Division of Forest Resources must notify the Division of all approvals.

(vii) Removal of individual trees that are in danger of causing damage to structures or human life shall be allowed.

(viii) Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the riparian buffer shall be allowed provided that soil disturbance is minimized. Plantings shall consist primarily of native species.

(ix) High intensity prescribed burns shall not be allowed.

(x) Application of fertilizer shall not be allowed except as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stand shall be conducted so that the chemicals are not applied directly to or allowed to drift into the riparian buffer.

(b) In Zone 1, forest vegetation shall be protected and maintained. Selective harvest as provided for below is allowed on forest lands that have a deferment for use value under forestry in accordance with G.S. 105-277.2 through G.S. 277.6 or on forest lands that have a forest management plan prepared or approved by a registered professional forester. Copies of either the approval of the deferment for use value under forestry or the forest management plan shall be produced upon request. For such forest lands, selective harvest is allowed in accordance with the following:

(i) Tracked or wheeled vehicles are not permitted except at stream crossings designed, constructed and maintained in accordance with 15A NCAC 01I .0203.

(ii) Soil disturbing site preparation activities are not allowed.

(iii) Trees shall be removed with the minimum disturbance to the soil and residual vegetation.

(iv) The following provisions for selective harvesting shall be met:

(A) The first 10 feet of Zone 1 directly adjacent to the stream or waterbody shall be undisturbed except for the removal of individual high value trees as defined provided that no trees with exposed primary roots visible in the streambank be cut.

(B) In the outer 20 feet of Zone 1, a maximum of 50 percent of the trees greater than five inches dbh may be cut and removed. The reentry time for harvest shall be no more frequent than every 15 years, except on forest plantations where the reentry time shall be no more frequent than every five years. In either case, the trees remaining after harvest shall be as evenly spaced as possible.

(C) In Zone 2, harvesting and regeneration of the forest stand shall be allowed provided that sufficient ground cover is maintained to provide for diffusion and infiltration of surface runoff.

(12) REQUIREMENTS SPECIFIC TO LOCAL GOVERNMENTS WITH STORMWATER PROGRAMS FOR NITROGEN CONTROL. Local governments that are required to have local stormwater programs pursuant to 15A NCAC 02B .0235 shall have two options for ensuring protection of riparian buffers on new developments within their jurisdictions as follows.

(a) Obtain authority to implement a local riparian buffer protection program pursuant to 15A NCAC 02B .0241.

(b) Refrain from issuing local approvals for new development projects unless either:

(i) The person requesting the approval does not propose to impact the riparian buffer of a surface water that appears on either the most recent versions of the soil survey maps prepared by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent versions of the 1:24,000 scale (7.5 minute quadrangle) topographic maps prepared by the United States Geologic Survey (USGS).

(ii) The person requesting the approval proposes to impact the riparian buffer of a surface water that appears on the maps described in Sub-Item (12)(b)(i) of this Rule and either:

(A) Has received an on-site determination from the Division pursuant to Sub-Item (3)(a) of this Rule that surface waters are not present;

(B) Has received an Authorization Certificate from the Division pursuant to Item (8) of this Rule for uses designated as Allowable under this Rule;

(C) Has received an Authorization Certificate from the Division pursuant to Item (8) of this Rule and obtained the Division's approval on a mitigation plan pursuant to Item (10) of this Rule for uses designated as Allowable with Mitigation under this Rule; or

(D) Has received a variance from the Commission pursuant to Item (9) of this Rule.

(13) OTHER LAWS, REGULATIONS AND PERMITS. In all cases, compliance with this Rule does not preclude the requirement to comply with all federal, state and local regulations and laws.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1); S.L. 1995, c. 572;*
Temporary Adoption Eff. July 22, 1997;
Temporary Adoption Eff. June 22, 1999; April 22, 1998; January 22, 1998;
Eff. August 1, 2000.

15A NCAC 02B .0234 NEUSE RIVER BASIN - NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: WASTEWATER DISCHARGE REQUIREMENTS

The following is the National Pollutant Discharge Elimination System (NPDES) wastewater discharge management strategy for the Neuse River Basin:

(1) Purpose. The purpose of this Rule is to establish minimum nutrient control requirements for point source discharges in the Neuse River Basin in order to maintain or restore the water quality in the Neuse River Estuary and protect its designated uses.

(2) Applicability. This Rule applies to all wastewater treatment facilities in the Neuse River Basin that receive nitrogen-bearing wastewater and are required to obtain individual NPDES permits.

(3) Definitions. For the purposes of this Rule, the following definitions apply:

(a) In regard to point source dischargers, treatment facilities, wastewater flows or discharges, or like matters:

(i) "Existing" means that which obtained a NPDES permit on or before December 31, 1995.

(ii) "Expanding" means that which increases beyond its permitted flow as defined in this Rule.

(iii) "New" means that which had not obtained a NPDES permit on or before December 31, 1995.

(b) "MGD" means million gallons per day.

(c) "Nitrogen wasteload allocation" is that portion of the Neuse River nitrogen TMDL assigned to individually permitted wastewater facilities in the basin and represents the maximum allowable load of total nitrogen to the estuary from these point source dischargers.

(d) "Nitrogen estuary allocation" or "estuary allocation" means the mass loading of total nitrogen at the estuary that is reserved for a discharger or group of dischargers. A discharger's or group's estuary allocation is equivalent to its discharge allocation multiplied by its assigned transport factor.

(e) "Nitrogen discharge allocation" or "discharge allocation" means the mass loading of total nitrogen at the point(s) of discharge that is reserved for a discharger or group of dischargers. A discharger's or group's discharge allocation is equivalent to its estuary allocation divided by its assigned transport factor.

(f) "Nitrogen TMDL," or "TMDL," means the total nitrogen load to the Neuse River estuary that is predicted to maintain adequate water quality to support all designated uses in the estuary and is approved by the United States Environmental Protection Agency in accordance with the federal Clean Water Act.

(g) "Nonpoint source load allocation" is that portion of the Neuse River nitrogen TMDL assigned to all other nitrogen sources in the basin other than individually permitted wastewater facilities and represents the maximum allowable load of total nitrogen to the estuary from these nonpoint sources.

(h) "Permitted flow" means the maximum monthly average flow authorized in a facility's NPDES permit as of December 31, 1995, with the following exceptions:

Facility Name	NPDES No.	Permitted Flow (MGD)
Benson	NC0020389	3.00
Goldsboro	NC0023949	16.80
Kenly	NC0064891	0.63
Snow Hill	NC0020842	0.50
Wilson	NC0023906	14.00

(i) "Total nitrogen" means the sum of the organic, nitrate, nitrite, and ammonia forms of nitrogen.

(j) "Transport factor" is the fraction of the total nitrogen in a discharge that is predicted to reach the estuary.

(4) This Item specifies the nitrogen wasteload allocation for point sources.

(a) Beginning with the calendar year 2003, the nitrogen wasteload allocation for point sources shall not exceed 1.64 million pounds per calendar year plus any portion of the nonpoint

source load allocation purchased in accordance with the provisions in Items (7) and (8) of this Rule and 15A NCAC 02B .0240.

(b) The Commission shall order future revisions in the nitrogen wasteload allocation whenever necessary to ensure that water quality in the estuary meets all standards in 15A NCAC 02B .0200 or to conform with applicable state or federal requirements.

(5) This Item specifies nitrogen discharge allocations for point sources.

(a) Upon adoption of this Rule and until revised as provided elsewhere in this Rule, the following group and individual discharge allocations for total nitrogen shall apply in order to comply with the nitrogen wasteload allocation for point sources in Item (4) of this Rule:

(i) Dischargers with permitted flows less than 0.5 MGD shall be assigned collectively an annual discharge allocation of 138,000 pounds of total nitrogen.

(ii) Dischargers upstream of Falls Lake Dam and with permitted flows greater than or equal to 0.5 MGD shall be assigned collectively an annual discharge allocation of 443,700 pounds of total nitrogen.

(iii) Municipal dischargers downstream of Falls Lake Dam and with permitted flows greater than or equal to 0.5 MGD shall be assigned collectively an annual discharge allocation of 2,021,400 pounds of total nitrogen.

(iv) Industrial dischargers downstream of Falls Lake Dam and with permitted flows greater than or equal to 0.5 MGD shall be assigned collectively an annual discharge allocation of 396,900 pounds of total nitrogen.

(v) Within each group in Sub-Items (i) - (iv) of this Item, each individual discharger shall be assigned an individual discharge allocation and the equivalent estuary allocation. Each discharger's discharge allocation shall be calculated as its permitted flow divided by the total permitted flow of the group, multiplied by the group discharge allocation.

(b) In the event that the nitrogen wasteload allocation for point sources is revised, as provided in Item (4) of this Rule, the Commission shall apportion the revised load among the existing facilities and shall revise discharge allocations as needed. The Commission may consider such factors as:

(i) fate and transport of nitrogen in the river basin;

(ii) technical feasibility and economic reasonableness of source reduction and treatment methods;

(iii) economies of scale;

(iv) nitrogen control measures already implemented;

(v) probable need for growth and expansion;

(vi) incentives for responsible planning, utilities management, resource protection, and cooperative efforts among dischargers; and

(vii) other factors the Commission deems relevant.

(6) This Item specifies nutrient controls for existing facilities.

(a) Beginning with calendar year 2003, each discharger with a permitted flow equal to or greater than 0.5 MGD shall be subject to a total nitrogen permit limit equal to its individual discharge allocation, pursuant to Item (5) of this Rule.

(b) Effective January 1, 2003, dischargers shall be subject to the following limits for total phosphorus:

(i) All existing facilities above Falls Lake Dam with permitted flows greater than or equal to 0.05 MGD shall meet a quarterly average total phosphorus limit of 2 mg/L.

(ii) All existing facilities below Falls Lake Dam with permitted flows greater than or equal to 0.5 MGD shall meet a quarterly average total phosphorus limit of 2 mg/L.

(c) The director shall establish more stringent limits for nitrogen or phosphorus upon finding that such limits are necessary to protect water quality standards in localized areas.

(7) This Item specifies nutrient controls for new facilities.

(a) New facilities proposing to discharge wastewater shall evaluate all practical alternatives to surface water discharge, pursuant to 15A NCAC 02H .0105(c)(2), prior to submitting an application to discharge.

(b) New facilities submitting an application shall make every reasonable effort to obtain estuary allocation for the proposed wastewater discharge from existing dischargers. If estuary allocation cannot be obtained from the existing facilities, new facilities may purchase a portion of the nonpoint source load allocation for a period of 30 years at a rate of 200 percent of the cost as set in 15A NCAC 02B .0240 to implement practices designed to offset the loading created by the new facility. Payment for each 30-year portion of the nonpoint source load allocation shall be made prior to the ensuing permit issuance.

(c) No application for a new discharge shall be made or accepted without written documentation demonstrating that the requirements of Sub-Items (a) and (b) of this Item have been met.

(d) The nitrogen discharge allocation for a new facility treating municipal or domestic wastewaters shall not exceed the mass equivalent to a concentration of 3.5 mg/L at the maximum monthly average flow limit in the facility's NPDES permit.

(e) The nitrogen discharge allocation for a new facility treating industrial wastewaters shall not exceed the mass equivalent of either the best available technology economically achievable or a discharge concentration of 3.2 mg/L at the maximum monthly average flow limit in the facility's NPDES permit, whichever is less.

(f) New dischargers must meet a monthly average total phosphorous limit of 1 mg/L.

(g) The director shall establish more stringent limits for nitrogen or phosphorus upon finding that such limits are necessary to protect water quality standards in localized areas.

(8) This Item specifies nutrient controls for expanding facilities.

(a) Expanding facilities shall evaluate all practical alternatives to surface water discharge, pursuant to 15A NCAC 02H .0105(c)(2), prior to submitting an application to discharge.

(b) Facilities submitting an application for increased discharge shall make every reasonable effort to minimize increases in their nitrogen discharges, such as reducing sources of nitrogen to the facility or increasing the nitrogen treatment capacity of the facility; or to obtain estuary allocation from existing dischargers.

(c) No application for an expanding facility shall be made or accepted without written documentation demonstrating that the requirements of Sub-Items (a) and (b) of this Item have been met.

(d) If these measures do not produce adequate estuary allocation for the expanded flows, facilities may purchase a portion of the nonpoint source load allocation for a period of 30 years at a rate of 200 percent of the cost as set in 15A NCAC 02B .0240 to implement practices designed to offset the loading created by the new facility. Payment for each 30-year portion of the nonpoint source load allocation shall be made prior to the ensuing permit issuance.

(e) The nitrogen discharge allocation for an expanded facility treating municipal or domestic wastewaters shall not exceed the mass equivalent to a concentration of 3.5 mg/L at the maximum monthly average flow limit in the NPDES permit, or its existing allocation, whichever is greater.

(f) The nitrogen discharge allocation for expanding facilities of an industrial nature shall not exceed the mass equivalent to the best available technology economically achievable or a concentration of 3.2 mg/L at the maximum monthly average flow limit in the facility's modified NPDES permit, whichever is less. If the resulting mass is less than the facility's existing discharge allocation, the existing discharge allocation shall not be reduced.

(g) Expanding facilities must meet a monthly average total phosphorous limit of 1 mg/L unless they are a member in good standing of a group compliance association described in Item (9) of this Rule, in which case they must meet a quarterly average total phosphorus limit of 2 mg/L.

(h) The director shall establish more stringent limits for nitrogen or phosphorus upon finding that such limits are necessary to protect water quality standards in localized areas.

(9) This Item describes the option for dischargers to join a group compliance association to collectively meet nutrient load allocations.

(a) Any or all facilities within the basin may form a group compliance association to meet nitrogen estuary allocations collectively. Any such association must apply for and shall be subject to an NPDES permit that establishes the effective total nitrogen allocations for the

association and for its members. More than one group compliance association may be established. No facility may belong to more than one association at a time.

(b) No later than 180 days prior to expiration of the association NPDES permit, the association and its members shall submit an application for a NPDES permit for the discharge of total nitrogen to the surface waters of the Neuse River Basin. The NPDES permit shall be issued to the association and its members as co-permittees ("association NPDES permit"). It shall contain the association's estuary allocation and individual estuary allocations for each of the members.

(c) An association's estuary allocation of total nitrogen shall be the sum of its members' individual estuary allocations plus any other estuary allocation obtained by the association or its members.

(d) An association may reapportion the individual estuary allocations of its members on an annual basis. The association NPDES permit shall be modified to reflect the revised individual estuary allocations.

(e) Beginning in calendar year 2003, if an association does not meet its estuary allocation, it shall make offset payments for nonpoint source controls no later than May 1 of the following year at the rate set in 15A NCAC 02B .0240.

(f) Association members shall be exempted from the permit limits for total nitrogen contained in their individually issued NPDES permits so long as they remain members in an association. Association members shall be exempted from their individual estuary allocations in the association NPDES permit as long as the association is in compliance with its estuary allocation. If the association fails to meet its estuary allocation, the association and the members that have failed to meet their individual estuary allocations in the association NPDES permit will be out of compliance with the association NPDES permit.

(10) Regional Facilities. In the event that an existing discharger or group of dischargers accepts wastewater from another NPDES-permitted treatment facility in the Neuse River Basin and that acceptance results in the elimination of the discharge from the treatment facility, the eliminated facility's total nitrogen estuary allocation shall be transferred and added to the accepting discharger's estuary allocation.

History Note: *Authority G.S. 143-214.1; 143-215; 143-215.1; 143-215.3(a) (1); S.L. 1995, c. 572;*
Temporary Adoption Eff. January 22, 1998;
Eff. August 1, 1998;
Temporary Amendment Eff. March 15, 2000;
Temporary Amendment Expired on December 10, 2000;
Amended Eff. April 1, 2003.

15A NCAC 02B .0235 NEUSE RIVER BASIN-NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: BASINWIDE STORMWATER REQUIREMENTS

The following is the urban stormwater management strategy for the Neuse River Basin:

(1) The following local governments are designated, based on population and other factors, as parties responsible for implementing stormwater management requirements as part of the Neuse River Nutrient Sensitive Waters stormwater management strategy:
   (a) Cary,
   (b) Durham,
   (c) Garner,
   (d) Goldsboro,
   (e) Havelock,
   (f) Kinston,
   (g) New Bern,
   (h) Raleigh,
   (i) Smithfield,
   (j) Wilson,
   (k) Durham County,
   (l) Johnston County,
   (m) Orange County,
   (n) Wake County, and
   (o) Wayne County.

(2) Other incorporated areas and other counties, not listed under Item (1) of this Rule, may seek to implement their own local stormwater management plan by complying with the requirements specified in Items (5) and (6) of this Rule.

(3) The Environmental Management Commission may designate additional local governments by amending this Rule based on their potential to contribute significant nutrient loads to the Neuse River. At a minimum, the Commission shall review the need for additional designations to the stormwater management program as part of the basinwide planning process for the Neuse River Basin. Any local governments that are designated at a later date under the Neuse Nutrient Sensitive Waters Stormwater Program shall meet the requirements under Items (5) and (6) of this Rule.

(4) Local stormwater programs shall address nitrogen reductions for both existing and new development and include the following elements:
   (a) Review and approval of stormwater management plans for new developments to ensure that:
      (i) the nitrogen load contributed by new development activities is held at 70 percent of the average nitrogen load contributed by the 1995 land uses of the non-urban areas of the Neuse River Basin. The local governments shall use a nitrogen export standard of 3.6 pounds/acre/year, determined by the Environmental Management Commission as 70 percent of the average collective nitrogen load for the 1995 non-urban land uses in the basin above New Bern. The EMC may periodically update the design standard based on the availability of new scientific information. Developers shall have the option of offsetting part of their nitrogen load by funding offsite management measures by making payment to the NC Ecosystem Enhancement Program or to another seller of offset credits approved by the Division or may implement other offset measures contingent upon approval by the Division. Offset payments shall meet the requirements of Rule .0240 of this Section, which establishes procedural requirements for nutrient offset payments. However, before using offset payments, the development must attain, at a minimum, a nitrogen export that does not exceed 6 pounds/acre/year for residential development and 10 pounds/acre/year for commercial or industrial development;
      (ii) For the following local governments and any additional local governments identified in rule by the Commission, the post-construction requirements of 15 NCAC 02B .0277 shall supersede the requirements in this Sub-item for areas within their jurisdiction within the watershed of the Falls of the Neuse Reservoir: Durham, Raleigh, Durham County, Orange County, and Wake County; and

(iii) there is no net increase in peak flow leaving the site from the predevelopment conditions for the 1-year, 24-hour storm.

(b) Review of new development plans for compliance with requirements for protecting and maintaining existing riparian areas as specified in 15A NCAC 02B .0233;

(c) Implementation of public education programs;

(d) Identification and removal of illegal discharges;

(e) Identification of suitable locations for potential stormwater retrofits (such as riparian areas) that could be funded by various sources; and

(f) Submittal of an annual report on October 30 to the Division documenting progress on and net changes to nitrogen load from the local government's planning jurisdiction.

(5) Local governments shall implement stormwater management programs according to their plans approved by the Commission as of March 2001. Local governments administering a stormwater management program shall submit annual reports to the Division documenting their progress and net changes to nitrogen load by October 30 of each year.

(6) If a local government fails to properly implement an approved plan, then stormwater management requirements for existing and new urban areas within its jurisdiction shall be administered through the NPDES municipal stormwater permitting program per 15A NCAC 02H .0126:

(a) Subject local governments shall develop and implement comprehensive stormwater management programs, tailored toward nitrogen reduction, for both existing and new development.

(b) These stormwater management programs shall provide all components that are required of local government stormwater programs in Sub-items (4)(a) through (f) of this Rule.

(c) Local governments that are subject to an NPDES permit shall be covered by the permit for at least one permitting cycle (five years) before they are eligible to submit a local stormwater management program for consideration and approval by the EMC.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.1; 143-215.3(a)(1); S.L. 1995, c. 572;*
Eff. August 1, 1998;
Amended Eff. January 15, 2011 (this permanent rule replaces the temporary rule approved by the RRC on December 16, 2010).

15A NCAC 02B .0236 NEUSE RIVER BASIN-NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: AGRICULTURAL NITROGEN LOADING REDUCTION

All persons engaging in agricultural operations in the Neuse River Basin, including those related to crops, livestock, and poultry, shall collectively achieve and maintain a 30 percent net total nitrogen loading reduction from the cumulative average 1991-1995 nitrogen loadings. In addition to requirements set forth in general permits for animal operations issued pursuant to G.S. 143-215.10C, these Rules apply to all livestock and poultry operations, regardless of size, in the Neuse River Basin. A management strategy to achieve this reduction is specified in Rule .0238 of this Rule.

History Note: *Authority G.S. 143.214.1; 143.214.7; 143.215.3(a)(1).*
Eff. August 1, 1998.

15A NCAC 02B .0238 NEUSE RIVER BASIN-NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: AGRICULTURAL NITROGEN REDUCTION STRATEGY

The following requirements apply to all persons in the Neuse River Basin who engage in agricultural operations. Agricultural operations are activities which relate to the production of crops, livestock, and poultry.

(1) All persons engaging in agricultural operations in the Neuse River Basin shall collectively achieve and maintain a 30 percent net total nitrogen loading reduction from the cumulative average 1991-1995 nitrogen loadings within five years from the effective date of this Rule. Persons subject to this Rule are provided with two options for meeting the requirements of this Rule. The first option is to sign-up for and participate in implementing a collective local strategy for agricultural nitrogen reduction as described in Item (7) of this Rule. This option allows site-specific plans to be developed for those operations where further nitrogen reduction practices are necessary to achieve the collective reduction goal. The second option requires the implementation of standard Best Management Practices as specified in Item (8) of this Rule. Failure to meet requirements of this Rule may result in imposition of enforcement measures as authorized by G.S. 143-215.6A (civil penalties), G.S. 143-215.6B (criminal penalties), and G.S. 143-215.6C (injunctive relief).

(2) Formation and membership of the Basin Oversight Committee. The Environmental Management Commission shall delegate to the Secretary of the Department of Environment and Natural Resources the responsibility of forming a Basin Oversight Committee.

(a) The Secretary shall solicit one nomination for membership on this Committee from each of the following agencies:

(i) Division of Soil and Water Conservation,

(ii) United States Department of Agriculture- Natural Resources Conservation Service,

(iii) North Carolina Department of Agriculture,

(iv) North Carolina Cooperative Extension Service, and

(v) Division of Water Quality.

(b) The Secretary shall also solicit one nomination that represents environmental interests, one nomination that represents agricultural interests, and one from the scientific community with experience related to water quality problems in the Neuse River Basin.

(c) The Secretary, Department of Environment and Natural Resources, shall appoint members of the Basin Oversight Committee from the nominees provided in Sub-Items (2)(a) and (2)(b) of this Rule. Members shall be appointed for a term not to exceed five years and shall serve at the pleasure of the Secretary. The United States Department of Agriculture-Natural Resources Conservation Service member shall serve in an "ex-officio" non-voting capacity and shall function as a technical program advisor to the Committee.

(3) Role of the Basin Oversight Committee. The Environmental Management Commission shall delegate the following responsibilities to the Basin Oversight Committee.

(a) Develop a tracking and accounting methodology, as described below, for evaluating total nitrogen loading from agricultural operations and progress toward reaching the total nitrogen net loading reduction from the implementation BMPs within the Neuse River Basin. The accountability methodology must demonstrate how the nitrogen loading reduction can be met collectively by implementing best management practices approved by the Soil and Water Conservation Commission that include, but are not limited to, water control structures, riparian area establishment, and nutrient management.

(b) Submit a draft accountability process in accordance with the requirements in Sub-Items (3)(a) and (3)(c) of this Rule to the Environmental Management Commission for review within six months after the effective date of the rule and the final accountability process to the Environmental Management Commission for approval within one year after the effective date of the rule. The Environmental Management Commission shall approve the accountability process if it meets requirements in Sub-Items (3)(a) and (3)(c) of this Rule. If the Basin Oversight Committee fails to submit an approvable accountability process to the Environmental Management Commission, then the Environmental Management Commission may accept alternative accountability process proposals within 15 months of the effective date of this Rule. If the Environmental Management Commission fails to receive an approvable accountability process, then the Environmental Management Commission may

require all agricultural operations to follow the standard Best Management Practices option as specified in Item (8) of this Rule.

(c) Include in the accountability process a method to accurately track implementation of BMPs, including location and type of BMPs; to estimate nitrogen reductions from BMP implementation; to quantify increases or decreases in nitrogen loading due to changes in land use, modified agricultural activity, or atmospheric nitrogen loading, based on the best available scientific information; to ensure operation and maintenance of BMPs, including year round management for water control structures; to address life expectancy of BMPs; and a method to ensure maintenance of the nitrogen net loading reduction after the initial five years of this Rule, including substitute BMPs to replace expired practices and additional BMPs to offset new sources of nitrogen.

(d) Calculate a separate total nitrogen loading for agricultural lands in the Neuse River Basin above and below New Bern based on the average of 1991-1995 conditions. Based on this loading, calculate a separate 30 percent net reduction. Loading calculations must include atmospheric emissions and deposition of nitrogen from agricultural lands based on the best available scientific information. Allocate to counties or watersheds, as allowed in Sub-Item (4)(a) of this Rule, within the Neuse River Basin their portion of the calculated nitrogen loading reduction from agricultural operations, including any division of the reduction between specific categories of agricultural operations. Each county or watershed may not have to reduce individually its nitrogen loading by 30 percent; however, the nitrogen loading reduction from all counties or watershed above New Bern shall collectively meet their total nitrogen reduction and all counties or watersheds below New Bern shall collectively meet their total nitrogen reduction. If the Basin Oversight Committee fails to allocate the nitrogen loading reductions from agricultural operations to counties or watersheds within the Neuse River Basin, the Environmental Management Commission may assign the agricultural nitrogen reductions based on the approved accountability process as described in Sub-Items (3)(a) and (3)(c) of this Rule.

(e) Review, approve and summarize county nitrogen reduction strategies and present these strategies to the Environmental Management Commission for approval within two years from the effective date of this Rule.

(f) Review, approve and summarize local nitrogen reduction annual reports and present these reports to the Environmental Management Commission each October. Information to be included in the Annual Report is described in Item (5)(d) of this Rule.

(4) Formation and membership of the Local Advisory Committees. The Environmental Management Commission shall delegate to the Directors of the Division of Water Quality and Division of Soil and Water Conservation the responsibility of forming Local Advisory Committees.

(a) The Directors shall form Local Advisory Committees in each county (or watershed specified by the Basin Oversight Committee) within the Neuse River Basin. The Directors shall solicit nominations for membership on the Local Advisory Committee from each of the following local agencies:

(i) Soil and Water Conservation District,
(ii) United States Department of Agriculture- Natural Resources Conservation Service,
(iii) North Carolina Department of Agriculture,
(iv) North Carolina Cooperative Extension Service,
(v) North Carolina Division of Soil and Water Conservation, and
(vi) The Directors shall also solicit at least two nominations that represents a local farmer in the county watershed.

The Soil and Water Conservation District may be designated by the Basin Oversight Committee as the lead agency on the Local Advisory Committee.

(b) The Environmental Management Commission and Soil and Water Conservation Commission shall appoint members of Local Advisory Committee from the nominees provided in Sub-Item (4)(a) of this Rule and shall be appointed for a term not to exceed five years and shall serve at the pleasure of the Commissions.

(5) Role of the Local Advisory Committees. The Environmental Management Commission shall delegate the following responsibilities to employees of the Department who are members of the Local Advisory

Committees and employees of the Division of Soil and Water Conservation or its designee. These employees shall act with advice from the Local Advisory Committees.

(a) Conduct a sign-up process for persons wishing to voluntarily implement the local nitrogen reduction strategy as specified in Item (7) of this Rule. This sign-up process shall be completed within one year following the effective date of this Rule.

(b) Develop local nitrogen reduction strategies that meet the nitrogen loading reduction goal for agricultural operations assigned by the Basin Oversight Committee. The local strategies shall be designed to achieve the required nitrogen loading reduction within five years from the effective date of this Rule. A matrix of best management practice options, which account for stream order, floodplain width, and regional variations in soil types and topography, may be used in developing the local nitrogen reduction strategies. Local nitrogen reduction strategies must specify the name and location of participant agricultural farming operations, BMPs which will be required as part of the plan, estimated nitrogen reduction, schedule for BMP implementation, and operation and maintenance requirements. If the Local Advisory Committee fails to develop the local nitrogen reduction strategy, the Environmental Management Commission may develop the strategy based on the tracking and accounting method approved by the Environmental Management Commission.

(c) Submit an annual report to the Basin Oversight Committee each May on net total nitrogen loading reductions from agricultural operations, the implementation of BMPs for nitrogen control, and progress towards the total nitrogen loading reduction requirements in the Neuse River Basin above and below New Bern.

(d) Include in the annual report, at a minimum, documentation on the BMPs implemented (including type and location), their costs, documentation of any expired contracts for BMPs, estimated nitrogen net loading reductions achieved as a result of those BMPs, any increases or decreases in nitrogen loading resulting from changes in land use or modified agricultural-related activity, discussion of operation and maintenance of BMPs, and a summary of the estimated load from agricultural operations for the previous year, and any modifications to the accounting methodology. Information shall be provided in the annual report on the status of BMP implementation and estimated total nitrogen reduction by all agricultural operations within the Neuse River Basin in each county or watershed. The annual report shall also be summarized separately for cropland, livestock and poultry activities.

(6) Options for meeting the collective total nitrogen net loading reduction requirement. Each agricultural operation in the Neuse River Basin shall have two options for meeting the requirements of this Rule. The options are to either implement a local nitrogen reduction strategy, specified by Item (7) of this Rule, or implement standard Best Management Practices specified by Item (8) of this Rule.

(7) Local nitrogen reduction strategy option. All persons subject to this Rule that choose to implement the county nitrogen reduction plan must complete the sign-up process that will be conducted per the requirements of Item (5)(a) of this Rule. This sign-up process will be completed within one year from the effective date of this Rule. If a person subject to this Rule does not complete the sign-up process, he shall be subject to implementation of Best Management Practices as specified in Item (8) of this Rule. Persons who choose to participate in the local nitrogen reduction strategy must commit and implement their portion of the plan within five years of the effective date of this Rule. A person may withdraw from the local nutrient reduction strategy up until the time that the local strategy is finalized by the Local Advisory Committee and the person signs the specific plan for his property, which represents his commitment to implement the plan within five years of the effective date of the rules. After a person has made the commitment to implement the local strategy by signing the plan for his property, then such persons may not withdraw from the local nitrogen reduction strategy during the initial five-year period. The local nitrogen reduction strategy is not required to be more stringent than the standard best management practice option provided that the net nitrogen reduction goals are met collectively; however, the Local Advisory Committees may develop strategies that achieve reductions of greater than 30 percent.

(8) Standard best management practice option. If a person subject to this Rule does not complete the sign-up process for implementation of the local nitrogen reduction strategy, then he shall implement the following best management practices within four years following the effective date of this Rule.

(a) A forested riparian area, as described in Sub-Item (8)(a)(i)-(ii) of this Rule, is required on all sides of surface waters in the Neuse River Basin (intermittent streams, perennial streams, lakes, ponds and estuaries) as indicated on the most recent versions of U.S.G.S. 1:24,000 scale (7.5 minute quadrangle) topographic maps or other site-specific evidence. Design and installation of the forested riparian area shall be such that, to the maximum extent possible, sheet flow of surface water is achieved. Any activities that would result in water quality standard violations or disrupt the structural or functional integrity of the forested riparian area are prohibited. The protected riparian area shall have two zones as follows:

(i) Zone 1 shall be undisturbed forest. Zone 1 begins at the top of bank for intermittent streams and perennial streams without tributaries and extends landward a distance of 30 feet on each side of the waterbody, measured horizontally on a line perpendicular to the waterbody. For all other waterbodies, Zone 1 begins at the top of bank or the mean high water line and extends landward a distance of 30 feet, measured horizontally on a line perpendicular to the waterbody. Forest vegetation of any width that exists in Zone 1 as of July 22, 1997 must be preserved and maintained in accordance with Sub-Items (8)(a)(i)(A)-(E) of this Rule. The application of fertilizer in Zone 1 is prohibited. The following practices and activities are allowed in Zone 1:

(A) Natural regeneration of forest vegetation and planting vegetation to enhance the riparian area if disturbance is minimized, provided that any plantings shall primarily consist of locally native trees and shrubs;

(B) Selective cutting of individual trees of high value in the outer 20 feet of Zone 1, provided that the basal area of this outer 20-foot wide area remains at or above 75 square feet per acre and is computed according to the following method. Basal area of this outer 20-foot wide area shall be computed every 100 feet along the stream to ensure even distribution of forest vegetation and shall be based on all trees measured at 4.5 feet from ground level. No tracked or wheeled equipment is allowed in Zone 1 except at stream crossings which are designed, constructed and maintained in accordance with Forest Practice Guidelines Related to Water Quality (15A NCAC 1J .0201 - .0209);

(C) Horticulture or silvicultural practices to maintain the health of individual trees;

(D) Removal of individual trees which are in danger of causing damage to dwellings, other structures, or the stream channel; and

(E) Removal of dead trees and other timber cutting techniques necessary to prevent extensive pest or disease infestation if recommended by the Director, Division of Forest Resources and approved by the Director, Division of Water Quality.

(ii) Zone 2: begins at the outer edge of Zone 1 and extends landward a minimum of 20 feet as measured horizontally on a line perpendicular to the waterbody. The combined minimum width of Zones 1 and 2 shall be 50 feet on all sides of the waterbody. Vegetation in Zone 2 shall consist of a dense ground cover composed of herbaceous or woody species which provides for diffusion and infiltration of runoff and filtering of pollutants. The following practices and activities are allowed in Zone 2 in addition to those allowed in Zone 1: Periodic mowing and removal of plant products such as timber, nuts, and fruit is allowed on a periodic basis provided the intended purpose of the riparian area is not compromised by harvesting, disturbance, or loss of forest or herbaceous ground cover. Forest vegetation in Zone 2 may be managed to minimize shading on adjacent land outside the riparian area if the water quality function of the riparian area is not compromised.

(iii) The following practices and activities are not allowed in Zone 1 and Zone 2:

(A) Land disturbing activities and placement of fill and other materials, other than those allowed in Items (8)(a)(i) and (8)(b) of this Rule;

(B) New development;

(C) New on-site sanitary sewage systems which use ground absorptions;

(D) Any activity that threatens the health and function of the vegetation including, but not limited to, application of fertilizer or chemicals in amounts exceeding the manufacturer's recommended rate, uncontrolled sediment sources on adjacent lands, and the creation of any areas with bare soil.

(iv) Timber removal and skidding of trees in the riparian area shall be directed away from the water course or water body. Skidding shall be done in a manner to prevent creation of ephemeral channels perpendicular to the water body. Any tree removal must be performed in a manner that does not compromise the intended purpose of the riparian area and is in accordance with the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J .0201-.0209).

(b) The following waterbodies and land uses are exempt from the riparian area requirement:

(i) Ditches and manmade conveyances, other than modified natural streams, which under normal conditions do not receive drainage waters from any tributary ditches, canals, or streams, unless the ditch or manmade conveyance delivers runoff directly to waters classified in accordance with 15A NCAC 2B .0100;

(ii) Ditches and manmade conveyances other than modified natural streams which are used exclusively for drainage of silvicultural land or naturally forested areas. All forest harvesting operations shall be in compliance with North Carolina's Forest Practices Guidelines Related to Water Quality;

(iii) Areas mapped as perennial streams, intermittent streams, lakes, ponds or estuaries on the most recent versions of United States Geological Survey 1:24,000 scale (7.5 minute quadrangle) topographic maps where no perennial, intermittent waterbody, or lakes, ponds or estuaries exists on the ground;

(iv) Ponds and lakes created for animal watering, irrigation, or other agricultural uses that are not part of a natural drainage way that is classified in accordance with 15A NCAC 2B .0100;

(v) Water dependent structures as defined in 15A NCAC 2B .0202 provided that they are located, designed, constructed and maintained to provide maximum nutrient removal, to have the least adverse effects on aquatic life habitat and to protect water quality;

(vi) The following uses may be allowed where no practical alternative exists. A lack of practical alternatives may be shown by demonstrating that, considering the potential for a reduction in size, configuration or density of the proposed activity and all alternative designs, the basic project purpose cannot be practically accomplished in a manner which would avoid or result in less adverse impact to surface waters. Also, these structures shall be located, designed, constructed, and maintained to have minimal disturbance, to provide maximum nutrient removal and erosion protection, to have the least adverse effects on aquatic life and habitat, and to protect water quality to the maximum extent practical through the use of best management practices:

(A) Road crossings, railroad crossings, bridges, airport facilities, and utility crossings may be allowed if conditions specified in Sub-Item (8)(b)(vi) of this Rule are met;

(B) Stormwater management facilities and ponds, and utility construction and maintenance corridors for utilities such as water, sewer or gas, may be allowed in Zone 2 of the riparian area as long as the conditions specified in Sub-Item (8)(b)(vi) of this Rule are met and they are located at least 30 feet from the top of bank or mean high water line. Additional requirements for utility construction and maintenance corridors are listed in Sub-Item (8)(b)(vi) of this Rule.

(vii) A corridor for the construction and maintenance of utility lines, such as water, sewer or gas, (including access roads and stockpiling of materials) may run parallel to the stream and may be located within Zone 2 of the riparian area, as long as no practical

alternative exists and they are located at least 30 feet from the top of bank or mean high water line and best management practices are installed to minimize runoff and maximize water quality protection to the maximum extent practicable. Permanent, maintained access corridors shall be restricted to the minimum width practicable and shall not exceed 10 feet in width except at manhole locations. A 10 feet by 10 feet perpendicular vehicle turnaround is allowed provided they are spaced at least 500 feet apart along the riparian area;

(viii) Stream restoration projects, scientific studies, stream gauging, water wells, passive recreation facilities such as boardwalks, trails, pathways, historic preservation and archaeological activities are allowed; provided that they are located in Zone 2 and are at least 30 feet from the top of bank or mean high water line and are designed, constructed and maintained to provide the maximum nutrient removal and erosion protection, to have the least adverse effects on aquatic life and habitat, and to protect water quality to maximum extent practical through the use of best management practices. Activities that must cross the stream or be located within Zone 1 are allowed as long as all other requirements of this Item are met;

(ix) Stream crossings associated with timber harvesting are allowed if performed in accordance with the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J.0201-.0209); and

(x) In addition to exceptions included in Sub-Item (8)(b)(i)-(ix), canals, ditches, and other drainage conveyances are exempt from the riparian area requirement if both water control structures with a water control structure management plan and a nutrient management plan, are implemented on the adjacent agricultural land according to the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission. The water control structures and nutrient management practices must provide equivalent protection and directly affect the land and waterbodies draining into the waterbody exempted from the riparian area requirement. To the maximum extent practical, water control structures shall be managed to maximize nitrogen removal throughout the year. A technical specialist designated pursuant to rules adopted by the Soil and Water Conservation Commission must provide written approval that the nutrient management and water management plans meet the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission. If the nutrient management plans and water management plans are not implemented, then a riparian area pursuant to this Section is required.

(c) The following are modifications to the riparian area requirements.

(i) On agricultural land where either water control structures with a water control structure management plan, or a nutrient management plan is implemented according to the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission, then a 20-ft forested or a 30-ft vegetated buffer is required. The water control structures or nutrient management practices must provide equivalent protection and directly affect the land and waterbodies draining into the waterbody with a modified buffer requirement. To the maximum extent practical, water control structures shall be managed to maximize nitrogen removal throughout the year. A technical specialist designated pursuant to rules adopted by the Soil and Water Conservation Commission must provide written approval that the nutrient management plan meets the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission.

(ii) A vegetated riparian area may be substituted for an equivalent width of forested riparian area within 100 feet of tile drainage.

(iii) Where the riparian area requirements would result in an unavoidable loss of tobacco allotments [(7 CFR 723.220(c)] and the BMPs of controlled drainage or nutrient management are not in place, forest cover is required only in the first 20 feet of the riparian area.

(d) Maintenance of Zones 1 and 2 is required in accordance with this Rule.

(i) Sheet flow must be maintained to the maximum extent practical through dispersing concentrated flow and re-establishment of vegetation to maintain the effectiveness of the riparian area.

(ii) Concentrated runoff from new ditches or manmade conveyances must be dispersed into sheetflow before the runoff enters Zone 2 of the riparian area. Existing ditches and manmade conveyances, as specified in Sub-Item (8)(b)(ii) of this Rule, are exempt from this requirement; however, care shall be taken to minimize pollutant loading through these existing ditches and manmade conveyances from fertilizer application or erosion.

(iii) Periodic corrective action to restore sheet flow shall be taken by the landowner if necessary to impede the formation of erosion gullies which allow concentrated flow to bypass treatment in the riparian area.

(e) Periodic maintenance of modified natural streams such as canals is allowed provided that disturbance is minimized and the structure and function of the riparian area is not compromised. A grassed travelway is allowed on one side of the waterbody when alternative forms of maintenance access are not practical. The width and specifications of the travelway shall be only that needed for equipment access and operation. The travelway shall be located to maximize stream shading.

(f) Where the standards and management requirements for riparian areas are in conflict with other laws, regulations, and permits regarding streams, steep slopes, erodible soils, wetlands, floodplains, forest harvesting, surface mining, land disturbance activities, development in Coastal Area Management Act Areas of Environmental Concern, or other environmental protection areas, the more protective shall apply.

(g) The Environmental Management Commission acknowledges that best management practices under the standard management practice option of this Rule do not fully address nitrogen loading, including atmospheric emissions and deposition, from animal operations. As information becomes available on nitrogen loadings from animal operations and best management practices to control these loadings, other best management practices from animal operations may be required by the Commission as necessary to achieve equivalent reduction in nitrogen loadings therefrom. These additional best management practices shall be required if deemed necessary to achieve a net total nitrogen loading reduction from the animal operations based on average 1991-1995 conditions.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1);*
Eff. August 1, 1998.

15A NCAC 02B .0239 NEUSE RIVER BASIN: NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: NUTRIENT MANAGEMENT

The following is the management strategy for nutrient management in the Neuse River Basin:

(1) The following persons shall obtain a certificate, issued within five years of the effective date of this Rule by the Cooperative Extension Service or the Division of Water Quality, verifying completion of training and continuing education in nutrient management. Within one year from the effective date of this Rule, the Division of Water Quality, in cooperation with the Cooperative Extension Service, shall conduct a sign-up process for persons wishing to take the nutrient management training. If these persons fail to obtain the nutrient management certificate, they are required to develop and properly implement nutrient management plans for the lands where they apply fertilizer within five years of the effective date of this Rule:

(a) Applicators who in a calendar year apply fertilizer to cropland areas, including row and vegetable crops, floriculture areas, ornamental areas and greenhouse production areas, that together comprise at least 50 acres and persons responsible for managing cropland areas, as described in Sub-Item (1)(a) of this Rule, that together comprise at least 50 acres;

(b) Applicators who in a calendar year apply fertilizer to a golf course, recreational land areas, right-of-way, or other turfgrass areas that together comprise at least 50 acres, and persons responsible for managing the turfgrass aspects of lands, as described in Sub-Item (1)(b) of this Rule, that together comprise at least 50 acres; and

(c) Commercial applicators who apply fertilizer to at least 50 total acres per year of lawn and garden areas in residential, commercial, or industrial developments, and persons responsible for managing the lawn and garden aspects of lands, as described in Sub-Item (1)(c) of this Rule, that together comprise at least 50 acres.

(2) If the persons listed in Sub-Items (1)(a)-(c) of this Rule do not attend and complete within five years of the effective date of this Rule a nutrient management training program administered by the Cooperative Extension Service, their nutrient management plans shall meet the following requirements:

(a) Nutrient management plans for cropland shall meet the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission. Written approval from a technical specialist designated pursuant to rules adopted by the Soil and Water Conservation Commission must be obtained by the applicator certifying that a nutrient management plan meeting these standards has been developed for the lands where they apply fertilizer.

(b) Nutrient management plans for turfgrass, floriculture, ornamental and greenhouse production application of nutrients shall meet recommended guidelines in the following documents or other recommended guidelines from land-grant universities to minimize nutrient loss to waters in the Neuse River Basin. Nutrient management plans for turfgrass shall follow the North Carolina Cooperative Extension Service (NCCES) guidelines in "Water Quality And Professional Lawn Care"; NCCES publication number WQMM-155 or "Water Quality And Home Lawn Care"; NCCES publication number WQMM-151. Copies may be obtained from the Division of Water Quality, 512 North Salisbury Street, Raleigh, North Carolina 27626 at no cost. Nutrient management plans for nursery crops and greenhouse production shall follow the Southern Nurserymen=s Association guidelines promulgated in "Best Management Practices Guide For Producing Container-Grown Plants". Copies may be obtained from the Southern Nurserymen=s Association, 1000 Johnson Ferry Road, Suite E-130, Marietta, GA 30068-2100 at a cost of thirty-five dollars ($35.00). There materials related to nutrient management plans for turfgrass, nursery crops and greenhouse production are hereby incorporated by reference including any subsequent amendments and editions and are available for inspection at the Department of Environment and Natural Resources Library, 512 North Salisbury Street, Raleigh, North Carolina. The Division of Water Quality shall develop model plans in consultation with the Cooperative Extension Service, the Natural Resources Conservation Service, the Division of Soil and Water Conservation, and the North Carolina Department of Agriculture and approved by the Director of the Division of Water Quality within one year of the effective date of this Rule. The model plans shall provide a description of the type of information to be included in the plans for source of nutrients, the amount of nutrient applied, the placement of nutrients, and the timing of nutrient applications. Written approval from a technical specialist designated pursuant to rules adopted by the Environmental Management Commission must be obtained by the applicator certifying that a

nutrient management plan meeting these standards has been developed for the lands where they apply fertilizer.

(c) For nutrient management plans developed under Sub-Items (2)(a) and (2)(b) of this Rule using dry poultry litter from animal waste management systems involving 30,000 or more birds, dry poultry litter shall be applied at agronomic rates for nitrogen based on realistic yield expectations derived from waste nutrient content, crop and soil type, or yield records.

(d) Nutrient management plans and supporting documents must be kept on-site or be producible within 24 hours of a request by the Division of Water Quality.

(e) Nutrient management plans may be written by the applicator or a consultant to the applicator.

(3) Applicators and commercial applicators subject to Item (2) of this Rule who do not develop a nutrient management plan or do not apply nutrients in accordance with a nutrient management plan meeting the specifications in Item (2) are in violation of this Rule and are subject to enforcement measures authorized in G.S. 143-215.6A (civil penalties), G.S. 143-215.6B (criminal penalties), and G.S. 143-215.6C (injunctive relief).

(4) Residential landowners and other individuals applying fertilizer to less than 50 acres per year shall to the maximum extent practical apply fertilizer to residential, commercial, industrial, turfgrass, and cropland areas at rates recommended by the Cooperative Extension Service.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1);*
Eff. August 1, 1998.

15A NCAC 02B .0240 NUTRIENT OFFSET PAYMENTS

(a) The purpose of this Rule is to establish procedures for the optional payment of nutrient offset fees to the NC Ecosystem Enhancement Program, subsequently referred to as the Program, or to other public or private parties where the Program or such parties implement projects for nutrient offset purposes and accept payments for those purposes, and where either of the following applies:

(1) The following rules of this Section allow offsite options or nutrient offset payments toward fulfillment or maintenance of nutrient reduction requirements:
   (A) .0234 and .0235 of the Neuse nutrient strategy,
   (B) .0258 of the Tar-Pamlico nutrient strategy, and
   (C) applicable rules of the Jordan nutrient strategy, which is described in Rule .0262; and

(2) Other rules adopted by the Commission allow this option toward fulfillment of nutrient load reduction requirements.

(b) Offset fees paid pursuant to this Rule shall be used to achieve nutrient load reductions subject to the following geographic restrictions:

(1) Load reductions shall be located within the same 8-digit cataloguing unit, as designated by the US Geological Survey, as the loading activity that is being offset;

(2) The Division shall track impacts by 10-digit watershed, as designated by the US Geological Survey and providers shall locate projects proportional to the location of impacts to the extent that the projects would meet the least cost alternative criterion per S.L. 2007-438. The location of load reduction projects shall be reviewed during the approval process described in Paragraph (c) of this Rule;

(3) Impacts that occur in the watershed of Falls Lake in the upper Neuse River Basin may be offset only by load reductions in the same watershed; Impacts in the Neuse 01 8-digit cataloguing unit below the Falls watershed, as designated by the US Geological Survey, may be offset only by load reductions in that same lower watershed;

(4) Restrictions established in the Jordan nutrient strategy, which is described in Rule 15A NCAC 02B .0262; and

(5) Any further restrictions established by the Commission through rulemaking.

(c) The Program and other parties shall obtain Division approval of proposed nutrient offset projects prior to construction. Other parties shall sell credits in compliance with approved credit release schedules and with the requirements of this Rule. Project approval shall be based on the following standards:

(1) Load reductions eligible for credit shall not include reductions used to satisfy other requirements under the same nutrient strategy;

(2) The Program and other parties shall agree to provide adequate financial assurance to protect and maintain load reductions for the stated duration, including for maintenance, repair and renovation of the proposed measure;

(3) The Program and other parties shall agree that once credits are established for a measure and until they are exhausted, they shall provide a credit/debit ledger to the Division at regular intervals;

(4) The Program and other parties shall agree that the party responsible for a measure shall allow the Division access to it throughout its lifetime for compliance inspection purposes;

(5) The Program or other party seeking approval shall obtain a site review from Division staff prior to Division approval to verify site conditions suitable to achieve the proposed load reductions through the proposed measure; and

(6) The Program shall submit a proposal, and other parties shall submit a proposal or a draft banking instrument, addressing the following items regarding a proposed load-reducing measure:
   (A) Identify the location and site boundaries of the proposed measure, the geographic area to be served by credits in compliance with the requirements of Paragraph (b) of this Rule, existing conditions in the contributing drainage area and location of the measure, and the nature of the proposed measure with sufficient detail to support estimates of load reduction required in this Paragraph;
   (B) Provide calculations of the annual magnitudes of load reductions and identify final credit values incorporating any delivery factors or other adjustments required under rules identified in Paragraph (a) of this Rule;
   (C) Define the duration of load reductions, and provide a conservation easement or similar legal mechanism to be recorded with the County Register of Deeds and that is sufficient to ensure protection and maintenance of load reductions for the stated duration;

(D) Identify the property owner and parties responsible for obtaining all permits and other authorizations needed to establish the proposed measure, for constructing and ensuring initial performance of the proposed measure, for reporting on and successfully completing the measure, for holding and enforcing the conservation easement, and for ensuring protection and maintenance of functions for its stated duration;

(E) Provide a plan for implementing the proposed measure, including a timeline, a commitment to provide an as-built plan and report upon establishment of the measure, elements to be included in the as-built plan and report, a commitment to provide a bond or other financial assurance sufficient to cover all aspects of establishment and initial performance prior to the release of any credits, and criteria for successful completion; and

(F) Provide a monitoring and maintenance plan designed to achieve successful completion, that commits to annual reporting to the Division until success is achieved, that recognizes the Division's authority to require extension or re-initiation of monitoring depending on progress toward success, and that commits to a final report upon completion. The final report shall reaffirm the party that shall hold and enforce the conservation easement or other legal instrument.

(d) The Program shall establish and revise nutrient offset rates as set out in Rule .0274 of this Section. Offset payments accepted by the Program shall be placed into the Riparian Buffer Restoration Fund administered by the Department pursuant to G.S. 143-214.21

(e) Persons who seek to pay nutrient offset fees under rules of this Section shall do so in compliance with such rules, the requirements of Paragraph (b) of this Rule, and the following:

(1) A non-governmental entity shall purchase nutrient offset credit from a party other than the Program if such credit is available in compliance with the criteria of this Rule at the time credit is sought, and shall otherwise demonstrate to the permitting authority that such credit is not available before seeking to make payment to the Program;

(2) Offset payments made to the Program shall be contingent upon acceptance of the payment by the Program. The financial, temporal and technical ability of the Program to satisfy the mitigation request will be considered to determine whether the Program will accept or deny the request;

(3) Where persons seek to offset more than one nutrient type, they shall make payment to address each type;

(4) The offset payment shall be an amount sufficient to fund 30 years of nutrient reduction.

(5) Persons who seek offsets to meet new development stormwater permitting requirements shall provide proof of offset credit purchase to the permitting authority prior to approval of the development plan; and

(6) A wastewater discharger that elects to purchase offset credits for the purpose of fulfilling or maintaining nutrient reduction requirements shall submit proof of offset credit acquisition or a letter of commitment from the Program or third party provider with its request for permit modification. Issuance of a permit that applies credits to nutrient limits shall be contingent on receipt of proof of offset credit acquisition. A discharger may propose to make incremental payments for additional nutrient allocations, contingent upon receiving a letter of commitment from the Program or third party provider to provide the offset credit needed for permit issuance. In that event the Division may issue or modify that permit accordingly, and shall condition any flow increase associated with that incremental purchase on payment in full for the additional allocation. Offset responsibility for nutrient increases covered under this Paragraph shall be transferred to the Program or third party provider when it has received the entire payment.

(f) Credits associated with load reducing activities funded under this Rule shall be awarded exclusively to the person, municipality, discharger, or group of dischargers who paid the offset fee.

History Note: *Authority G.S. 143-214.1; 143-214.20; 143-214.21; S.L. 1995, c. 572; S.L. 2007, c. 438; S.L. 2009, c. 337; S.L. 2009, c. 484; S.L. 2009, c. 486;*
Eff. August 1, 1998;
Amended Eff. August 1, 2006;
Amended Eff. September 1, 2010.

15A NCAC 02B .0241 NEUSE RIVER BASIN: NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: DELEGATION OF AUTHORITY FOR THE PROTECTION AND MAINTENANCE OF EXISTING RIPARIAN BUFFERS

(a) PURPOSE. This Rule sets out the requirements for delegation of the responsibility for implementing and enforcing the Neuse Basin existing riparian buffer protection program, as described in Rule 15A NCAC 2B .0233, to local governments.

(b) PROCEDURES FOR GRANTING AND RESCINDING DELEGATION. The Commission shall grant and rescind local government delegation of the Neuse River Basin Riparian Buffer Protection requirements according to the following procedures.

(1) Local governments within the Neuse River Basin may submit a written request to the Commission for authority to implement and enforce the State's riparian buffer protection requirements within their jurisdiction. The written request shall be accompanied by information that shows:
   (A) The local government has land use jurisdiction for the riparian buffer demonstrated by delineating the local land use jurisdictional boundary on USGS 1:24,000 topographical map(s) or other finer scale map(s);
   (B) The local government has the administrative organization, staff, legal authority, financial and other resources necessary to implement and enforce the State's riparian buffer protection requirements based on its size and projected amount of development;
   (C) The local government has adopted ordinances, resolutions, or regulations necessary to establish and maintain the State's riparian buffer protection requirements; and
   (D) The local government has provided a plan to address violations with appropriate remedies and actions including, but not limited to, civil or criminal remedies that shall restore buffer nutrient removal functions on violation sites and provide a deterrent against the occurrence of future violations.

(2) Within 90 days after the Commission has received the request for delegation, the Commission shall notify the local government whether it has been approved, approved with modifications, or denied.

(3) The Commission, upon determination that a delegated local authority is failing to implement or enforce the Neuse Basin riparian buffer protection requirements in keeping with a request approved under Sub-item (b)(2) of this Rule, shall notify the delegated local authority in writing of the local program's inadequacies. If the delegated local authority has not corrected the deficiencies within 90 days of receipt of the written notification, then the Commission shall rescind the delegation of authority to the local government and shall implement and enforce the State's riparian buffer protection requirements.

(4) The Commission may delegate its duties and powers for granting and rescinding local government delegation of the State's riparian buffer protection requirements, in whole or in part, to the Director.

(c) APPOINTMENT OF A RIPARIAN BUFFER PROTECTION ADMINISTRATOR. Upon receiving delegation, local governments shall appoint a Riparian Buffer Protection Administrator who shall coordinate the implementation and enforcement of the program. The Administrator shall attend an initial training session by the Division and subsequent annual training sessions. The Administrator shall ensure that local government staffs working directly with the program receive training to understand, implement and enforce the program.

(d) PROCEDURES FOR USES WITHIN RIPARIAN BUFFERS THAT ARE ALLOWABLE AND ALLOWABLE WITH MITIGATION. Upon receiving delegation, local authorities shall review proposed uses within the riparian buffer and issue approvals if the uses meet the State's riparian buffer protection requirements. Delegated local authorities shall issue an Authorization Certificate for uses if the proposed use meets the State's riparian buffer protection requirements, or provides for appropriate mitigated provisions to the State's riparian buffer protection requirements. The Division may challenge a decision made by a delegated local authority for a period of 30 days after the Authorization Certificate is issued. If the Division does not challenge an Authorization Certificate within 30 days of issuance, then the delegated local authority's decision shall stand.

(e) VARIANCES. After receiving delegation, local governments shall review variance requests, provide approvals for minor variance requests and make recommendations to the Commission for major variance requests pursuant to the State's riparian buffer protection program.

(f) LIMITS OF DELEGATED LOCAL AUTHORITY. The Commission shall have jurisdiction to the exclusion of local governments to implement the State's riparian buffer protection requirements for the following types of activities:

(1) Activities conducted under the authority of the State;

(2) Activities conducted under the authority of the United States;

(3) Activities conducted under the authority of multiple jurisdictions; and
(4) Activities conducted under the authority of local units of government.

(g) RECORD-KEEPING REQUIREMENTS. Delegated local authorities shall maintain on-site records for a minimum of five years. Delegated local authorities must furnish a copy of these records to the Director within 30 days of receipt of a written request for the records. The Division shall inspect local riparian buffer protection programs to ensure that the programs are being implemented and enforced in keeping with a request approved under Sub-item (b)(2) of this Rule. Each delegated local authority's records shall include the following:

(1) A copy of variance requests;
(2) The variance request's finding of fact;
(3) The result of the variance proceedings;
(4) A record of complaints and action taken as a result of the complaint;
(5) Records for stream origin calls and stream ratings; and
(6) Copies of request for authorization, records approving authorization and Authorization Certificates.

History Note: *Authority 143-214.1; 143-214.7; 143-215.3(a)(1); S.L. 1998 c. 221; Eff. August 1, 2000.*

APPENDIX F

FLORA AND FAUNA SPECIES LISTS

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CONTENTS

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Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
ACER BARBATUM	FLORIDA MAPLE	
ACER LEUCODERME	CHALK MAPLE	
ACER RUBRUM VAR RUBRUM	RED MAPLE	
ACER RUBRUM VAR TRILOBUM	RED MAPLE	
ACER SACCHARUM	SUGAR MAPLE	
ACHILLEA MILLEFOLIUM	COMMON YARROW	
ADIANTUM PEDATUM	NORTHERN MAIDENHAIR-FERN	
AGALINIS PURPUREA	LARGE-PURPLE FALSE-FOXGLOVE	
AGROSTIS PERENNANS	PERENIAL BENTGRASS	
AILANTHUS ALTISSIMA***	TREE-OF-HEAVEN***	
ALBIZIA JULIBRISSIN***	SILK TREE***	
ALLIUM AMPELOPRASUM***	WILD LEEK***	
ALLIUM VINEALE***	FIELD GARLIC***	
ALNUS SERRULATA	BROOK-SIDE ALDER	
AMBROSIA ARTEMISIIFOLIA	ANNUAL RAGWEED	
AMPHICARPAEA BRACTEATA	AMERICAN HOG-PEANUT	
ANDROPOGON TERNARIUS	SILVER BLUESTEM	
ANDROPOGON VIRGINICUS	BROOM-SEDGE	
ANEMONELLA THALICTROIDES	WINDFLOWER	
ANTENNARIA PLANTAGINIFOLIA	PLANTAIN-LEAF PUSSYTOES	
ANTENNARIA SOLITARIA	SINGLE-HEAD PUSSYTOES	
ANTHEMIS ARVENSIS	CORN CAMOMILE	
APOCYNUM CANNABINUM	CLASPING-LEAF DOGBANE	
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT	
ARNOGLOSSUM ATRIPLICIFOLIUM	PALE INDIAN-PLANTAIN	
ASCLEPIAS AMPLEXICAULIS	CLASPING MILKWEED	
ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	
ASIMINA PARVIFLORA	DWARF PAW-PAW	
ASPLENIUM PLATYNEURON	EBONY SPLEENWORT	
ASTER DIVARICATUS	SERPENTINE ASTER	
ASTER DUMOSUS	BUSHY ASTER	
ASTER SPECTABILIS	WESTERN SHOWY ASTER	CP: pine barrens and woodland borders
ATHYRIUM ASPLENIOIDES	SOUTHERN LADY FERN	
AUREOLARIA VIRGINICA	DOWNY FALSE-FOXGLOVE	
BARBAREA VERNA	EARLY WINTER-CRESS	
BETULA NIGRA	RIVER BIRCH	
BIDENS ARISTOSA	TICKSEED BEGGAR-TICKS	
BOEHMERIA CYLINDRICA	FALSE NETTLE	
CAMPSIS RADICANS	TRUMPET-CREEPER	
CARDAMINE ANGUSTATA	SLENDER TOOTHWORT	
CARDAMINE HIRSUTA***	HAIRY BITTER-CRESS***	
CAREX CRINITA	FRINGED SEDGE	
CAREX DIGITALIS	SLENDER WOOD SEDGE	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
CAREX FESTUCACEA	FESCUE SEDGE	
CAREX INTUMESCENS	BLADDER SEDGE	
CAREX LAXIFLORA	LOOSE-FLOWERED SEDGE	
CAREX LEPTALEA	BRISTLY-STALK SEDGE	
CAREX LURIDA	SHALLOW SEDGE	
CAREX NIGROMARGINATA	BLACK-EDGE SEDGE	
CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	
CAREX STRICTA	TUSSOCK SEDGE	
CARPINUS CAROLINIANA	AMERICAN HORNBEAM	
CARYA ALBA	MOCKERNUT HICKORY	
CARYA GLABRA VAR GLABRA	PIGNUT HICKORY	
CARYA OVATA	SHAG-BARK HICKORY	
CELTIS LAEVIGATA	SUGARBERRY	
CENTROSEMA VIRGINIANUM	COASTAL BUTTERFLY-PEA	
CERASTIUM FONTANUM	COMMON MOUSE-EAR CHICKWEED	
CERCIS CANADENSIS	EASTERN REDBUD	
CHAMAECRISTA FASCICULATA	PRAIRIE SENNA	
CHAMAESYCE MACULATA	SPOTTED SPURGE	
CHASMANTHIUM LATIFOLIUM	RIVER OATS	
CHASMANTHIUM LAXUM	SLENDER SPIKEGRASS	
CHASMANTHIUM SESSILIFLORUM	LONGLEAF SPIKEGRASS	CP: hardwood forests
CHIMAPHILA MACULATA	SPOTTED WINTERGREEN	
CHIONANTHUS VIRGINICUS	FRINGE TREE	
CHRYSOGONUM VIRGINIANUM	GREEN-AND-GOLD	
CHRYSOPSIS MARIANA	MARYLAND GOLDEN ASTER	
CIRSIUM HORRIDULUM	YELLOW THISTLE	
CLAYTONIA VIRGINICA	NARROW-LEAVED SPRING BEAUTY	
COMMELINA COMMUNIS	ASIATIC DAYFLOWER	
CONYZA CANADENSIS	CANADA HORSEWEED	
COREOPSIS AURICULATA	LOBED TICKSEED	
COREOPSIS MAJOR	WOOD TICKSEED	
COREOPSIS TINCTORIA	GOLDEN TICKSEED	
CORNUS FLORIDA	FLOWERING DOGWOOD	
CORNUS FOEMINA	STIFF DOGWOOD	
CORYLUS AMERICANA	AMERICAN HAZELNUT	
CRATAEGUS FLAVA	A HAWTHORN	
CUNILA ORIGANOIDES	DITTANY	
CUSCUTA CAMPESTRIS	FIELD DODDER	
CYPERUS ESCULENTUS	CHUFA FLAT-SEDGE	
CYPERUS RETRORSUS	RETRORSE FLATSEDGE	
CYTISUS SCOPARIUS	SCOTCH BROOM	
DANTHONIA COMPRESSA	FLATTENED OATGRASS	
DANTHONIA SERICEA	SILKY OAT-GRASS	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
DANTHONIA SPICATA	POVERTY OAT-GRASS	
DENNSTAEDTIA PUNCTILOBULA	EASTERN HAY-SCENTED FERN	
DESMODIUM NUDIFLORUM	BARE-STEMMED TICK-TREEFOIL	
DESMODIUM PANICULATUM	NARROW-LEAF TICK-TREFOIL	
DESMODIUM ROTUNDIFOLIUM	PROSTRATE TICK-TREEFOIL	
DICHANTHELIUM CLANDESTINUM	DEER-TONGUE WITCHGRASS	
DICHANTHELIUM DICHOTOMUM VAR DICHOTOMUM	SMALL-FRUITED PANICGRASS	
DICHANTHELIUM LAXIFLORUM	LAX-FLOWER WITCHGRASS	
DICHANTHELIUM SPHAEROCARPON	ROUNDFRUIT PANICGRASS	
DIGITARIA SANGUINALIS	HAIRY CRABGRASS	
DIODIA TERES	ROUGH BUTTONWEED	
DIOSPYROS VIRGINIANA	PERSIMMON	
DIPHASIASTRUM DIGITATUM	FAN CLUB-MOSS	
DRABA VERNA	VERNAL WHITLOW GRASS	
DULICHIUM ARUNDINACEUM	THREE-WAY SEDGE	
ECHINOCHLOA CRUS-GALLI***	BARNYARD GRASS***	
ELEOCHARIS FLAVESCENS	PALE SPIKERUSH	
ELEPHANTOPUS TOMENTOSUS	TOBACCOWEED	
ELYMUS HYSTRIX VAR. HYSTRIX	BOTTLEBRUSH GRASS	
EPIFAGUS VIRGINIANA	BEECHDROPS	
EPIGAEA REPENS	TRAILING ARBUTUS	
ERAGROSTIS SPECTABILIS	PURPLE LOVE-GRASS	
ERECHTITES HIERACIIFOLIA	FIREWEED	
ERIGERON ANNUUS	WHITE-TOP FLEABANE	
ERIGERON STRIGOSUS	DAISY FLEABANE	
ERYTHRONIUM AMERICANUM	YELLOW TROUT-LILY	
ERYTHRONIUM UMBILICATUM SSP UMBILICATUM	YELLOW TROUT-LILY	
EUONYMUS AMERICANUS	AMERICAN STRAWBERRY-BUSH	
EUPATORIUM CAPILLIFOLIUM	SMALL DOG-FENNEL THOROUGHWORT	
EUPATORIUM HYSSOPIFOLIUM	HYSSOPLEAF THOROUGHWORT	
EUPATORIUM ROTUNDIFOLIUM	ROUND-LEAF THOROUGH-WORT	
EUPATORIUM SEROTINUM	LATE-FLOWERING THOROUGH-WORT	
EUPHORBIA COROLLATA	FLOWERING SPURGE	
EUPHORBIA MARGINATA	SNOW-ON-THE-MOUNTAIN	
EUTHAMIA CAROLIANA	CAROLINA FLAT-TOP GOLDENROD	
FAGUS GRANDIFOLIA	AMERICAN BEECH	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
FRAGARIA VIRGINIANA	VIRGINIA STRAWBERRY	
FRAXINUS AMERICANA	WHITE ASH	
FRAXINUS PENNSYLVANICA	GREEN ASH	
GALACTIA VOLUBILIS	DOWNY MILKPEA	
GALIUM APARINE	CATCHWEED BEDSTRAW	
GALIUM CIRCAEZANS	WILD LICORICE	
GALIUM OBTUSUM	BLUNT-LEAF BEDSTRAW	
GALIUM PILOSUM	HAIRY BEDSTRAW	
GALIUM TRIFLORUM	SWEET-SCENT BEDSTRAW	
GAYLUSSACIA FRONDOSA	DANGLE-BERRY	
GERANIUM MACULATUM	WILD GERANIUM	
GEUM CANADENSE	WHITE AVENS	
GLEDITSIA TRIACANTHOS	HONEY-LOCUST	
GLYCERIA STRIATA	FOWL MANNA-GRASS	
HAMAMELIS VIRGINIANA	AMERICAN WITCH-HAZEL	
HELENIUM AMARUM	FIVE-LEAF SNEEZEWEED	
HELENIUM AUTUMNALE	COMMON SNEEZEWEED	
HEPATICA AMERICANA	LIVERLEAF	
HEUCHERA AMERICANA	AMERICAN ALUMROOT	
HEXALECTRIS SPICATA	**CRESTED CORALROOT**	**PMC: dry or mesic woods on basic soils**
HEXASTYLIS LEWISII	LEWIS'S HEARTLEAF	PSC: forests, pocosin edges
HEXASTYLIS MINOR	LITTLE HEARTLEAF	
HEXASTYLIS SHUTTLEWORTHII	LARGE-FLOWERED HEARTLEAF	
HEXASTYLIS VIRGINICA	VIRGINIA HEARTLEAF	
HIERACIUM GRONOVII	HAIRY HAWKWEED	
HIERACIUM VENOSUM	RATTLESNAKE HAWKWEED	
HOUSTONIA CAERULEA	QUACKER'S BONNETS	
HYPERICUM GENTIANOIDES	ORANGE-GRASS ST. JOHN'S-WORT	
HYPERICUM HYPERICOIDES	ST. ANDREW'S CROSS	
HYPERICUM NUDIFLORUM	PRETTY ST. JOHN'S-WORT	
HYPERICUM PUNCTATUM	COMMON ST. JOHN'S-WORT	
HYPERICUM STRAGULUM	ST. ANDREW'S CROSS	
ILEX DECIDUA	DECIDUOUS HOLLY	
ILEX OPACA	AMERICAN HOLLY	
IMPATIENS CAPENSIS	SPOTTED JEWEL-WEED	
IPOMOEA PANDURATA	BIG-ROOT MORNING-GLORY	
IRIS VERNA	DWARF IRIS	
ISOETES ENGELMANNII	ENGALMAN'S QUILLWORT	
JUGLANS NIGRA	BLACK WALNUT	
JUNCUS CORIACEUS	LEATHERY RUSH	
JUNCUS EFFUSUS	SOFT RUSH	
JUNCUS TENUIS	SLENDER RUSH	
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
JUSTICIA AMERICANA	COMMON WATER-WILLOW	
KALMIA LATIFOLIA	MOUNTAIN LAUREL	
KRIGIA VIRGINICA	DWARF DANDELION	
LECHEA PULCHELLA	LEGGETT'S PINWEED	
LESPEDEZA BICOLOR	SHRUBBY BUSHCLOVER	
LESPEDEZA CAPITATA	ROUND-HEAD BUSH-CLOVER	
LESPEDEZA CUNEATA	CHINESE BUSHCLOVER	
LESPEDEZA PROCUMBENS	TRAILING BUSH-CLOVER	
LESPEDEZA VIRGINICA	SLENDER BUSH-CLOVER	
LEUCANTHEMUM VULGARE	OXEYE DAISY	
LEUCOTHOE RECURVA	RECURVED DOG-HOBBLE	
LIATRIS SQUARROSA	SCALY GAY-FEATHER	
LINDERA BENZOIN	SPICEBUSH	
LINUM SULCATUM VAR SULCATUM	**GLADE FLAX**	**P: diabase glades**
LIQUIDAMBAR STYRACIFLUA	SWEET GUM	
LIRIODENDRON TULIPIFERA	TULIP TREE	
LOBELIA CARDINALIS	CARDINAL FLOWER	
LOBELIA INFLATA	INDIAN-TOBACCO	
LOBELIA NUTTALLII	NUTTALL'S LOBELIA	
LOBELIA PUBERULA	DOWNY LOBELIA	
LOBELIA SPICATA	PALE-SPIKED LOBELIA	
LONICERA DIOICA	LIMBER HONEYSUCKLE	
LONICERA JAPONICA	JAPANESE HONEYSUCKLE***	
LONICERA SEMPERVIRENS	TRUMPET HONEYSUCKLE	
LUDWIGIA ALTERNIFOLIA	BUSHY SEEDBOX	
LUDWIGIA DECURRENS	PRIMROSE WILLOW	
LUDWIGIA PALUSTRIS	MARSH SEEDBOX	
LUZULA MULTIFLORA	HEATH WOODRUSH	MP: moist woods
LYCOPUS UNIFLORUS	NORTHERN BUGLEWEED	
MACLURA POMIFERA	OSAGEORANGE	
MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	C: mainland forests with maritime influence on the southeastern coast of North Carolina; introduced elsewhere
MALUS ANGUSTIFOLIA	SOUTHERN CRABAPPLE	
MELICA MUTICA	NARROW MELIC GRASS	
MERTENSIA VIRGINICA	VIRGINIA BLUEBELLS	PCM: rich forests on slopes and bottomlands
MICROSTEGIUM VIMINEUM***	JAPANESE GRASS***	
MIMULUS ALATUS	SHARP-WING MONKEYFLOWER	
MITCHELLA REPENS	PARTRIDGE-BERRY	
MORUS RUBRA	RED MULBERRY	
MUHLENBERGIA TENUIFLORA	SLENDER MUHLY	
MURDANNIA KEISAK	MARSH DEWFLOWER	
NARCISSUS SP***	DAFFODIL***	
NUPHAR LUTEA	AMERICAN LOTUS	CS: blackwater streams, rivers and

Species Observed During 2006 Vegetation Community and Rare Plant Survey		
SCIENTIFIC NAME	**COMMON NAME**	**HABITAT IN North Carolina**
		lakes
NUTTALLANTHUS CANADENSIS	BUTTER-AND-EGGS	
NYSSA SYLVATICA	BLACK GUM	
OENOTHERA BIENNIS	COMMON EVENING-PRIMROSE	
OENOTHERA FRUTICOSA	NARROW-LEAVED SUNDROPS	
ONOCLEA SENSIBILIS	SENSITIVE FERN	
ORONTIUM AQUATICUM	GOLDEN CLUB	
OSMUNDA CINNAMOMEA	CINNAMON FERN	
OSMUNDA REGALIS	ROYAL FERN	
OSTRYA VIRGINIANA	EASTERN HOP-HORNBEAM	
OXALIS CORNICULATA	CREEPING WOODSORREL	
OXALIS DILLENII	DILLEN'S WOODSORREL	
OXALIS STRICTA	UPRIGHT YELLOW WOOD-SORREL	
OXALIS VIOLACEA	VIOLET WOOD-SORREL	
OXYDENDRUM ARBOREUM	SOURWOOD	
PANICUM ANCEPS	PANIC GRASS	
PANICUM DICHOTOMIFLORUM	SPREADING PANICGRASS	
PANICUM FLEXILE	**WIRY PANIC GRASS**	**PM: glades and openings over mafic rocks**
PARTHENOCISSUS QUINQUEFOLIA	VIRGINIA CREEPER	
PASPALUM FLORIDANUM	FLORIDA PASPALUM	
PASPALUM NOTATUM	BAHIA GRASS	
PASSIFLORA INCARNATA	PURPLE PASSION-FLOWER	
PASSIFLORA LUTEA	YELLOW PASSIONFLOWER	
PAULOWNIA TOMENTOSA***	ROYAL PAULOWNIA***	
PENNISETUM AMERICANUM	AMERICAN MILLET GRASS	
PHEGOPTERIS HEXAGONOPTERA	BROAD BEECH FERN	
PHLOX PILOSA	DOWNY PHLOX	
PHYTOLACCA AMERICANA	COMMON POKEWEED	
PINUS ECHINATA	SHORTLEAF PINE	
PINUS TAEDA	LOBLOLLY PINE	
PINUS VIRGINIANA	VIRGINIA PINE	
PIPTOCHAETIUM AVENACEUM	BLACKSEED NEEDLEGRASS	
PLANTAGO ARISTATA	LARGE-BRACT PLANTAIN	
PLANTAGO RUGELII	BLACK-SEED PLANTAIN	
PLANTAGO VIRGINICA	PALE-SEEDED PLANTAIN	
PLATANUS OCCIDENTALIS	SYCAMORE	
PLEOPELTIS POLYPODIOIDES	RESURRECTION FERN	
PLUCHEA CAMPHORATA	MARSH FLEABANE	
POA COMPRESSA	CANADA BLUEGRASS***	
POA CUSPIDATA	BLUEGRASS	
PODOPHYLLUM PELTATUM	MAY APPLE	
POLYGALA CURTISSII	CURTIS'S MILKWORT	

Species Observed During 2006 Vegetation Community and Rare Plant Survey		
SCIENTIFIC NAME	**COMMON NAME**	**HABITAT IN North Carolina**
POLYGONUM HYDROPIPEROIDES	MILD WATER-PEPPER	
POLYGONUM PERSICARIA	LADY'S THUMB	
POLYGONUM SAGITTATUM	ARROW-LEAVED TEARTHUMB	
POLYGONUM SETACEUM	SWAMP SMARTWEED	
POLYSTICHUM ACROSTICHOIDES	CHRISTMAS FERN	
PORTERANTHUS TRIFOLIATUS	BOWMAN'S-ROOT	
POTENTILLA CANADENSIS	CANADA CINQUEFOIL	
POTENTILLA SIMPLEX	OLD-FIELD CINQUEFOIL	
PRENANTHES SERPENTARIA	LION'S-FOOT	
PRUNELLA VULGARIS	SELF-HEAL	
PRUNUS AMERICANA	AMERICAN PLUM	
PRUNUS SEROTINA	BLACK CHERRY	
PSEUDOGNAPHALIUM OBTUSIFOLIUM	FRAGRANT CUDWEED	
PTERIDIUM AQUILINUM	BRACKEN FERN	
PUERARIA MONTANA	KUDZU	
PYCNANTHEMUM INCANUM	HOARY MOUNTAIN-MINT	
PYCNANTHEMUM MUTICUM	BLUNT MOUNTAIN MINT	
PYCNANTHEMUM PYCNANTHEMOIDES	SOUTHERN MOUNTAIN-MINT	
PYCNANTHEMUM TENUIFOLIUM	SLENDER MOUNTAIN-MINT	
PYRUS COMMUNIS***	COMMON PEAR***	
QUERCUS ALBA	WHITE OAK	
QUERCUS BICOLOR	SWAMP WHITE OAK	P: upland swamp forests
QUERCUS COCCINEA	SCARLET OAK	
QUERCUS FALCATA	SPANISH OAK	
QUERCUS LAEVIS	TURKEY OAK	
QUERCUS MARILANDICA	BLACKJACK OAK	
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	
QUERCUS MONTANA	CHESTNUT OAK	
QUERCUS PALUSTRIS	PIN OAK	P: swamps
QUERCUS PHELLOS	WILLOW OAK	
QUERCUS RUBRA	NORTHERN RED OAK	
QUERCUS SHUMARDII	SHUMARD OAK	
QUERCUS STELLATA	POST OAK	
QUERCUS VELUTINA	BLACK OAK	
RANUNCULUS ABORTIVUS	KIDNEY-LEAVED BUTTERCUP	
RANUNCULUS RECURVATUS	HOOKED CROWFOOT	
RHEXIA MARIANA VAR EXALBIDA	MARYLAND MEADOW-BEAUTY	
RHODODENDRON PERICLYMENOIDES	PINK AZALEA	
RHUS COPALLINA	WINGED SUMAC	
ROBINIA PSEUDOACACIA	BLACK LOCUST	
ROSA CAROLINA	CAROLINA ROSE	
RUBUS ARGUTUS	PRICKLY FLORIDA BLACKBERRY	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
RUBUS IDAEUS SSP IDAEUS	EUROPEAN RED RASPBERRY***	
RUBUS TRIVIALIS	SOUTHERN DEWBERRY	
RUDBECKIA LACINIATA	CUT-LEAVED CONEFLOWER	
RUELLIA CAROLINIENSIS	CAROLINA PETUNIA	
RUELLIA HUMILIS	**LOW WILD-PETUNIA**	**P: diabase glades**
RUELLIA PURSHIANA	**PURSH'S WILD-PETUNIA**	**PM: glades and woodlands, mostly over mafic or calcareous rocks**
SABATIA ANGULARIS	SQUARE-STEMMED ROSE PINK	
SACCHARUM BREVIBARBE	SHORT-BEARD PLUMEGRASS	
SAGITTARIA LATIFOLIA	BROADLEAF ARROWHEAD	
SALIX NIGRA	BLACK WILLOW	
SALVIA LYRATA	LYRE-LEAF SAGE	
SAMBUCUS CANADENSIS	COMMON ELDERBERRY	
SANGUINARIA CANADENSIS	BLOODROOT	
SANICULA CANADENSIS	SHORT-STYLED SANICLE	
SASSAFRAS ALBIDUM	SASSAFRAS	
SAURURUS CERNUUS	LIZARD'S TAIL	
SAXIFRAGA VIRGINIENSIS	VIRGINIA SAXIFRAGE	
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	
SCIRPUS CYPERINUS	COTTONGRASS BULRUSH	
SCLERANTHUS ANNUUS	ANNUAL KNAWEL	
SCUTELLARIA ELLIPTICA	HAIRY SKULLCAP	
SCUTELLARIA INTEGRIFOLIA	HYSSOP SKULLCAP	
SENECIO ANONYMUS	SMALL'S RAGWORT	
SERICOCARPUS ASTEROIDES	TOOTHED WHITE-TOP ASTER	
SILPHIUM TEREBINTHINACEUM	**PRAIRIE DOCK**	**P: diabase glades, other open or semi-open sites over mafic rock**
SMILAX BONA-NOX	SAW GREENBRIER	
SMILAX ROTUNDIFOLIA	COMMON GREENBRIER	
SOLANUM CAROLINENSE	CAROLINA HORSE-NETTLE	
SOLIDAGO CAESIA VAR CURTISII	CURTIS' GOLDENROD	
SOLIDAGO CANADENSIS	CANADA GOLDENROD	
SOLIDAGO NEMORALIS	FIELD GOLDENROD	
SOLIDAGO ODORA	SWEET GOLDENROD	
SOLIDAGO PINETORUM	SMALL'S GOLDENROD	
SOLIDAGO SPECIOSA	SHOWY GOLDENROD	
SORGHUM HALEPENSE	JOHNSON GRASS	
SPIRANTHES CERNUA	NODDING LADIES'-TRESSES	
SPIRANTHES LACERA VAR GRACILIS	SOUTHERN SLENDER LADIES'TRESSES	
SPIRANTHES OVALIS	LESSER LADIES'-TRESSES	
SPIRANTHES PRAECOX	GRASSLEAF LADIES'-TRESSES	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
STAPHYLEA TRIFOLIA	AMERICAN BLADDERNUT	
STELLARIA PUBERA	GIANT CHICKWEED	
STROPHOSTYLES UMBELLATA	PINK WILD-BEAN	
STYLOSANTHES BIFLORA	PENCILFLOWER	
STYRAX GRANDIFOLIUS	BIGLEAF SNOWBELL	
SYMPLOCOS TINCTORIA	HORSE-SUGAR	
TANACETUM VULGARE	COMMON TANSY	
TARAXACUM OFFICINALE	COMMON DANDELION	
TEESDALIA NUDICAULIS	COMMON SHEPHERD'S-CRESS	
TEPHROSIA VIRGINIANA	GOAT'S-RUE	
THALICTRUM REVOLUTUM	WAXLEAF MEADOWRUE	
THELYPTERIS NOVEBORACENSIS	NEW YORK FERN	
THELYPTERIS PALUSTRIS	MARSH FERN	
TOXICODENDRON RADICANS	POISON IVY	
TRICHOSTEMA DICHOTOMUM	FORKED BLUECURLS	
TRILLIUM CATESBAEI	CATESBY'S TRILLIUM	
TYPHA LATIFOLIA	BROAD-LEAF CATTAIL	
ULMUS ALATA	WINGED ELM	
ULMUS AMERICANA	AMERICAN ELM	
ULMUS RUBRA	SLIPPERY ELM	
VACCINIUM ARBOREUM	FARKLEBERRY	
VACCINIUM FUSCATUM		
VACCINIUM PALLIDUM	EARLY LOWBUSH BLUEBERRY	
VACCINIUM STAMINEUM	SQUAW HUCKLEBERRY	
VERBASCUM THAPSUS	GREAT MULLEIN	
VERNONIA NOVEBORACENSIS	NEW YORK IRONWEED	
VIBURNUM ACERIFOLIUM	MAPLE-LEAF VIBURNUM	
VIBURNUM DENTATUM	SOUTHERN ARROW-WOOD	
VIBURNUM PRUNIFOLIUM	SMOOTH BLACK-HAW	
VIBURNUM RAFINESQUIANUM	DOWNY ARROWWOOD	
VIOLA PRIMULIFOLIA	PRIMROSE-LEAF VIOLET	
VIOLA SORORIA	WOOLLY BLUE VIOLET	
VIOLA TRICOLOR	THREE COLORED VIOLET	
VITIS AESTIVALIS	SUMMER GRAPE	
VITIS ROTUNDIFOLIA	MUSCADINE GRAPE	
WISTERIA SINENSIS	CHINESE WISTERIA	
WOODSIA OBTUSA	BLUNT-LOBE WOODSIA	
WOODWARDIA AREOLATA	NETTED CHAINFERN	
XANTHORHIZA SIMPLICISSIMA	YELLOW ROOT	
ZEPHYRANTHES ATAMASCA	ATAMASCO LILY	

Source: AMEC 2007a

Plant species encountered during LCTA Core Plot Inventory Camp Butner Training Site, NC (1999 Inventory)		
SPECIES	**COMMON NAME**	**FAMILY**
Acer rubrum	red maple	Aceraceae
Ailanthus altissima	tree-of-heaven	Simaroubaceae
Amelanchier arborea	serviceberry	Roseaceae
Andropogon sp.	bluestem	Poaceae
Arrhenatherum elatius	oatgrass	Poaceae
Aristolochia serpentaria	Virginia snakeroot	Aristolochiaceae
Asplenium platyneuron	ebony spleenwort	Aspleniaceae
Aster sp.	aster	Asteraceae
Athyrium filix-femina	common ladyfern	Dryopteridaceae
Betula nigra	river birch	Betulaceae
Boehmeria cylindrica	smallspike false nettle	Urticaceae
Carpinus caroliniana	hornbeam / musclewood	Betulaceae
Carya glabra	pignut hickory	Juglandaceae
Carya ovata	shagbark hickory	Juglandaceae
Castanea pumila	Allegheny chinkapin	Fagaceae
Campsis radicans	trumpet creeper	Bignoniaceae
Carex sp.	sedge	Cyperaceae
Carya tormentosa	mockernut hickory	Juglandaceae
Cercis canadensis	redbud	Fabaceae
Chasmanthium latifolium	indian woodoats	Poaceae
Chimaphila maculata	spotted wintergreen	Pyrolaceae
Corylus americana	hazelnut	Betulaceae
Conyza canadensis		Asteraceae
Cornus florida	flowering dogwood	Cornaceae
Crataegus crus-galli	cockspur hawthorne	Rosaceae
Desmodium nudiflorum	nakedflower tick-trefoil	Fabaceae
Dichanthium sp.	panicgrass	Poaceae
Dichanthium scoparium	velvet panicum	Poaceae
Diospyros virginiana	persimmon	Ebenaceae
Epilobium angustifolium	fireweed	Onagraceae
Euonymus americana	strawberrybush	Celastraceae
Eupatorium capillifolium	dog fennel	Asteraceae
Fagus grandifolia	American beech	Fagaceae
Fraxinus americana	white ash	Oleaceae
Fraxinus sp.	ash	Oleaceae
Fragaria virginiana	wild strawberry	Rosaceae
Galium sp.	bedstraw	Rubiaceae
Gamochaeta purpurea	purple cudweed	Asteraceae
Gaylussacia sp.	huckleberry	Ericaceae
Goodyera pubescens	rattlesnake plantain	Orchidaceae
Hamamelis virginiana	witchhazel	Hamamelidaceae
Hexastylis sp.	wild ginger / heartleaf	Aristolochiaceae
Hypericum hypericoides	St. Andrew's Cross	Clusiaceae
Hypericum sp.	St. John's-wort	Clusiaceae
Ilex decidua	possumhaw	Aquifoliaceae
Ilex opaca	American holly	Aquifoliaceae

Plant species encountered during LCTA Core Plot Inventory Camp Butner Training Site, NC (1999 Inventory)		
SPECIES	**COMMON NAME**	**FAMILY**
Ipomoea purpurea	morning glory	Convolvulaceae
Juncus effusus	soft rush	Juncaceae
Juncus sp.	rush	Juncaceae
Juniperus virginiana	eastern redcedar	Cupressaceae
Lespedeza bicolor	bicolor lespedeza	Fabaceae
Lespedeza procumbens	trailing lespedeza	Fabaceae
Lespedeza sp.	lespedeza	Fabaceae
Liquidambar stryaciflua	sweetgum	Hamamelidaceae
Liriodendron tulipifera	yellow-poplar	Magnoliaceae
Lonicera japonica	Japanese honeysuckle	Caprifoliaceae
Lycopodium digitatum	fan clubmoss	Lycopodiaceae
Lycopus virginicus	Virginia water horehound	Lamiaceae
Maianthemum racemosum	false Solomon's-seal	Liliaceae
Mitchella repens	partridgeberry	Rubiaceae
Microstegium vimineum	Japanese grass	Poaceae
Morus rubra	red mulberry	Moraceae
Nuttallanthus canadensis	Canada toadflax	Scrophulariaceae
Nyssa sylvatica	blackgum	Nyssaceae
Ostrya virginiana	hophornbeam	Betulaceae
Oxalis sp.	wood sorrel	Oxalidaceae
Oxydendrum arboreum	sourwood	Ericaeae
Parthenocissus quinquefolia	Virginia creeper	Vitaceae
Phytolacca americana	pokeweed	Phytolaccaceae
Photinia pyrifolia	red chokeberry	Rosaceae
Pinus echinata	shortleaf pine	Pinaceae
Pinus taeda	loblolly pine	Pinaceae
Pinus virginiana	Virginia pine	Pinaceae
Plantago sp.	Plantain	Plantaginaceae
Plantago aristata	largebracted plantain	Plantaginaceae
Platanus occidentalis	American sycamore	Platanaceae
Polystichum acrostichoides	Christmas fern	Dryopteridaceae
Prenanthes altissima	lion's foot	Asteraceae
Prunus serotina	black cherry	Rosaceae
Quercus alba	white oak	Fagaceae
Quercus coccinea	scarlet oak	Fagaceae
Quercus falcata	southern red oak	Fagaceae
Quercus marilandica	blackjack oak	Fagaceae
Quercus phellos	willow oak	Fagaceae
Quercus rubra	northern red oak	Fagaceae
Quercus stellata	post oak	Fagaceae
Quercus velutina	black oak	Fagaceae
Rhus copallinum	winged sumac	Anacardiaceae
Rubus sp.	blackberry	Anacardiaceae
Sassafras albidum	sassafras	Lauraceae
Smilax rotundifolia	greenbrier	Smilacaceae
Solidago caesia	wreath goldenrod	Asteraceae
Solidago sp.	goldenrod	Asteraceae

Plant species encountered during LCTA Core Plot Inventory Camp Butner Training Site, NC (1999 Inventory)		
SPECIES	**COMMON NAME**	**FAMILY**
Symphyotrichum grandiflorum	largeflower aster	Asteraceae
Toxicodedron radicans	poison ivy	Anacardiaceae
Trifolium arvense	rabbitsfoot clover	Fabaceae
Trifolium sp.	clover	Fabaceae
Ulmus alata	winged elm	Ulmaceae
Ulmus americana	American elm	Ulmaceae
Vaccinium sp.	blueberry	Ericaceae
Vibernum acerifolium	mapleleaf viburnum	Caprifoliaceae
Viburnum prunifolium	blackhaw	Caprifoliaceae
Viburnum rafinesquianum	downy arrowwood	Caprifoliaceae
Vitis rotundifolia	muscadine grape	Vitaceae
Viburnum rufidulum	rusty blackhaw	Caprifoliaceae

CBTS Wetland Species (Documented in USACE-WES 1998)		
Group	**Scientific Name**	**Common Name**
Plant	*Acer rubrum*	Red maple
Plant	*Acer saccharum ssp. floridanum*	Sugar maple
Plant	*Alnus serrulata*	Hazel alder
Plant	*Arisaema triphyllum*	Jack in the pulpit
Plant	*Betula nigra*	River birch
Plant	*Carex alata*	Broadwing sedge
Plant	*Carex complanta*	--
Plant	*Carex crinita*	Fringed sedge
Plant	*Carex debilis*	White edge sedge
Plant	*Carex lurida*	Shallow sedge
Plant	*Carex stipata*	Sawbreak sedge
Plant	*Carpinus caroliniana*	American hornbeam
Plant	*Cornus foemina*	Stiff dogwood
Plant	*Dryopteris celsa*	Log fern
Plant	*Eulalia viminea*	Japanese stilt grass
Plant	*Fraxinus pennsylvanica*	Green ash
Plant	*Glyceria striata*	Fowl mannagrass
Plant	*Ilex opaca*	American holly
Plant	*Impatiens capensis*	Jewelweed
Plant	*Juncus effusus*	Common rush
Plant	*Juniperus virginiana*	Eastern redcedar
Plant	*Leersia virginica*	Whitegrass
Plant	*Lindera benzoin*	Spicebush
Plant	*Liquidambar styraciflua*	Sweetgum
Plant	*Lonicera japonica*	Japanesse honeysuckle
Plant	*Lycopus virginicus*	Virginia bugleweed
Plant	*Nyssa sylvatica*	Blackgum
Plant	*Onoclea sensibilis*	Sensitive fern
Plant	*Osmunda cinnamomea*	Cinnamon fern
Plant	*Parthenocissus quinquefolia*	Virginia creeper
Plant	*Phalaris occidentalis*	Reed canarygrass
Plant	*Polystichum acrostichoides*	Loblolly pine
Plant	*Quercus alba*	White oak
Plant	*Quercus phellos*	Willow oak
Plant	*Quercus shumardii*	Shumard oak
Plant	*Smilax glauca*	Cat greenbriar
Plant	*Smilax rotundifolia*	Common greenbriar
Plant	*Tilia americana*	American basswood
Plant	*Toxicodendron radicans*	Poision ivy
Plant	*Ulmus alata*	Winged elm
Plant	*Vaccinium conymbosum*	--
Plant	*Viburnum dentatum*	Arrowwood
Plant	*Woodwardia areolata*	Netted chainfern
Plant	*Zephyranthes atamasca*	Atamasco lily

Species Observed During 2006 Vegetation Community and Flora Survey and 2012 – 2013 Vegetation Community and Flora Plant Survey, CBTS

The following table lists the plant species observed on the CBTS during the 2006 vegetation community and flora survey and/or the 2012 – 2013 vegetation community and flora survey.

*** - non-native plants

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
TREE				
ACER BARBATUM	FLORIDA MAPLE	ACBA3	X	
ACER RUBRUM VAR RUBRUM	RED MAPLE	ACRUR	X	X
ACER RUBRUM VAR TRILOBUM	RED MAPLE	ACRUT	X	
ACER SACCHARUM	SUGAR MAPLE	ACSAS	X	
AILANTHUS ALTISSIMA***	TREE-OF-HEAVEN***	AIAL	X	X
BETULA NIGRA	RIVER BIRCH	BENI	X	X
CARPINUS CAROLINIANA	IRONWOOD	CACA18	X	X
CARYA ALBA	MOCKERNUT HICKORY	CAAL27	X	X
CARYA GLABRA VAR GLABRA	PIGNUT HICKORY	CAGL8	X	X
CARYA OVATA	SHAG-BARK HICKORY	CAOV2	X	X
CELTIS LAEVIGATA	SUGARBERRY	CELA	X	
CORNUS FLORIDA	FLOWERING DOGWOOD	COFL2	X	X
DIOSPYROS VIRGINIANA	PERSIMMON	DIVI5	X	X
FAGUS GRANDIFOLIA	AMERICAN BEECH	FAAM	X	X
FRAXINUS AMERICANA	WHITE ASH	FRAM2	X	X
FRAXINUS PENNSYLVANICA	GREEN ASH	FRPE	X	X
GLEDITSIA TRIACANTHOS	HONEY-LOCUST	GLTR	X	
ILEX OPACA	AMERICAN HOLLY	ILOP	X	X
JUGLANS NIGRA	BLACK WALNUT	JUNI	X	
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	JUVI	X	X
LIQUIDAMBAR STYRACIFLUA	SWEET GUM	LIST2	X	X
LIRIODENDRON TULIPIFERA	TULIP TREE	LITU	X	X
MACLURA POMIFERA	OSAGEORANGE	MAPO	X	
MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	MAGR4	X	X
MALUS ANGUSTIFOLIA	SOUTHERN CRABAPPLE	MAAN3	X	
MORUS RUBRA	RED MULBERRY	MORU2	X	X
NYSSA SYLVATICA	BLACK GUM	NYSY	X	X
OSTRYA VIRGINIANA	EASTERN HOP-HORNBEAM	OSVI	X	X
OXYDENDRUM ARBOREUM	SOURWOOD	OXAR	X	X
PAULOWNIA TOMENTOSA***	ROYAL PAULOWNIA***	PATO2	X	X
PINUS ECHINATA	SHORTLEAF PINE	PIEC2	X	X
PINUS TAEDA	LOBLOLLY PINE	PITA	X	X
PINUS VIRGINIANA	VIRGINIA PINE	PIVI2	X	X
PLATANUS OCCIDENTALIS	SYCAMORE	PLOC	X	X
PRUNUS AMERICANA	AMERICAN PLUM	PRAM	X	
PRUNUS SEROTINA	BLACK CHERRY	PRSE2	X	X
PYRUS COMMUNIS***	COMMON PEAR***	PYCO	X	X
QUERCUS ALBA	WHITE OAK	QUAL	X	X
QUERCUS BICOLOR	SWAMP WHITE OAK	QUBI	X	
QUERCUS COCCINEA	SCARLET OAK	QUCO2	X	
QUERCUS FALCATA	SPANISH OAK	QUCO2	X	X
QUERCUS HEMISPHAERICA	DARLINGTON OAK	QUHE2		X
QUERCUS LAEVIS	TURKEY OAK	QULA2	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
QUERCUS MARILANDICA	BLACKJACK OAK	QUMA3	X	
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	QUMI	X	
QUERCUS MONTANA	CHESTNUT OAK	QUMO4	X	
QUERCUS PALUSTRIS	PIN OAK	QUPA2	X	
QUERCUS PHELLOS	WILLOW OAK	QUPH	X	X
QUERCUS RUBRA	NORTHERN RED OAK	QURU	X	X
QUERCUS SHUMARDII	SHUMARD OAK	QUSH	X	X
QUERCUS STELLATA	POST OAK	QUST	X	X
QUERCUS VELUTINA	BLACK OAK	QUVE	X	X
ROBINIA PSEUDOACACIA	BLACK LOCUST	ROPS	X	X
SALIX NIGRA	BLACK WILLOW	SANI	X	X
SASSAFRAS ALBIDUM	SASSAFRAS	SAAL5	X	X
ULMUS ALATA	WINGED ELM	ULAL	X	X
ULMUS AMERICANA	AMERICAN ELM	ULAM	X	X
ULMUS RUBRA	SLIPPERY ELM	ULRU	X	
	VINE			
CAMPSIS RADICANS	TRUMPET-CREEPER	CARA2	X	X
LONICERA DIOICA	LIMBER HONEYSUCKLE	LODI2	X	
LONICERA JAPONICA	JAPANESE HONEYSUCKLE***	LOJA	X	X
LONICERA SEMPERVIRENS	TRUMPET HONEYSUCKLE	LOSE	X	X
MITCHELLA REPENS	PARTRIDGE-BERRY	MIRE	X	X
PARTHENOCISSUS QUINQUEFOLIA	VIRGINIA CREEPER	PAQU2	X	X
PASSIFLORA INCARNATA	PURPLE PASSION-FLOWER	PAIN6	X	
PASSIFLORA LUTEA	YELLOW PASSIONFLOWER	PALU2	X	
PUERARIA MONTANA***	KUDZU	PUMO	X	X
ROSA CAROLINA	CAROLINA ROSE	ROCA4	X	
RUBUS ARGUTUS	PRICKLY FLORIDA BLACKBERRY	RUAR2	X	X
RUBUS IDAEUS SSP IDAEUS	EUROPEAN RED RASPBERRY***	RUIDI	X	X
RUBUS TRIVIALIS	SOUTHERN DEWBERRY	RUTR	X	X
SMILAX BONA-NOX	SAW GREENBRIER	SMBO2	X	X
SMILAX ROTUNDIFOLIA	COMMON GREENBRIER	SMRO	X	X
TOXICODENDRON RADICANS	POISON IVY	TORA2	X	X
VITIS AESTIVALIS	SUMMER GRAPE	VIAE	X	
VITIS ROTUNDIFOLIA	MUSCADINE GRAPE	VIRO3	X	X
WISTERIA SINENSIS***	CHINESE WISTERIA***	WISI	X	X
	SHRUB			
ALBIZIA JULIBRISSIN***	MIMOSA***	ALJU	X	X
ALNUS SERRULATA	BROOK-SIDE ALDER	ALSE2	X	X
ASIMINA PARVIFLORA	DWARF PAW-PAW	ASTR	X	
CERCIS CANADENSIS	EASTERN REDBUD	CECA4	X	X
CHIONANTHUS VIRGINICUS	FRINGE TREE	CHVI3	X	
CORNUS FOEMINA	STIFF DOGWOOD	COFO	X	
CORYLUS AMERICANA	AMERICAN HAZELNUT	COAM3	X	
CRATAEGUS FLAVA	A HAWTHORN	CRAP3	X	X
EPIGAEA REPENS	TRAILING ARBUTUS	EPRE2	X	
EUONYMUS AMERICANA	AMERICAN STRAWBERRY-BUSH	EUAM7	X	X
GAYLUSSACIA FRONDOSA	DANGLE-BERRY	GAFR2	X	
HAMAMELIS VIRGINIANA	AMERICAN WITCH-HAZEL	HAVI4	X	
ILEX DECIDUA	DECIDUOUS HOLLY	ILDE	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
ILEX OPACA	AMERICAN HOLLY	ILOP		X
KALMIA LATIFOLIA	MOUNTAIN LAUREL	KALA	X	
LINDERA BENZOIN	SPICEBUSH	LIBE3	X	
RHODODENDRON PERICLYMENOIDES	PINK AZALEA	RHPE4	X	
RHUS COPALLINUM	WINGED SUMAC	RHCO	X	X
ROSA MULTIFLORA	MULTIFLORA ROSE	ROMU		X
SAMBUCUS CANADENSIS	COMMON ELDERBERRY	SACA12	X	
STAPHYLEA TRIFOLIA	AMERICAN BLADDERNUT	STTR	X	
STYRAX GRANDIFOLIUS	BIGLEAF SNOWBELL	STGR4	X	
SYMPLOCOS TINCTORIA	HORSE-SUGAR	SYTI	X	X
VACCINIUM ARBOREUM	FARKLEBERRY	VAAR	X	X
VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	VACO		X
VACCINIUM FUSCATUM	BLACK HIGHBUSH BLUEBERRY	VAFU	X	X
VACCINIUM PALLIDUM	EARLY LOWBUSH BLUEBERRY	VAPA4	X	
VACCINIUM STAMINEUM	SQUAW HUCKLEBERRY	VAST	X	X
VIBURNUM ACERIFOLIUM	MAPLE-LEAF VIBURNUM	VIAC	X	
VIBURNUM DENTATUM	SOUTHERN ARROW-WOOD	VIDE	X	
VIBURNUM PRUNIFOLIUM	SMOOTH BLACK-HAW	VIPR	X	
VIBURNUM RAFINESQUIANUM	DOWNY ARROWWOOD	VIRA	X	
XANTHORHIZA SIMPLICISSIMA	YELLOW ROOT	XASI	X	X
	HERB			
ACHILLEA MILLEFOLIUM	COMMON YARROW	ACMIM2	X	X
AGALINIS PURPUREA	LARGE-PURPLE FALSE-FOXGLOVE	AGPU5	X	
ALLIUM AMPELOPRASUM***	WILD LEEK***	ALAM	X	X
ALLIUM VINEALE***	FIELD GARLIC***	ALVI	X	
AMBROSIA ARTEMISIIFOLIA	ANNUAL RAGWEED	AMARA2	X	X
AMPHICARPAEA BRACTEATA	AMERICAN HOG-PEANUT	AMBR2	X	X
ANEMONELLA THALICTROIDES	WINDFLOWER	ANTH5	X	
ANTENNARIA PLANTAGINIFOLIA	PLANTAIN-LEAF PUSSYTOES	ANPL	X	
ANTENNARIA SOLITARIA	SINGLE-HEAD PUSSYTOES	ANSO	X	
ANTHEMIS ARVENSIS	CORN CAMOMILE	ANAR6	X	
APOCYNUM CANNABINUM	CLASPING-LEAF DOGBANE	APCA	X	X
ARISAEMA TRIPHYLLUM	JACK IN THE PULPIT	ARTR		X
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT	ARSE3	X	
ARNOGLOSSUM ATRIPLICIFOLIUM	PALE INDIAN-PLANTAIN	ARAT	X	
ASCLEPIAS AMPLEXICAULIS	CLASPING MILKWEED	ASAM	X	
ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	ASTUT2	X	X
ASTER DIVARICATUS	SERPENTINE ASTER	ASDI	X	
ASTER DUMOSUS	BUSHY ASTER	ASDU	X	X
ASTER SPECTABILIS	WESTERN SHOWY ASTER	ASSP11	X	
AUREOLARIA VIRGINICA	DOWNY FALSE-FOXGLOVE	AUVI	X	
BARBAREA VERNA	EARLY WINTER-CRESS	BAVE	X	X
BIDENS ARISTOSA	TICKSEED BEGGAR-TICKS	BIAR	X	X
BOEHMERIA CYLINDRICA	FALSE NETTLE	BOCY	X	X
CARDAMINE ANGUSTATA	SLENDER TOOTHWORT	CARA2	X	
CARDAMINE HIRSUTA***	HAIRY BITTER-CRESS***	CAHI3	X	
CENTROSEMA VIRGINIANUM	COASTAL BUTTERFLY-PEA	CEVI2	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
CERASTIUM FONTANUM	COMMON MOUSE-EAR CHICKWEED	CEFO2	X	
CHAMAECRISTA FASCICULATA	PRAIRIE SENNA	CHFA2	X	
CHAMAESYCE MACULATA	SPOTTED SPURGE	CHMA11	X	
CHIMAPHILA MACULATA	STRIPED WINTERGREEN	CHMA3	X	
CHRYSOGONUM VIRGINIANUM	GREEN-AND-GOLD	CHVI5	X	
CHRYSOPSIS MARIANA	MARYLAND GOLDEN ASTER	CHMA14	X	
CIRSIUM HORRIDULUM	YELLOW THISTLE	CIHO2	X	X
CLAYTONIA VIRGINICA	NARROW-LEAVED SPRING BEAUTY	CLVI3	X	
CNIDOSCOLUS URENS VAR. STIMULOSUS	FINGER ROT	CNURS		X
COMMELINA COMMUNIS***	ASIATIC DAYFLOWER***	COCO3	X	
CONYZA CANADENSIS	CANADA HORSEWEED	COCA5	X	
COREOPSIS AURICULATA	LOBED TICKSEED	COAU	X	
COREOPSIS MAJOR	WOOD TICKSEED	COMA6	X	
COREOPSIS TINCTORIA	GOLDEN TICKSEED	COTI3	X	
CUNILA ORIGANOIDES	DITTANY	CUOR	X	
CUSCUTA CAMPESTRIS	FIELD DODDER	CUCA2	X	X
CYTISUS SCOPARIUS	SCOTCH BROOM	CYSC4	X	
DAUCUS CAROTA	QUEEN ANNE'S LACE	DACA6		X
DESMODIUM NUDIFLORUM	BARE-STEMMED TICK-TREEFOIL	DENU4	X	
DESMODIUM PANICULATUM	NARROW-LEAF TICK-TREFOIL	DEPA6	X	
DESMODIUM ROTUNDIFOLIUM	PROSTRATE TICK-TREEFOIL	DERO3	X	
DIODIA TERES	ROUGH BUTTONWEED	DITE2	X	X
DRABA VERNA	VERNAL WHITLOW GRASS	DRVE2	X	
ELEPHANTOPUS TOMENTOSUS	TOBACCOWEED	ELTO2	X	X
EPIFAGUS VIRGINIANA	BEECHDROPS	EPVI2	X	X
ERECHTITES HIERACIIFOLIA	FIREWEED	ERHI9	X	X
ERIGERON ANNUUS	WHITE-TOP FLEABANE	ERAN	X	X
ERIGERON STRIGOSUS	DAISY FLEABANE	ERSTS2	X	
ERYTHRONIUM AMERICANUM	YELLOW TROUT-LILY	ERAM5	X	
ERYTHRONIUM UMBILICATUM SSP UMBILICATUM	YELLOW TROUT-LILY	ERUM2	X	
EUPATORIUM CAPILLIFOLIUM	SMALL DOG-FENNEL THOROUGHWORT	EUCA5	X	X
EUPATORIUM HYSSOPIFOLIUM	HYSSOPLEAF THOROUGHWORT	EUHY	X	
EUPATORIUM ROTUNDIFOLIUM	ROUND-LEAF THOROUGH-WORT	EURO4	X	X
EUPATORIUM SEROTINUM	LATE-FLOWERING THOROUGH-WORT	EUSE2	X	X
EUPHORBIA COROLLATA	FLOWERING SPURGE	EUCO10	X	
EUPHORBIA MARGINATA	SNOW-ON-THE-MOUNTAIN	EUMA8	X	
EUTHAMIA CAROLIANA	CAROLINA FLAT-TOP GOLDENROD	EUCA26	X	
FRAGARIA VIRGINIANA	VIRGINIA STRAWBERRY	FRVI	X	X
GALACTIA VOLUBILIS	DOWNY MILKPEA	GAVO	X	
GALIUM APARINE	CATCHWEED BEDSTRAW	GAAP2	X	
GALIUM CIRCAEZANS	WILD LICORICE	GACI2	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
GALIUM OBTUSUM	BLUNT-LEAF BEDSTRAW	GAOB	X	
GALIUM PILOSUM	HAIRY BEDSTRAW	GAPI2	X	
GALIUM TRIFLORUM	SWEET-SCENT BEDSTRAW	GATR3	X	
GAMOCHAETA PURPUREA	SPOONLEAF PURPLE EVERLASTING	GAPU3		X
GERANIUM MACULATUM	WILD GERANIUM	GEMA	X	X
GEUM CANADENSE	WHITE AVENS	GECA7	X	
HELENIUM AMARUM	FIVE-LEAF SNEEZEWEED	HEAM	X	
HELENIUM AUTUMNALE	COMMON SNEEZEWEED	HEAU	X	
HEPATICA AMERICANA	LIVERLEAF	HEAM8	X	X
HEUCHERA AMERICANA	AMERICAN ALUMROOT	HEAM8	X	
HEXALECTRIS SPICATA	CRESTED CORALROOT	HESP3	X	
HEXASTYLIS LEWISII	LEWIS'S HEARTLEAF	HELE2	X	
HEXASTYLIS MINOR	LITTLE HEARTLEAF	HEMI13	X	X
HEXASTYLIS SHUTTLEWORTHII	LARGE-FLOWERED HEARTLEAF	HESH2	X	
HEXASTYLIS VIRGINICA	VIRGINIA HEARTLEAF	HEVI3	X	
HIERACIUM GRONOVII	HAIRY HAWKWEED	HIGR3	X	
HIERACIUM VENOSUM	RATTLESNAKE HAWKWEED	HIVE	X	
HOUSTONIA CAERULEA	QUACKER'S BONNETS	HOCA4	X	X
HYPERICUM GENTIANOIDES	ORANGE-GRASS ST. JOHN'S-WORT	HYGE	X	
HYPERICUM HYPERICOIDES	ST. ANDREW'S CROSS	HYHY	X	X
HYPERICUM NUDIFLORUM	PRETTY ST. JOHN'S-WORT	HYNU	X	
HYPERICUM PUNCTATUM	COMMON ST. JOHN'S-WORT	HYPU	X	
HYPERICUM STRAGULUM	ST. ANDREW'S CROSS	HYST4	X	
IMPATIENS CAPENSIS	SPOTTED JEWEL-WEED	IMCA	X	X
IPOMOEA PANDURATA	BIG-ROOT MORNING-GLORY	IPPA	X	
IRIS VERNA	DWARF IRIS	IRVE	X	
JUSTICIA AMERICANA	COMMON WATER-WILLOW	JUAM	X	
KRIGIA VIRGINICA	DWARF DANDELION	KRVI	X	X
LECHEA PULCHELLA	LEGGETT'S PINWEED	LEPU4	X	
LESPEDEZA BICOLOR	SHRUBBY BUSHCLOVER	LEBI2	X	X
LESPEDEZA CAPITATA	ROUND-HEAD BUSH-CLOVER	LECA8	X	X
LESPEDEZA CUNEATA	CHINESE BUSHCLOVER	LECU	X	X
LESPEDEZA PROCUMBENS	TRAILING BUSH-CLOVER	LEPR	X	X
LESPEDEZA VIRGINICA	SLENDER BUSH-CLOVER	LEVI7	X	X
LEUCANTHEMUM VULGARE	OXEYE DAISY	LEVU	X	
LEUCOTHOE RECURVA	RECURVED DOG-HOBBLE	LERE6	X	
LIATRIS SQUARROSA	SCALY GAY-FEATHER	LISQ	X	
LINUM SULCATUM VAR SULCATUM	GLADE FLAX	LISU4	X	
LOBELIA CARDINALIS	CARDINAL FLOWER	LOCA2	X	X
LOBELIA INFLATA	INDIAN-TOBACCO	LOIN	X	
LOBELIA NUTTALLII	NUTTALL'S LOBELIA	LONU	X	
LOBELIA PUBERULA	DOWNY LOBELIA	LOPU	X	
LOBELIA SPICATA	PALE-SPIKED LOBELIA	LOSP	X	
LUDWIGIA ALTERNIFOLIA	BUSHY SEEDBOX	LUAL2	X	
LUDWIGIA DECURRENS	PRIMROSE WILLOW	LUDE4	X	
LUDWIGIA PALUSTRIS	MARSH SEEDBOX	LUPA	X	X
LYCOPUS UNIFLORUS	NORTHERN BUGLEWEED	LYUN	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
MIMULUS ALATUS	SHARP-WING MONKEYFLOWER	MIAL2	X	X
MURDANNIA KEISAK***	MARSH DEWFLOWER	MUKE	X	
NARCISSUS SP***	DAFFODIL***	NARCI	X	
NUPHAR LUTEA	AMERICAN LOTUS	NULU	X	
NUTTALLANTHUS CANADENSIS	CANADA TOADFLAX	NUCA	X	X
OENOTHERA BIENNIS	COMMON EVENING-PRIMROSE	OEBI	X	X
OENOTHERA FRUTICOSA	NARROW-LEAVED SUNDROPS	OEFR	X	
ORONTIUM AQUATICUM	GOLDEN CLUB	ORAQ	X	
OXALIS CORNICULATA	CREEPING WOODSORREL	OXCO	X	
OXALIS DILLENII	DILLEN'S WOODSORREL	OXDI2	X	
OXALIS STRICTA	UPRIGHT YELLOW WOOD-SORREL	OXST	X	X
OXALIS VIOLACEA	VIOLET WOOD-SORREL	OXVI	X	
PENNISETUM AMERICANUM	AMERICAN MILLET GRASS	PEAM4	X	
PHLOX PILOSA	DOWNY PHLOX	PHPI	X	
PHYTOLACCA AMERICANA	COMMON POKEWEED	PHAM4	X	X
PLANTAGO LANCEOLATA	NARROWLEAF PLANTAIN	PLLA		X
PLUCHEA CAMPHORATA	MARSH FLEABANE	PLCA7	X	
PODOPHYLLUM PELTATUM	MAY APPLE	POPE	X	X
POLYGALA CURTISSII	CURTIS'S MILKWORT	POCU5	X	
POLYGONUM HYDROPIPEROIDES	MILD WATER-PEPPER	POHY2	X	X
POLYGONUM PERSICARIA	LADY'S THUMB	POPE3	X	
POLYGONUM SAGITTATUM	ARROW-LEAVED TEARTHUMB	POSA5	X	
POLYGONUM SETACEUM	SWAMP SMARTWEED	POSE6	X	X
PONTEDERIA CORDATA	PICKERELWEED	POCO14		X
PORTERANTHUS TRIFOLIATUS	BOWMAN'S-ROOT	POTR11	X	
POTENTILLA CANADENSIS	CANADA CINQUEFOIL	POCA17	X	
POTENTILLA SIMPLEX	OLD-FIELD CINQUEFOIL	POSI2	X	
PRENANTHES SERPENTARIA	LION'S-FOOT	PRSE	X	
PRUNELLA VULGARIS	SELF-HEAL	PRVU	X	
PSEUDOGNAPHALIUM OBTUSIFOLIUM	RABBIT-TOBACCO	PSOBS	X	X
PYCNANTHEMUM INCANUM	HOARY MOUNTAIN-MINT	PYIN	X	
PYCNANTHEMUM MUTICUM	BLUNT MOUNTAIN MINT	PYMU	X	
PYCNANTHEMUM PYCNANTHEMOIDES	SOUTHERN MOUNTAIN-MINT	PYPY	X	
PYCNANTHEMUM TENUIFOLIUM	SLENDER MOUNTAIN-MINT	PYTE	X	X
RANUNCULUS ABORTIVUS	KIDNEY-LEAVED BUTTERCUP	RAAB	X	
RANUNCULUS RECURVATUS	HOOKED CROWFOOT	RARE2	X	
RHEXIA MARIANA VAR EXALBIDA	MARYLAND MEADOW-BEAUTY	RHMAE	X	
RUDBECKIA LACINIATA	CUT-LEAVED CONEFLOWER	RULA3	X	
RUELLIA CAROLINIENSIS	CAROLINA PETUNIA	RUCA4	X	
RUELLIA HUMILIS	LOW WILD-PETUNIA	RUHU	X	
RUELLIA PURSHIANA	PURSH'S WILD-PETUNIA	RUPU2	X	
SABATIA ANGULARIS	SQUARE-STEMMED ROSE PINK	SAAN	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
SACCHARUM BREVIBARBE	SHORT-BEARD PLUMEGRASS	SABR18	X	
SAGITTARIA LATIFOLIA	BROADLEAF ARROWHEAD	SALA2	X	
SALVIA LYRATA	LYRE-LEAF SAGE	SALY2	X	X
SANGUINARIA CANADENSIS	BLOODROOT	SACA13	X	
SANICULA CANADENSIS	SHORT-STYLED SANICLE	SACA13	X	
SAURURUS CERNUUS	LIZARD'S TAIL	SACE	X	X
SAXIFRAGA VIRGINIENSIS	VIRGINIA SAXIFRAGE	SAVI5	X	
SCLERANTHUS ANNUUS*	ANNUAL KNAWEL***	SCAN2	X	
SCUTELLARIA ELLIPTICA	HAIRY SKULLCAP	SCEL	X	
SCUTELLARIA INTEGRIFOLIA	HYSSOP SKULLCAP	SCIN2	X	X
SENECIO AUREUS	SMALL'S RAGWORT	SEAU2	X	
SERICOCARPUS ASTEROIDES	TOOTHED WHITE-TOP ASTER	SEAS3	X	
SILPHIUM TEREBINTHINACEUM	PRAIRIE DOCK	SITE	X	
SOLANUM CAROLINENSE	CAROLINA HORSE-NETTLE	SOCA3	X	X
SOLIDAGO CAESIA	A GOLDENROD	SOCA4	X	
SOLIDAGO CANADENSIS	CANADA GOLDENROD	SOCA6	X	
SOLIDAGO NEMORALIS	FIELD GOLDENROD	SONE	X	
SOLIDAGO ODORA	SWEET GOLDENROD	SOOD	X	X
SOLIDAGO PINETORUM	SMALL'S GOLDENROD	SOPI	X	
SOLIDAGO SPECIOSA	SHOWY GOLDENROD	SOSP2	X	
SPIRANTHES CERNUA	NODDING LADIES'-TRESSES	SPCE	X	
SPIRANTHES LACERA VAR GRACILIS	SOUTHERN SLENDER LADIES'TRESSES	SPGR8	X	
SPIRANTHES OVALIS	LESSER LADIES'-TRESSES	SPOV	X	
SPIRANTHES PRAECOX	GRASSLEAF LADIES'-TRESSES	SPPR2	X	
STELLARIA PUBERA	GIANT CHICKWEED	STPU	X	
STROPHOSTYLES UMBELLATA	PINK WILD-BEAN	STRUM	X	
STYLOSANTHES BIFLORA	PENCILFLOWER	STBI2	X	
TANACETUM VULGARE	COMMON TANSY	TAVU	X	
TARAXACUM OFFICINALE	COMMON DANDELION	TAOF	X	X
TEESDALIA NUDICAULIS	COMMON SHEPHERD'S-CRESS	TENU	X	
TEPHROSIA VIRGINIANA	GOAT'S-RUE	TEVI	X	X
THALICTRUM REVOLUTUM	WAXLEAF MEADOWRUE	THRE	X	
TRICHOSTEMA DICHOTOMUM	FORKED BLUECURLS	TRDI2	X	
TRIDENS STRICTUS	LONGSPIKE TRIDENS	TRST2		X
TRIFOLIUM CAMPESTRE	FIELD CLOVER	TRCA5		X
TRIFOLIUM PRATENSE	RED CLOVER	TRPR2		X
TRIFOLIUM REPENS	WHITE CLOVER	TRRE3		X
TRILLIUM CATESBAEI	CATESBY'S TRILLIUM	TRCA11	X	
TRIODANIS PERFOLIATA	CLASPING VENUS' LOOKING-GLASS	TRPE4		X
TYPHA LATIFOLIA	BROAD-LEAF CATTAIL	TYLA	X	X
VERBASCUM THAPSUS	GREAT MULLEIN	VETH	X	
VERNONIA NOVEBORACENSIS	NEW YORK IRONWEED	VENO	X	
VIOLA PRIMULIFOLIA	PRIMROSE-LEAF VIOLET	VIPRO2	X	
VIOLA SORORIA	WOOLLY BLUE VIOLET	VISO	X	
VIOLA TRICOLOR	THREE COLORED VIOLET	VITR	X	
ZEPHYRANTHES ATAMASCA	ATAMASCO LILY	ZEAT	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
GRAMMINOID				
AGROSTIS PERENNANS	PERENIAL BENTGRASS	AGPE	X	
ANDROPOGON TERNARIUS	SILVER BLUESTEM	ANTE2	X	
ANDROPOGON VIRGINICUS	BROOM-SEDGE	ANVIV	X	X
ARUNDINARIA GIGANTEA	GIANT CANE	ARGI		X
CAREX ALBOLUTESCENS	GREENWHITE SEDGE	CAAL5		X
CAREX CRINITA	FRINGED SEDGE	CACRC2	X	
CAREX DIGITALIS	SLENDER WOOD SEDGE	CADI5	X	
CAREX INTUMESCENS	BLADDER SEDGE	CAIN12	X	X
CAREX LAXIFLORA	LOOSE-FLOWERED SEDGE	CALA19	X	
CAREX LEPTALEA	BRISTLY-STALK SEDGE	CALEL4	X	
CAREX LURIDA	SHALLOW SEDGE	CALU5	X	
CAREX NIGROMARGINATA	BLACK-EDGE SEDGE	CANI3	X	
CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	CAPE6	X	
CAREX STRICTA	TUSSOCK SEDGE	CAST8	X	
CHASMANTHIUM LATIFOLIUM	RIVER OATS	CHLA5	X	
CHASMANTHIUM LAXUM	SLENDER SPIKEGRASS	CHLA6	X	X
CHASMANTHIUM SESSILIFLORUM	LONGLEAF SPIKEGRASS	CHSE2	X	X
CYPERUS ESCULENTUS	CHUFA FLAT-SEDGE	CYES	X	
CYPERUS RETRORSUS	RETRORSE FLATSEDGE	CYRE5	X	
DANTHONIA COMPRESSA	FLATTENED OATGRASS	DACO	X	
DANTHONIA SERICEA	SILKY OAT-GRASS	DASE2	X	
DANTHONIA SPICATA	POVERTY OAT-GRASS	DASP2	X	
DICHANTHELIUM CLANDESTINUM	DEER-TONGUE WITCHGRASS	DICL	X	
DICHANTHELIUM DICHOTOMUM VAR DICHOTOMUM	SMALL-FRUITED PANICGRASS	DIDID	X	
DICHANTHELIUM LAXIFLORUM	LAX-FLOWER WITCHGRASS	DILA9	X	
DICHANTHELIUM SPHAEROCARPON	ROUNDFRUIT PANICGRASS	DISP2	X	
DIGITARIA SANGUINALIS	HAIRY CRABGRASS	DISA	X	X
DULICHIUM ARUNDINACEUM	THREE-WAY SEDGE	DUAR3	X	X
ECHINOCHLOA CRUS-GALLI***	BARNYARD GRASS***	ECCR	X	X
ELEOCHARIS FLAVESCENS	PALE SPIKERUSH	ELFL	X	
ELEOCHARIS PARVULA	DWARF SPIKERUSH	ELPA5		X
ELYMUS HYSTRIX VAR. HYSTRIX	BOTTLEBRUSH GRASS	ELHY	X	X
ERAGROSTIS SPECTABILIS	PURPLE LOVE-GRASS	ERSP	X	X
FESTUCA RUBRA	RED FESCUE	FERU2		X
GLYCERIA STRIATA	FOWL MANNA-GRASS	GLST	X	
JUNCUS CORIACEUS	LEATHERY RUSH	JUCO4	X	X
JUNCUS EFFUSUS	SOFT RUSH	JUEF	X	X
JUNCUS TENUIS	SLENDER RUSH	JUTE	X	X
LUZULA MULTIFLORA	HEATH WOODRUSH	LUMU2	X	X
MELICA MUTICA	NARROW MELIC GRASS	MEMU	X	
MICROSTEGIUM VIMINEUM***	JAPANESE GRASS***	MIVI	X	X
MUHLENBERGIA TENUIFLORA	SLENDER MUHLY	MUTE	X	
PANICUM ANCEPS	PANIC GRASS	PAAN	X	
PANICUM DICHOTOMIFLORUM	SPREADING PANICGRASS	PADI	X	
PANICUM FLEXILE	WIRY PANIC GRASS	PAFL2	X	
PASPALUM FLORIDANUM	FLORIDA PASPALUM	PAFL4	X	X
PASPALUM NOTATUM***	BAHIA GRASS	PANO2	X	X
PIPTOCHAETIUM AVENACEUM	BLACKSEED NEEDLEGRASS	PIAV	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
PLANTAGO ARISTATA	LARGE-BRACT PLANTAIN	PLAR3	X	
PLANTAGO RUGELII	BLACK-SEED PLANTAIN	PLRU	X	
PLANTAGO VIRGINICA	PALE-SEEDED PLANTAIN	PLVI	X	
POA COMPRESSA***	CANADA BLUEGRASS***	POCO	X	
POA CUSPIDATA	BLUEGRASS	POCU4	X	
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	SCSC	X	
SCIRPUS CYPERINUS	COTTONGRASS BULRUSH	SCCY	X	
SORGHUM HALEPENSE	JOHNSON GRASS	SOHA	X	X
	FERN			
ADIANTUM PEDATUM	NORTHERN MAIDENHAIR-FERN	ADPE	X	
ASPLENIUM PLATYNEURON	EBONY SPLEENWORT	ASPLP	X	X
ATHYRIUM ASPLENIOIDES	SOUTHERN LADY FERN	ATAS	X	X
DENNSTAEDTIA PUNCTILOBULA	EASTERN HAY-SCENTED FERN	DEPU2	X	
DIPHASIASTRUM DIGITATUM	FAN CLUB-MOSS	DIDI8	X	
ISOETES SPP.	QUILLWORT	ISOET	X	
ONOCLEA SENSIBILIS	SENSITIVE FERN	ONSE	X	X
OSMUNDA CINNAMOMEA	CINNAMON FERN	OSCI	X	X
OSMUNDA REGALIS	ROYAL FERN	OSRE	X	
PHEGOPTERIS HEXAGONOPTERA	BROAD BEECH FERN	PHHE11	X	
PLEOPELTIS POLYPODIOIDES	RESURRECTION FERN	PLPO2	X	
POLYSTICHUM ACROSTICHOIDES	CHRISTMAS FERN	POAC4	X	X
PTERIDIUM AQUILINUM	BRACKEN FERN	PTAQ	X	X
THELYPTERIS NOVEBORACENSIS	NEW YORK FERN	THNO	X	X
THELYPTERIS PALUSTRIS	MARSH FERN	THPA	X	
WOODSIA OBTUSA	BLUNT-LOBE WOODSIA	WOOB2	X	
WOODWARDIA AREOLATA	NETTED CHAINFERN	WOAR	X	

Mammals Documented to Occur at CBTS (2006 Inventory)

Order	Family	Scientific Name	Common Name	Abundance[1,2]	Community[3]
Artiodactyla	Cervidae	*Odocoileus virginianus*	whitetail deer	A	BH CC LS MPH O
Carnivora	Canidae	*Canis latrans*	coyote	U	O UH
Carnivora	Canidae	*Urocyon cinereoargenteus*	gray fox	R	O
Carnivora	Mephitidae	*Mephitis mephitis*	striped skunk	R	O
Carnivora	Mustelidae	*Lutra canadensis*	river otter	R	LS ST
Carnivora	Procyonidae	*Procyon lotor*	raccoon	A	BH LS ST
Chiroptera	Vespertilionidae	*Eptesicus fuscus*	big brown bat	Ud	ST
Chiroptera	Vespertilionidae	*Lasiurus borealis*	eastern red bat	Ud	ST
Chiroptera	Vespertilionidae	*Nycticeius humeralis*	evening bat	Ud	ST
Chiroptera	Vespertilionidae	*Pipistrellus subflavus*	eastern pipistrelle	Ud	ST
Didelphimorphia	Didelphidae	*Didelphis marsupialis*	Virginia opossum	C	O
Lagomorpha	Leporidae	*Sylvilagus floridanus*	eastern cottontail	A	MPH O UH
Lipotyphla	Soricidae	*Blarina carolinensis*	southern shorttail shrew	U*	MPH WPND
Lipotyphla	Soricidae	*Sorex longirostris*	southeastern shrew	C*	BH CC MPH UH WPND
Lipotyphla	Talpidae	*Scalopus aquaticus*	eastern mole	C	BH UH
Rodentia	Castoridae	*Castor canadensis*	beaver	C	BH LS ST WPND
Rodentia	Muridae	*Peromyscus leucopus*	white-footed mouse	A*	BH CC MPH O ST UH
Rodentia	Muridae	*Reithrodontomys humulis*	eastern harvest mouse	C*	CC OF MPH WPND
Rodentia	Muridae	*Sigmodon hispidus*	hispid cotton rat	O*	CC OF
Rodentia	Sciuridae	*Marmota monax*	woodchuck	U	O
Rodentia	Sciuridae	*Sciurus carolinensis*	eastern gray squirrel	C	MPH UH
Rodentia	Sciuridae	*Tamias striatus*	eastern chipmunk	R	CC
Rodentia	Muridae	*Mus musculus*	house mouse	U*	O

[1] A = abundant; C = common; O = occasional; U = uncommon; R = rare; Ud = undetermined

[2] values with asterisks were estimated based on relative proportions of live trap and pitfall captures; non-asterisk values were approximated based on frequency of incidental sightings or signs.

[3] Habitat/plant community associations where observed or captured: BH = Bottomland Hardwoods; CC = Clearcut; MPH = Pine/Mixed Hardwoods; LS = Lakeshore; O = Open; OF = Old Field; ST = Stream/Riparian; UH = Upland Hardwoods; WPND = man-made pond; WVP = vernal pond

Source: AMEC 2007b

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Anseriformes	Anatidae	*Aix sponsa*	wood duck	R	ST	U
Anseriformes	Anatidae	*Anas platyrhynchos*	mallard	--	LS	U
Anseriformes	Anatidae	*Branta canadensis*	Canada goose	--	LS	U
Apodiformes	Apodidae	*Chaetura pelagica*	chimney swift	--	O	U
Apodiformes	Trochilidae	*Archilochus colubris*	ruby-throated hummingbird	R	BH UH	B
Caprimulgiformes	Caprimulgidae	*Caprimulgus carolinensis*	Chuck-will's-widow	U	CC	B
Caprimulgiformes	Caprimulgidae	*Caprimulgus vociferus*	whip-poor-will	C	CC O	B
Caprimulgiformes	Caprimulgidae	*Chordeiles minor*	common nighthawk	--	O	U
Charadriformes	Charadriidae	*Charadrius vociferus*	killdeer	R	O	B
Charadriformes	Scolopacidae	*Tringa solitaria*	solitary sandpiper	--	LS	M
Ciconiiformes	Ardeidae	*Ardea alba*	great egret	--	LS	M
Ciconiiformes	Ardeidae	*Ardea herodias*	great blue heron	U	LS O WPND	U
Ciconiiformes	Ardeidae	*Butorides virescens*	green heron	--	LS	U
Ciconiiformes	Cathartidae	*Coragyps atratus*	black vulture	C	MPH O	U
Circoniiformes	Cathartidae	*Cathartes aura*	turkey vulture	C	CC	U
Columbiformes	Columbidae	*Zenaida macroura*	mourning dove	O	BH CC MPH O UH	B
Coraciiformes	Alcedinidae	*Ceryle alcyon*	belted kingfisher	U	BH LS ST	B
Cuculiformes	Cuculidae	*Coccyzus americanus*	yellow-billed cuckoo	U	BH MPH UH	B
Falconiformes	Accipitridae	*Accipiter cooperii.*	Cooper's hawk	--	O	U
Falconiformes	Accipitridae	*Buteo jamaicensis*	red-tailed hawk	U	CC UH	B
Falconiformes	Accipitridae	*Buteo lineatus*	red-shouldered hawk	U	BH CC MPH O	B
Falconiformes	Accipitridae	*Pandion haliaetus*	osprey	--	LS	U
Galliformes	Odontophoridae	*Colinus virginianus*	northern bobwhite	O	CC MPH O	B
Galliformes	Phasianidae	*Meleagris gallopavo*	wild turkey	A	BH LS MPH ST UH	B
Passeriformes	Bombycillidae	*Bombycilla cedrorum*	cedar waxwing	U	MPH O	B
Passeriformes	Cardinalidae	*Cardinalis cardinalis*	northern cardinal	C	BH CC MPH O OF UH	B
Passeriformes	Cardinalidae	*Passerina caerulea*	blue grosbeak	U	CC O	B
Passeriformes	Cardinalidae	*Passerina cyanea*	indigo bunting	O	CC MPH O OF	B
Passeriformes	Corvidae	*Corvus brachyrhynchos*	American crow	O	BH CC MPH O	B
Passeriformes	Corvidae	*Corvus ossifragus*	fish crow	--	O	U
Passeriformes	Corvidae	*Cyanocitta cristata*	bluejay	O	BH CC MPH O UH	B

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Passeriformes	Emberizidae	*Junco hyemalis*	dark-eyed junco	--	BH O	W
Passeriformes	Emberizidae	*Melospiza georgiana*	swamp sparrow	--	WVP	W
Passeriformes	Emberizidae	*Melospiza melodia*	song sparrow	--	CC OF WVP	U
Passeriformes	Emberizidae	*Pipilo erythrophthalmus*	eastern towhee	O	BH CC MPH O UH	B
Passeriformes	Emberizidae	*Spizella passerina*	chipping sparrow	C	BH CC MPH O	B
Passeriformes	Emberizidae	*Spizella pusilla*	field sparrow	U	CC OF WVP	B
Passeriformes	Emberizidae	*Zonotrichia albicollis*	white-throated sparrow	--	MPH OF O	W
Passeriformes	Fringillidae	*Carduelis tristis*	American goldfinch	O	BH CC MPH O OF UH	B
Passeriformes	Fringillidae	*Carpodacus mexicanus*	house finch	R	MPH O	B
Passeriformes	Icteridae	*Agelaius phoeniceus*	red-winged blackbird	--	O	U
Passeriformes	Icteridae	*Icterus galbula*	Baltimore oriole	--	OF	M
Passeriformes	Icteridae	*Molothrus ater*	brown-headed cowbird	O	BH MPH O UH	B
Passeriformes	Icteridae	*Quiscalus quiscula*	common grackle	R	MPH	U
Passeriformes	Mimidae	*Dumetella carolinensis*	gray catbird	R	OF	B
Passeriformes	Mimidae	*Mimus polyglottos*	northern mockingbird	U	O	B
Passeriformes	Mimidae	*Toxostoma rufum*	brown thrasher	U	O OF	B
Passeriformes	Paridae	*Baeolophus bicolor*	tufted titmouse	C	BH CC MPH O UH	B
Passeriformes	Paridae	*Poecile carolinensis*	Carolina chickadee	O	BH CC MPH UH	B
Passeriformes	Parulidae	*Dendroica caerulescens*	black-throated blue warbler	--	BH CC UH	M
Passeriformes	Parulidae	*Dendroica coronata*	yellow-rumped warbler	--	BH MPH	W
Passeriformes	Parulidae	*Dendroica discolor*	prairie warbler	U	CC MPH OF	B
Passeriformes	Parulidae	*Dendroica pinus*	pine warbler	C	BH CC MPH O UH	B
Passeriformes	Parulidae	*Geothlypis trichas*	common yellowthroat	U	BH CC LS MPH UH WPND	B
Passeriformes	Parulidae	*Helmitheros vermivorum*	worm-eating warbler	--	BH MPH	M
Passeriformes	Parulidae	*Icteria virens*	yellow-breasted chat	O	BH CC MPH UH	B
Passeriformes	Parulidae	*Mniotilta varia*	black-and-white warbler	--	O	U
Passeriformes	Parulidae	*Oporornis formosus*	Kentucky warbler	R	BH MPH	B
Passeriformes	Parulidae	*Parula americana*	northern parula	O	BH UH	B
Passeriformes	Parulidae	*Seiurus aurocapilla*	ovenbird	A	BH MPH O UH	B
Passeriformes	Parulidae	*Seiurus motacilla*	Louisana waterthrush	R	BH ST	B
Passeriformes	Parulidae	*Setophaga ruticilla*	American redstart	R	BH	B

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Passeriformes	Parulidae	*Wilsonia canadensis*	Canada warbler	R	UH	M
Passeriformes	Parulidae	*Wilsonia citrina*	hooded warbler	O	BH MPH UH	B
Passeriformes	Regulidae	*Regulus calendula*	ruby-crowned kinglet	--	BH	W
Passeriformes	Regulidae	*Regulus satrapa*	golden-crowned kinglet	--	OF	W
Passeriformes	sittidae	*Sitta carolinensis*	white-breasted nuthatch	U	BH MPH UH	B
Passeriformes	Sittidae	*Sitta pusilla*	brown-headed nuthatch	U	MPH O UH	B
Passeriformes	Sylviidae	*Polioptila caerulea*	bluegray gnatcatcher	C	BH CC MPH O UH WVP	B
Passeriformes	Thraupidae	*Piranga olivacea*	scarlet tanager	O	BH MPH UH	B
Passeriformes	Thraupidae	*Piranga rubra*	summer tanager	O	BH CC MPH O UH	B
Passeriformes	Troglodytidae	*Thryothorus ludovicianus*	Carolina wren	C	BH CC MPH O OF UH	B
Passeriformes	Troglodytidae	*Ttroglodytes troglodytes*	winter wren	--	BH	W
Passeriformes	Turdidae	*Catharus guttatus*	hermit thrush	--	UH	W
Passeriformes	Turdidae	*Hylocichla mustelina*	wood thrush	C	BH MPH O UH	B
Passeriformes	Turdidae	*Sialia Sialis*	eastern bluebird	U	BH CC MPH O	B
Passeriformes	Turdidae	*Turdis migratorius*	American robin	U	O	B
Passeriformes	Tyrannidae	*Contopus virens*	eastern wood-pewee	O	BH CC MPH O	B
Passeriformes	Tyrannidae	*Empidonax virescens*	Acadian flycatcher	O	BH MPH UH	B
Passeriformes	Tyrannidae	*Myiarchus crinitus*	great-crested flycatcher	U	CC MPH O UH	B
Passeriformes	Tyrannidae	*Sayornis phoebe*	eastern phoebe	R	BH ST WVP	B
Passeriformes	Vireonidae	*Vireo flavifrons*	yellow-throated vireo	R	BH UH	B
Passeriformes	Vireonidae	*Vireo griseus*	white-eyed vireo	R	BH CC	B
Passeriformes	Vireonidae	*Vireo olivaceus*	red-eyed vireo	A	BH CC MPH O UH	B
Passeriformes	Vireonidae	*Vireo solitarius*	blue-headed vireo	U	BH MPH UH	B
Piciformes	Picidae	*Colaptes auratus*	northern flicker	U	MPH O UH	B
Piciformes	Picidae	*Dryocopus pileatus*	pileated woodpecker	R	BH UH	B
Piciformes	Picidae	*Melanerpes carolinus*	red-bellied woodpecker	U	BH MPH O UH	B
Piciformes	Picidae	*Melanerpes erythrocephalus*	red-headed woodpecker	R	BH CC MPH O	B
Piciformes	Picidae	*Picoides pubescens*	downy woodpecker	O	BH CC MPH O UH	B
Piciformes	Picidae	*Picoides villosus*	hairy woodpecker	U	BH MPH UH	B
Strigiformes	Strigidae	*Bubo virginianus*	great horned owl	--	O	U

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Strigiformes	Strigidae	*Megascops asio*	eastern screech owl	--	BH	U
Strigiformes	Strigidae	*Strix varia*	barred owl	--	BH	U

[1] Abundance estimation for breeding birds based on the proportion of overall records supplemented by incidental sightings: A = abundant; C = common; O = Occasional U = uncommon; R = rare
[2] Habitat /Plant Community Associations: BH = Bottomland Hardwoods; CC = Clearcut; MPH =Pine/Mixed Hardwoods; LS = Lakeshore; O = Open; OF = Old Field; ST = Stream/Riparian; UH = Upland Hardwoods; WPND = man-made pond; WVP = vernal pond
[3]Breeding Status: B = breeding: seasonal or year-round resident; M = Migrant, not breeding; U = observed, but breeding status undetermined; potential breeder based on habitat availability; W = wintering resident, not breeding

Source: AMEC 2007b

Reptiles and amphibians documented to occur at CBTS (2006 Inventory)					
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**
Amphibians					
Anura	Bufonidae	*Bufo americanus*	American toad	A	BH CC MPH UH WPND WVP
Anura	Bufonidae	*Bufo fowleri*	Fowler's toad	C	BH MPH ST WPND WVP MPH
Anura	Hylidae	*Acris crepitans*	northern cricket frog	A	BH LS OF ST UH WPND WVP
Anura	Hylidae	*Hyla chrysoscelis*	Cope's gray treefrog	C	MPH UH WPND WVP
Anura	Hylidae	*Pseudacris crucifer*	spring peeper	A	BH WPND WVP
Anura	Hylidae	*Pseudacris feriarum*	upland chorus frog	A	BH MPH ST WPND WVP
Anura	Hylidae	*Hyla cinerea*	green treefrog	R	LS
Anura	Microhylidae	*Gastrophryne carolinensis*	narrowmouthed toad	U	BH CC MPH O WPND
Anura	Ranidae	*Rana catesbeiana*	bullfrog	A	MPH ST WPND
Anura	Ranidae	*Rana clamitans*	greenfrog	A	BH MPH ST WPND
Anura	Ranidae	*Rana palustris*	pickerel frog	U	BH CC UH WPND WVP
Anura	Ranidae	*Rana sphenocephala*	southern leopard frog	C	BH ST WPND WVP
Caudata	Ambystomatidae	*Ambystoma maculatum*	spotted salamander	U	BH CC UH WVP
Caudata	Ambystomatidae	*Ambystoma opacum*	marbled salamander	A	BH CC MPH UH WPND WVP
Caudata	Ambystomatidae	*Ambystoma talpoideum*	mole salamander	R	WPND
Caudata	Plethodontidae	*Desmognathus fuscus*	northern dusky salamander	R	ST UH
Caudata	Plethodontidae	*Eurycea cirigerra*	two-lined salamander	C	ST
Caudata	Plethodontidae	*Eurycea guttolineata*	three-lined salamander	R	ST
Caudata	Plethodontidae	*Hemidactylium scutatum*	four-toed salamander	R	BH LS MPH O ST UH WPND
Caudata	Plethodontidae	*Plethedon cinereus*	red-backed salamander	C	CC O UH
Caudata	Plethodontidae	*Plethodon cylindraceus*	white-spotted slimy salamander	U	BH ST UH
Caudata	Plethodontidae	*Pseudotriton montanus*	mud salamander	R	UH
Caudata	Salamandridae	*Notophthalmus viridescens*	red-spotted newt	U	BH MPH OF UH WVP
Turtles					
Cryptodeira	Emydidae	*Chrysemys picta picta*	eastern painted turtle	U	LS
Cryptodeira	Emydidae	*Terrapene carolina*	eastern box turtle	C	UH BH MPH O ST
Cryptodeira	Emydidae	*Trachemys scripta*	yellow-bellied slider	U	LS O

Reptiles and amphibians documented to occur at CBTS (2006 Inventory)

Order	Family	Scientific Name	Common Name	Abundance[1]	Community[2]
Cryptodeira	Kinosternidae	*Sternotherus odoratus*	common musk turtle	R	BH
Lizards and Snakes					
Squamata	Colubridae	*Carphophis amoenus*	worm snake	A	BH CC LS MPH O UH
Squamata	Colubridae	*Coluber constrictor*	northern black racer	U	MPH OF UH
Squamata	Colubridae	*Diadophis punctatus edwardsii*	ring-necked snake	A	BH MPH UH
Squamata	Colubridae	*Elaphe obsoleta*	black rat snake	U	WVP
Squamata	Colubridae	*Heterodon platirhinos*	eastern hog-nosed snake	R	MPH
Squamata	Colubridae	*Lampropreltis calligaster rhombomaculeta*	mole kingsnake	R	O
Squamata	Colubridae	*Nerodia sipedon*	northern watersnake	U	O ST WPND
Squamata	Colubridae	*Regina septemvittata*	queen snake	R	ST
Squamata	Colubridae	*Storeria dekayi*	brown snake	U	BH OF
Squamata	Colubridae	*Thamnophis sirtalis*	eastern garter snake	C	CC O
Squamata	Colubridae	*Virginia valeriae*	smooth earth snake	R	MPH
Squamata	Phrynosomatidae	*Sceloporus undulatus*	fence lizard	A	BH CC LS MPH OF UH WPND
Squamata	Scincidae	*Eumeces fasciatus*	five-lined skink	C	BH MPH O UH
Squamata	Scincidae	*Scincella lateralis*	ground skink	C	BH CC LS MPH OF ST UH WPND
Squamata	Serpentes	*Opheodrys aestivus*	rough greensnake	R	LS

[1] Abundance approximated based on sighting and capture frequency: A = abundant; C = common; U = uncommon; R = rare

[2] Habitat /Plant Community Associations: BH = Bottomland Hardwoods; CC = Clearcut; MPH =Pine/Mixed Hardwoods; LS = Lakeshore; O = Open; OF = Old Field; ST = Stream/Riparian; UH = Upland Hardwoods; WPND = man-made pond; WVP = vernal pond

Source: AMEC 2007b

Fish species documented to occur at CBTS (2006 Inventory)					
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**
Cypriniformes	Cyprinidae	*Clinostomus funduloides*	rosyside dace	O	ST
Cypriniformes	Cyprinidae	*Luxilus albeolus*	white shiner	C	ST
Cypriniformes	Cyprinidae	*Nocomis leptocephalus*	bluehead chub	C	ST
Cypriniformes	Cyprinidae	*Notemigonus crysoleucas*	Golden shiner	O	ST
Cypriniformes	Cyprinidae	*Phoxinus oreas*	mountain redbelly dace	C	ST
Cypriniformes	Cyprinidae	*Semotilus atromaculatus*	creek chub	O	ST
Perciformes	Centrarchidae	*Lepomis auritus*	redbreast sunfish	C	ST
Perciformes	Centrarchidae	*Lepomis cyanellus*	green sunfish	C	ST
Perciformes	Centrarchidae	*Lepomis macrochirus*	bluegill	A	ST
Perciformes	Centrarchidae	*Lepomis microlophus*	redear sunfish	R	ST
Perciformes	Centrarchidae	*Micropterus salmoides*	largemouth bass	U	ST
Perciformes	Percidae	*Etheostoma nigrum*	Johnny darter	U	ST
Perciformes	Percidae	*Percina roanoka*	Roanoke darter	U	ST
Percopsiformes	Aphredoderidae	*Aphredoderus sayanus*	pirate perch	R	ST
Siluriformes	Ictaluridae	*Ameiurus natalis*	yellow bullhead	U	ST
Siluriformes	Ictaluridae	*Ameiurus platycephalus*	flat bullhead	R	ST
Siluriformes	Ictaluridae	*Noturus insignis*	margined madtom	O	ST

[1] Abundance estimates based on CPUE: A = rare; C = common; O = occasional; U = uncommon; R = rare
[2] ST = stream habitat

Source: AMEC 2007b

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Class Insecta			
Blattodea	Blattellidae	*spp.*	a cockroach
Coleoptera	Anobiidae	*sp.*	a drugstore beetle
Coleoptera	Bostrichidae	*sp.*	a horned powder-post beetle
Coleoptera	Buprestidae	*Buprestis salisburyensis*	a wood-boring beetle
Coleoptera	Cantharidae	*Podabrus sp.*	a soldier beetle
Coleoptera	Cantharidae	*sp.*	a soldier beetle
Coleoptera	Carabidae	*Agonum octopunctatum*	a ground beetle
Coleoptera	Carabidae	*Amara impuncticollis*	a ground beetle
Coleoptera	Carabidae	*Amphasia interstitialis*	a ground beetle
Coleoptera	Carabidae	*Anisodactylus nigerrimus*	a ground beetle
Coleoptera	Carabidae	*Anisodactylus rusticus*	a ground beetle
Coleoptera	Carabidae	*Carabus vinctus*	a ground beetle
Coleoptera	Carabidae	*Chlaenius aestivus*	a ground beetle
Coleoptera	Carabidae	*Chlaenius emarginatus*	a ground beetle
Coleoptera	Carabidae	*Chlaenius impunctifrons*	a ground beetle
Coleoptera	Carabidae	*Chlaenius sericeus*	a ground beetle
Coleoptera	Carabidae	*Cicindela sexguttata*	a ground beetle
Coleoptera	Carabidae	*Clivina bipustulata*	a ground beetle
Coleoptera	Carabidae	*Cyclotrachelus spoliatus*	a ground beetle
Coleoptera	Carabidae	*Cyclotrachelus unicolor*	a ground beetle
Coleoptera	Carabidae	*Dicaelus ambiguus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus dilatatus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus elongatus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus furvus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus politus*	a ground beetle
Coleoptera	Carabidae	*Galerita bicolor*	a ground beetle
Coleoptera	Carabidae	*Harpalus herbivagus*	a ground beetle
Coleoptera	Carabidae	*Harpalus pennsylvanicus*	a ground beetle
Coleoptera	Carabidae	*Harpalus protractus*	a ground beetle
Coleoptera	Carabidae	*Helluomorphoides nigripennis*	a ground beetle
Coleoptera	Carabidae	*Loxandrus brevicollis*	a ground beetle
Coleoptera	Carabidae	*Loxandrus vitiosus*	a ground beetle
Coleoptera	Carabidae	*Notiobia terminata*	a ground beetle
Coleoptera	Carabidae	*Notiophilus aeneus*	a ground beetle
Coleoptera	Carabidae	*Notobia sayi*	a ground beetle
Coleoptera	Carabidae	*Oodes amaroides*	a ground beetle
Coleoptera	Carabidae	*Pasimachus depressus*	a ground beetle
Coleoptera	Carabidae	*Pasimachus sp.*	a ground beetle
Coleoptera	Carabidae	*Platynus decentis*	a ground beetle
Coleoptera	Carabidae	*Poecilus lucublandus*	a ground beetle
Coleoptera	Carabidae	*Scaphinotus andrewsi*	a ground beetle
Coleoptera	Carabidae	*Scarites subterraneus*	a ground beetle

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Coleoptera	Carabidae	*Selenophorus hylacis*	a ground beetle
Coleoptera	Carabidae	*Selenophorus opalinus*	a ground beetle
Coleoptera	Carabidae	*Sphaeroderus canadensis*	a ground beetle
Coleoptera	Carabidae	*Stenolophus ochropezus*	a ground beetle
Coleoptera	Cerambycidae	*sp.*	a longhorned beetle
Coleoptera	Chrysomelidae	*Disonycha leptolineata*	a leaf beetle
Coleoptera	Chrysomelidae	*sp.*	a leaf beetle
Coleoptera	Coccinellidae	*sp.*	a ladybird beetle
Coleoptera	Curculionidae	*Hylobius sp.*	a snout beetle
Coleoptera	Curculionidae	*sp.*	a snout beetle
Coleoptera	Elateridae	*Limonius sp.*	a click beetle
Coleoptera	Elateridae	*Melanotus morosus*	a click beetle
Coleoptera	Elateridae	*sp.*	a click beetle
Coleoptera	Heteroceridae	*sp.*	a variegated mud-loving beetle
Coleoptera	Hydrophilidae	*sp.*	a water scavenger beetle
Coleoptera	Lampyridae	*sp.*	a firefly beetle
Coleoptera	Latridiidae	*sp.*	a minute brown scavenger beetle
Coleoptera	Lycidae	*sp.*	a net-winged beetle
Coleoptera	Mordellidae	*sp.*	a tumbling flower beetle
Coleoptera	Nitidulidae	*sp.*	a sap-feeding beetle
Coleoptera	Passalidae	*Odontotaenius disjunctus*	a bessbug
Coleoptera	Pyrochroidae	*Neopyrochroa femoralis*	a fire-colored beetle
Coleoptera	Scarabaeidae	*Copris minutus*	a scarab beetle
Coleoptera	Scarabaeidae	*Phyllophaga sp.*	a scarab beetle
Coleoptera	Scarabaeidae	*Serica sp.*	a scarab beetle
Coleoptera	Scarabaeidae	*sp.*	a scarab beetle
Coleoptera	Scirtidae	*sp.*	a marsh beetle
Coleoptera	Silvanidae	*sp.*	a flat bark beetle
Coleoptera	Staphylinidae	*Platydracus maculosus*	a rove beetle
Coleoptera	Staphylinidae	*sp.*	a rove beetle
Coleoptera	Tenebrionidae	*Helops aereus*	a darkling beetle
Coleoptera	Tenebrionidae	*Merinus laevis*	a darkling beetle
Coleoptera	Tenebrionidae	*Polypleurus geminatus*	a darkling beetle
Coleoptera	Tenebrionidae	*sp.*	a darkling beetle
Coleoptera	Tenebrionidae	*Uloma puctulata*	a darkling beetle
Coleoptera	Throscidae	*sp.*	a wood-boring beetle
Diptera	Anthomyiidae	*sp.*	a root-maggot fly
Diptera	Asilidae	*sp.*	a robber fly
Diptera	Cecidomyiidae	*sp.*	a gall midge
Diptera	Cecidomyiidae	*sp.*	a gall midge
Diptera	Chaoboridae	*sp.*	a phantom midge
Diptera	Chironomidae	*sp.*	a midge
Diptera	Chironomidae	*sp.*	a midge
Diptera	Culicidae	*sp.*	a mosquitoe

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Diptera	Dolichopodidae	*sp.*	a longlegged fly
Diptera	Heleomyzidae	*sp.*	a fly
Diptera	Mycetophilidae	*sp.*	a fungus gnat
Diptera	Phoridae	*sp.*	a scuttle fly
Diptera	Tipulidae	*sp.*	a crane fly
Diptera	Tipulidae	*sp.*	a crane fly
Hemiptera	Cicadellidae	*sp.*	a leafhopper
Hemiptera	Cicadellidae	*sp.*	a leafhopper
Hemiptera	Coreidae	*sp.*	a leaffooted bug
Hemiptera	Corixidae	*sp.*	a water boatman
Hemiptera	Pentatomidae	*sp.*	a stink bug
Hemiptera	Pentatomidae	*sp.*	a stink bug
Hemiptera	Reduviidae	*sp.*	an assassin bug
Hemiptera	Reduviidae	*sp.*	an assassin bug
Heteroptera	Reduviidae	*Melanolestes picipes*	an assassin bug
Hymenoptera	Evaniidae	*sp.*	an ensign wasp
Hymenoptera	Formicidae	*Acanthomyops sp.*	an ant
Hymenoptera	Formicidae	*Aphaenogaster sp.*	an ant
Hymenoptera	Formicidae	*Camponotus sp.*	an ant
Hymenoptera	Formicidae	*Formica sp.*	an ant
Hymenoptera	Formicidae	*Lasius alienus*	an ant
Hymenoptera	Formicidae	*Leptothorax sp.*	an ant
Hymenoptera	Formicidae	*sp.*	an ant
Hymenoptera	Formicidae	*Tapinoma sessile*	an ant
Hymenoptera	Ichneumonidae	*sp.*	an Ichneumonid wasp
Hymenoptera	Mutillidae	*sp.*	a velvet ant
Hymenoptera	Pompilidae	*sp.*	spider wasp
Hymenoptera	Vespidae	*Vespa crabro*	a wasp
Lepidoptera	Apatelodidae	*Apatelodes torrefacta*	spotted apatelodes
Lepidoptera	Arctiidae	*Apantesis sp.*	a tiger moth
Lepidoptera	Arctiidae	*Cisthene packardii*	Packard's lichen moth
Lepidoptera	Arctiidae	*Cisthene plumbea*	lead-colored lichen moth
Lepidoptera	Arctiidae	*Halysidota tessellaris*	banded tussock moth
Lepidoptera	Arctiidae	*Holomelina sp.*	a holomelina
Lepidoptera	Arctiidae	*Holomelina aurantiaca*	orange holomelina
Lepidoptera	Arctiidae	*Holomelina opella*	tawny holomelina
Lepidoptera	Arctiidae	*Hyphantria cunea*	Fall webworm moth
Lepidoptera	Arctiidae	*Hypoprepia fucosa*	painted lichen moth
Lepidoptera	Arctiidae	*Spilosoma virginica*	Virginian tiger moth
Lepidoptera	Cossidae	*Cossula magnifica*	pecan carpenterworm moth
Lepidoptera	Cossidae	*Prionoxystus ribiniae*	carpenterworm moth
Lepidoptera	Epiplemidae	*Calledapteryx dryopterata*	brown scoopwing moth
Lepidoptera	Gelechiidae	*sp.*	a Gelechid moth
Lepidoptera	Geometridae	*Anacamptodes vellivolata*	large purplish gray

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Lepidoptera	Geometridae	*Anavitrinella pampinaria*	common gray
Lepidoptera	Geometridae	*Besma quercivoraria*	oak besma
Lepidoptera	Geometridae	*Cyclophora packardi*	Packard's wave
Lepidoptera	Geometridae	*Ectropis crepuscularia*	saddleback looper
Lepidoptera	Geometridae	*Epimecis hortaria*	tulip-tree beauty
Lepidoptera	Geometridae	*Euchlaena amoenaria*	deep yellow euchlaena
Lepidoptera	Geometridae	*Euchlaena sp.*	a euchlaena
Lepidoptera	Geometridae	*Euclaena obtusaria/muzaria*	obtuse euclaena
Lepidoptera	Geometridae	*Eulithis diversilineata*	lesser grapevine looper moth
Lepidoptera	Geometridae	*Eupithecia sp.*	a eupithecia
Lepidoptera	Geometridae	*Eutrapela clemataria*	curve-toothed geometer
Lepidoptera	Geometridae	*Glena sp.*	a gray
Lepidoptera	Geometridae	*Heliomata cycladata*	common spring moth
Lepidoptera	Geometridae	*Hethemia pistaciaria*	pistachio emerald
Lepidoptera	Geometridae	*Hydriomena sp.*	a hydriomena
Lepidoptera	Geometridae	*Hypagyrtis unipunctata*	one-spotted variant
Lepidoptera	Geometridae	*Hypomecis umbrosaria*	umber moth
Lepidoptera	Geometridae	*Iridopsis defectaria*	brown-shaded gray
Lepidoptera	Geometridae	*Iridopsis humaria*	pale-winged gray
Lepidoptera	Geometridae	*Iridopsis larvaria*	bent-line gray
Lepidoptera	Geometridae	*Itame pustularia*	lesser maple spanworm moth
Lepidoptera	Geometridae	*Lambdina fervidaria*	curve-lined looper
Lepidoptera	Geometridae	*Lambdina pellucidaria*	eastern pine looper
Lepidoptera	Geometridae	*Macaria bicolorata*	bicolored angle
Lepidoptera	Geometridae	*Macaria granitata*	granite angle
Lepidoptera	Geometridae	*Macaria multilineata*	many-lined angle
Lepidoptera	Geometridae	*Macaria transitaria*	blurry chocolate angle
Lepidoptera	Geometridae	*Melanolophia signataria*	signate melanolophia
Lepidoptera	Geometridae	*Metarranthis hypochraria*	common metarranthis
Lepidoptera	Geometridae	*Metarranthis sp.*	a metarranthis
Lepidoptera	Geometridae	*Nemoria bistriaria*	red-fringed emerald
Lepidoptera	Geometridae	*Nemoria lixaria*	red bordered emerald
Lepidoptera	Geometridae	*Nepytia semiclusaria*	pine conelet looper
Lepidoptera	Geometridae	*Pero hubneraria*	Hubner's pero
Lepidoptera	Geometridae	*Plagodis alcoolaria*	birch looper
Lepidoptera	Geometridae	*Plagodis fervidaria*	fervid plagodis
Lepidoptera	Geometridae	*Plagodis phlogosaria*	straight-lined plagodis
Lepidoptera	Geometridae	*Probole sp.*	a probole
Lepidoptera	Hesperidae	*Euphyes vestris*	dun skipper
Lepidoptera	Hesperiidae	*Acyloxypha numitor*	least skipper
Lepidoptera	Hesperiidae	*Atalopedes campestris*	sachem
Lepidoptera	Hesperiidae	*Atrytonopsis hianna*	dusted skipper
Lepidoptera	Hesperiidae	*Epargyreus clarus*	silver-spotted skipper
Lepidoptera	Hesperiidae	*Erynnis brizo*	sleepy duskywing

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Lepidoptera	Hesperiidae	*Erynnis horatius*	Horace's duskywing
Lepidoptera	Hesperiidae	*Erynnis juvenalis*	Juvenal's duskywing
Lepidoptera	Hesperiidae	*Euphyes dion*	dion skipper
Lepidoptera	Hesperiidae	*Hylephila phyleus*	fiery skipper
Lepidoptera	Hesperiidae	*Ierema accius*	clouded skipper
Lepidoptera	Hesperiidae	*Nastra lherminier*	swarthy skipper
Lepidoptera	Hesperiidae	*Panoquina ocola*	ocola skipper
Lepidoptera	Hesperiidae	*Poanes zabulon*	Zabulon skipper
Lepidoptera	Hesperiidae	*Polites origenes*	crossline skipper
Lepidoptera	Hesperiidae	*Polites themistocles*	tawny-edged skipper
Lepidoptera	Hesperiidae	*Pompeius verna*	little glassywing
Lepidoptera	Hesperiidae	*Thorybes pylades*	northern cloudywing
Lepidoptera	Hesperiidae	*Wallengrenia egeremet*	northern broken dash
Lepidoptera	Hesperiidae	*Wallengrenia otho*	southern broken dash
Lepidoptera	Lasiocampidae	*Artace cribraria*	dot-lined white
Lepidoptera	Lasiocampidae	*Malacosoma americanum*	eastern tent caterpillar
Lepidoptera	Lasiocampidae	*Malacosoma disstria*	forest tent caterpiller
Lepidoptera	Limacodidae	*Adoneta spinuloides*	purple-crested slug moth
Lepidoptera	Limacodidae	*Apoda biguttata*	shagreened slug moth
Lepidoptera	Limacodidae	*Lithacodes fasciola*	yellow-shouldered slug moth
Lepidoptera	Limacodidae	*Monoleuca semifascia*	pin-striped vermilion slug moth
Lepidoptera	Limacodidae	*Natada nasoni*	Nason's slug moth
Lepidoptera	Limacodidae	*Tortricidia flexuosa*	abbreviated button slug moth
Lepidoptera	Lycaenidae	*Callophrys gryneus*	juniper hairstreak
Lepidoptera	Lycaenidae	*Calycopis cecrops*	red-banded hairstreak
Lepidoptera	Lycaenidae	*Celastrina ladon*	spring azure
Lepidoptera	Lycaenidae	*Celastrina neglecta*	summer azure
Lepidoptera	Lycaenidae	*Everes comyntas*	eastern tailed blue
Lepidoptera	Lycaenidae	*Feniseca tarquinius*	harvester
Lepidoptera	Lycaenidae	*Satyrium liparops*	striped hairstreak
Lepidoptera	Lycaenidae	*Satyrum titus*	coral hairstreak
Lepidoptera	Lycaenidae	*Strymon melinus*	gray hairstreak
Lepidoptera	Lymantriidae	*Dasychira tephra*	tephra tussock moth
Lepidoptera	Megalopygidae	*Lagoa crispata*	black-waved flannel moth
Lepidoptera	Mimallonidae	*Lacosoma chiridota*	scalloped sack-bearer moth
Lepidoptera	Noctuidae	*Acronicta afflicta*	afflicted dagger moth
Lepidoptera	Noctuidae	*Acronicta americana*	American dagger moth
Lepidoptera	Noctuidae	*Acronicta exilis*	exiled dagger moth
Lepidoptera	Noctuidae	*Acronicta inclara* complex	unclear dagger moth
Lepidoptera	Noctuidae	*Acronicta lithospila*	streaked dagger moth
Lepidoptera	Noctuidae	*Acronicta modica*	medium dagger moth
Lepidoptera	Noctuidae	*Acronicta spp.*	a dagger moth
Lepidoptera	Noctuidae	*Acronicta tristis*	sad dagger moth
Lepidoptera	Noctuidae	*Agrotis ipsilon*	black cutworm moth

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Lepidoptera	Noctuidae	*Allotria elonympha*	false underwing
Lepidoptera	Noctuidae	*Amphipyra pyramidoides*	copper underwing
Lepidoptera	Noctuidae	*Anorthodes tarda*	the slowpoke
Lepidoptera	Noctuidae	*Baileya ophthalmica*	eyed baileya moth
Lepidoptera	Noctuidae	*Catacola coccinata*	scarlet underwing
Lepidoptera	Noctuidae	*Catocala sp.*	girlfriend underwing
Lepidoptera	Noctuidae	*Celiptera frustulum*	black bit moth
Lepidoptera	Noctuidae	*Charadra deridens*	the laugher
Lepidoptera	Noctuidae	*Chytolita petrealis*	stone-winged owlet
Lepidoptera	Noctuidae	*Chytonix palliatricula*	cloaked marvel
Lepidoptera	Noctuidae	*Colocasia flavicornis*	yellowhorn
Lepidoptera	Noctuidae	*Cosmia calami*	Americam dunbar
Lepidoptera	Noctuidae	*Elaphria grata*	grateful midget
Lepidoptera	Noctuidae	*Elaphria sp.*	festive midget moth
Lepidoptera	Noctuidae	*Galgula partita*	the wedgling
Lepidoptera	Noctuidae	*Hypena baltimoralis*	Baltimore bomolocha
Lepidoptera	Noctuidae	*Hypena palparia*	mottled bomolocha
Lepidoptera	Noctuidae	*Hypena scabra*	green cloverworm moth
Lepidoptera	Noctuidae	*Hyperstrotia pervertens*	dotted graylet moth
Lepidoptera	Noctuidae	*Lacinipolia renigera*	bristly cutworm moth
Lepidoptera	Noctuidae	*Lascoria ambigualis*	ambiguous moth
Lepidoptera	Noctuidae	*Lesmone detrahens*	detracted owlet moth
Lepidoptera	Noctuidae	*Leucania sp.*	a wainscot
Lepidoptera	Noctuidae	*Leuconycta diphteroides*	green leuconycta
Lepidoptera	Noctuidae	*Morrisonia confusa*	confused woodgrain moth
Lepidoptera	Noctuidae	*Mythimna unipuncta*	armyworm moth
Lepidoptera	Noctuidae	*Nigetia formosalis*	thin-winged owlet moth
Lepidoptera	Noctuidae	*Paectes abrostoloides*	large paectes
Lepidoptera	Noctuidae	*Palthis angulalis*	dark-spotted palthis
Lepidoptera	Noctuidae	*Pangrapta decoralis*	decorated owlet moth
Lepidoptera	Noctuidae	*Pangrapta sp.*	an owlet
Lepidoptera	Noctuidae	*Panopoda rufimargo*	red-lined panopoda
Lepidoptera	Noctuidae	*Parallelia bistriaris*	maple looper moth
Lepidoptera	Noctuidae	*Phosphila miselioides*	spotted phosphila
Lepidoptera	Noctuidae	*Phyprosopus callitrichoides*	curve-lined owlet
Lepidoptera	Noctuidae	*Platysenta videns*	white-dotted groundling
Lepidoptera	Noctuidae	*Polygrammate hebraeicum*	the Hebrew moth
Lepidoptera	Noctuidae	*Schinia sp.*	a flower moth
Lepidoptera	Noctuidae	*Schinia arcigera*	Arcigera flower moth
Lepidoptera	Noctuidae	*Schinia rivulosa*	ragweed flower moth
Lepidoptera	Noctuidae	*Schinia trifascia*	three-lined flower moth
Lepidoptera	Noctuidae	*sp.*	a noctuid moth
Lepidoptera	Noctuidae	*sp.*	a dart
Lepidoptera	Noctuidae	*Spodoptera frugiperda*	Fall armyworm moth

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Order	**Family**	**Scientific Name**	**Common Name**
Lepidoptera	Noctuidae	*Tarachidia candefacta*	olive-shaded bird dropping moth
Lepidoptera	Noctuidae	*Thioptera nigrofimbria*	black-bordered lemon moth
Lepidoptera	Noctuidae	*Ulolonche culea*	sheathed quaker moth
Lepidoptera	Noctuidae	*Zale lunata*	lunate zale
Lepidoptera	Noctuidae	*Zale squamularis*	gray-banded zale
Lepidoptera	Noctuidae	*Zanclognatha pedipilalis*	grayish zanclognatha
Lepidoptera	Notodontidae	*Datana sp.*	a Datana moth
Lepidoptera	Notodontidae	*Furcula sp.*	a furcula
Lepidoptera	Notodontidae	*Heterocampa biundata*	wavy-lined heterocampa
Lepidoptera	Notodontidae	*Heterocampa guttivitta*	maple prominent moth
Lepidoptera	Notodontidae	*Heterocampa obliqua*	oblique heterocampa
Lepidoptera	Notodontidae	*Heterocampa sp.*	a Heterocampa
Lepidoptera	Notodontidae	*Heterocampa umbrata*	white-blotched heterocampa
Lepidoptera	Notodontidae	*Hyperaeschra georgica*	Georgian prominent
Lepidoptera	Notodontidae	*Lochmaeus bilineata*	double-lined prominent
Lepidoptera	Notodontidae	*Macrurocampa marthesia*	mottled prominent
Lepidoptera	Notodontidae	*Nadata gibbosa*	white-dotted prominent
Lepidoptera	Notodontidae	*Oligocentria lignicolor*	white-streaked prominent
Lepidoptera	Notodontidae	*sp.*	a prominent
Lepidoptera	Notodontidae	*Symmerista albifrons*	white-headed prominent moth
Lepidoptera	Nymphalidae	*Asterocampa celtis*	hackberry emperor
Lepidoptera	Nymphalidae	*Danaus plexippus*	monarch
Lepidoptera	Nymphalidae	*Enodia anthedon*	northern pearly eye
Lepidoptera	Nymphalidae	*Euptoieta claudia*	variegated fritillary
Lepidoptera	Nymphalidae	*Euptychia gemma*	gemmed satyr
Lepidoptera	Nymphalidae	*Hermeuptychia sosybius*	Carolina satyr
Lepidoptera	Nymphalidae	*Junonia coenia*	common buckeye
Lepidoptera	Nymphalidae	*Limenitis arthemis*	red-spotted purple
Lepidoptera	Nymphalidae	*Megisto cymela*	little wood satyr
Lepidoptera	Nymphalidae	*Nymphalis antiopa*	mourning cloak
Lepidoptera	Nymphalidae	*Phyciodes tharos*	pearl crescent
Lepidoptera	Nymphalidae	*Polygonia comma*	eastern comma
Lepidoptera	Nymphalidae	*Polygonia interrogationis*	questionmark
Lepidoptera	Nymphalidae	*Satyrodes appalachia*	Appalachian brown
Lepidoptera	Nymphalidae	*speyeria cybele*	great spangled fritillary
Lepidoptera	Nymphalidae	*Vanessa atalanta*	red admiral
Lepidoptera	Nymphalidae	*Vanessa virginiensis*	American lady
Lepidoptera	Papilionidae	*Battus philenor*	pipevine swallowtail
Lepidoptera	Papilionidae	*Papilio glaucus*	eastern tiger swallowtail
Lepidoptera	Papilionidae	*Papilio troilus*	spicebush swallowtail
Lepidoptera	Pieridae	*Anthocharis midea*	falcate orangetip
Lepidoptera	Pieridae	*Colias eurytheme*	orange sulphur
Lepidoptera	Pieridae	*Colias philodice*	clouded sulphur
Lepidoptera	Pieridae	*Eurema nicippe*	sleepy orange

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Lepidoptera	Pieridae	*Phoebis sennae*	cloudless sulphur
Lepidoptera	Pterophoridae	*sp.*	a plume moth
Lepidoptera	Pyralidae	*Antaeotricha sp.*	a Pyralid moth
Lepidoptera	Pyralidae	*Clyderopteron sp.*	a Pyralid moth
Lepidoptera	Pyralidae	*Conchylodes ovulalis*	zebra conchylodes moth
Lepidoptera	Pyralidae	*Crambus laqueatellus*	eastern grass-veneer moth
Lepidoptera	Pyralidae	*Desmia funeralis*	grape leaffolder moth
Lepidoptera	Pyralidae	*Desmia maculalis*	grape leafroller moth
Lepidoptera	Pyralidae	*Diacme elealis*	paler diacme moth
Lepidoptera	Pyralidae	*Diasemiodes janassalis*	a Pyralid moth
Lepidoptera	Pyralidae	*Dolichomia olinalis*	yellow-fringed dolichomia moth
Lepidoptera	Pyralidae	*Euzophera sp.*	borer moth
Lepidoptera	Pyralidae	*Nomophila nearctica*	lucerne moth
Lepidoptera	Pyralidae	*Ostrinia sp.*	a borer moth
Lepidoptera	Pyralidae	*Palpita magniferalis*	splendid palpita moth
Lepidoptera	Pyralidae	*Pyrausta acrionalis*	mint-loving Pyrausta moth
Lepidoptera	Pyralidae	*Pyromorpha dimidiata*	orange-patched smoky moth
Lepidoptera	Pyralidae	*sp.*	a Pyralid moth
Lepidoptera	Pyralidae	*Synclita obliteralis*	waterlily leafcutter moth
Lepidoptera	Pyralidae	*Udea rubigalis*	celery leaftier moth
Lepidoptera	Saturniidae	*Actias luna*	luna moth
Lepidoptera	Saturniidae	*Antheraea polyphemus*	Polyphemus moth
Lepidoptera	Saturniidae	*Automeris io*	IO moth
Lepidoptera	Saturniidae	*Callosamia angulifera*	tulip-tree silkmoth
Lepidoptera	Saturniidae	*Citheronia regalis*	regal moth
Lepidoptera	Saturniidae	*Dryocampa rubicunda*	rosy maple moth
Lepidoptera	Sesiidae	*sp.*	a clear-winged moth
Lepidoptera	Sphingidae	*Deidamia inscripta*	lettered sphinx
Lepidoptera	Sphingidae	*Lapara coniferarum*	pine sphinx
Lepidoptera	Ypnnomeutidae	*Atteva punctella*	Ailanthus webworm moth
Microcoryphia	Machilidae	*sp.*	a bristletail
Odonata	Aeshnidae	*Anax junius*	common green darner
Odonata	Aeshnidae	*Basiaeschna janata*	springtime darner
Odonata	Aeshnidae	*Epiaeschna heros*	swamp darner
Odonata	Aeshnidae	*Gomphaeschna antilope*	taper-tailed darner
Odonata	Calopterygidae	*Calopteryx maculata*	ebony jewelwing
Odonata	Coenagrionidae	*Argia fumipennis*	variable dancer
Odonata	Coenagrionidae	*Argia fumipennis violacea*	variable dancer
Odonata	Coenagrionidae	*Argia moesta*	powdered dancer
Odonata	Coenagrionidae	*Argia tibialis*	blue-tipped dancer
Odonata	Coenagrionidae	*Enallagma signatum*	orange bluet
Odonata	Coenagrionidae	*Ischnura posita*	fragile forktail
Odonata	Corduliidae	*Epitheca cynosura*	common baskettail
Odonata	Corduliidae	*Epitheca princeps*	prince baskettail

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Odonata	Corduliidae	*Helocordulia uhleri*	Uhler's sundragon
Odonata	Corduliidae	*Somatochlora linearis*	mocha emerald
Odonata	Gomphidae	*Dromogomphus spinosus*	black-shouldered spinyleg
Odonata	Gomphidae	*Gomphus exilis*	lancet clubtail
Odonata	Gomphidae	*Gomphus lividus*	ashy clubtail
Odonata	Lestidae	*Lestes vigilax*	swamp spreadwing
Odonata	Libellulidae	*Celithemis elisa*	calico pennant
Odonata	Libellulidae	*Celithemis eponena*	Halloween pennant
Odonata	Libellulidae	*Celithemis fasciata*	banded pennant
Odonata	Libellulidae	*Dythemis velox*	swift setwing
Odonata	Libellulidae	*Erethymis simplicicollis*	eastern pondhawk
Odonata	Libellulidae	*Libellula cyanea*	spangled skimmer
Odonata	Libellulidae	*Libellula deplanata*	blue corporal
Odonata	Libellulidae	*Libellula incesta*	slaty skimmer
Odonata	Libellulidae	*Libellula luctuosa*	widow skimmer
Odonata	Libellulidae	*Libellula lydia*	common whitetail
Odonata	Libellulidae	*Libellula semifasciata*	painted skimmer
Odonata	Libellulidae	*Libellula vibrans*	great blue skimmer
Odonata	Libellulidae	*Pachydiplax longipennis*	blue dasher
Odonata	Libellulidae	*Perithemis tenera*	eastern amberwing
Odonata	Libellulidae	*Tramea lacerata*	black saddlebags
Odonata	Macromiidea	*Didymops transversa*	stream cruiser
Odonata	Petaluridae	*Tachopteryx thoreyi*	gray petaltail
Orthoptera	Acrididae	*Chortophaga viridifasciata*	short-horned grasshopper
Orthoptera	Gryllidae	*Gryllus sp.*	a cricket
Orthoptera	Rhaphidophoridae	*Ceuthophilus crassifemoris*	camel cricket
Orthoptera	Tetrigidae	*sp.*	pygma grasshoper
Orthoptera	Tetrigidae	*Tettigidea lateralis*	pygma grasshoper
Orthoptera	Tettigoniidae	*Atlanticus sp.*	long-horned grasshopper
Orthoptera	Tettigoniidae	*Atlanticus testaceus*	long-horned grasshopper
Orthoptera	Tettigoniidae	*sp.*	a katydid
Trichoptera	Hydroptilidae	*sp.*	a caddisfly
Trichoptera	Leptoceridae	*sp.*	a long-horned caddisfly
Class Arachnida			
Araneae	Agelenidae	*Agelenopsis kastoni*	a funnel-web spider
Araneae	Agelenidae	*sp.*	a funnel-web spider
Araneae	Amaurobiidae	*Coras medicinalis*	a hacklemesh weavers
Araneae	Amaurobiidae	*Wadotes calcaratus*	a hacklemesh weavers
Araneae	Anyphaenidae	*Anyphaena pectorosa*	a ghost spider
Araneae	Anyphaenidae	*Wulfila alba*	a ghost spider
Araneae	Araneidae	*Larinia directa*	a rob weaver spider
Araneae	Atypidae	*Sphodros coylei*	a purseweb spider
Araneae	Clubionidae	*Clubiona sp*	a sac spider

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Order	**Family**	**Scientific Name**	**Common Name**
Araneae	Gnaphosidae	*Drassyllus aprilinus*	a ground spider
Araneae	Gnaphosidae	*Drassyllus covensis*	a ground spider
Araneae	Gnaphosidae	*Drassyllus ellipes*	a ground spider
Araneae	Gnaphosidae	*Drassyllus novus*	a ground spider
Araneae	Gnaphosidae	*Gnaphosa fontinalis*	a ground spider
Araneae	Gnaphosidae	*Haplodrassus signifer*	a ground spider
Araneae	Gnaphosidae	*Zelotes hentzi*	a ground spider
Araneae	Linyphiidae	*Ceraticelus sp*	a spider
Araneae	Liocranidae	*Agroeca pratensis*	a spider
Araneae	Lycosidae	*Gladicosa gulosa*	a wolf spider
Araneae	Lycosidae	*Gladicosa sp*	a wolf spider
Araneae	Lycosidae	*Hogna carolinensis*	a wolf spider
Araneae	Lycosidae	*Hogna frondicola*	a wolf spider
Araneae	Lycosidae	*Hogna helluo*	a wolf spider
Araneae	Lycosidae	*Pardosa milvina*	a wolf spider
Araneae	Lycosidae	*Pirata sp.*	a wolf spider
Araneae	Lycosidae	*Schizocosa duplex*	a wolf spider
Araneae	Lycosidae	*Schizocosa ocreata*	a wolf spider
Araneae	Lycosidae	*Schizocosa saltatrix*	a wolf spider
Araneae	Lycosidae	*Schizocosa sp.*	a wolf spider
Araneae	Lycosidae	*sp.*	a wolf spider
Araneae	Lycosidae	*Trebasoca marxi*	a wolf spider
Araneae	Lycosidae	*Varacosa avara*	a wolf spider
Araneae	Miturgidae	*Strotarchus piscatorius*	a prowling spider
Araneae	Oxyopidae	*Oxyopes aglossus*	a lynx spider
Araneae	Oxyopidae	*Oxyopes salticus*	a lynx spider
Araneae	Oxyopidae	*Peucetia viridans*	a lynx spider
Araneae	Philodromidae	*Philodromus marxi*	a crab spider
Araneae	Pisauridae	*Dolomedes scriptus*	a nursery web spider
Araneae	Pisauridae	*Dolomedes sp.*	a nursery web spider
Araneae	Pisauridae	*Pisaurina mira*	a nursery web spider
Araneae	Pisauridae	*sp.*	a nursery web spider
Araneae	Salticidae	*Eris militaris*	a jumping spider
Araneae	Salticidae	*Ghelna sp.*	a jumping spider
Araneae	Salticidae	*Maevia inclemens*	a jumping spider
Araneae	Salticidae	*Pelegrina galathea*	a jumping spider
Araneae	Salticidae	*Pelegrina peckhamorum*	a jumping spider
Araneae	Salticidae	*Phidippus pius*	a jumping spider
Araneae	Salticidae	*sp.*	a jumping spider
Araneae	Salticidae	*Thiodina puerpera*	a jumping spider
Araneae	Salticidae	*Thiodina sylvana*	a jumping spider
Araneae	Salticidae	*Tutelina elegans*	a jumping spider
Araneae	Salticidae	*Tutelina formicarius*	a jumping spider
Araneae	Tetragnathidae	*Leucage venusta*	an orbweaver spider

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Araneae	Tetragnathidae	*sp.*	an orbweaver spider
Araneae	Theridiidae	*Latrodectus variolus*	a cobweb spider
Araneae	Thomisidae	*sp.*	a crab spider
Araneae	Thomisidae	*Tmarus angulatus*	a crab spider
Araneae	Thomisidae	*Xysticus ferox*	a crab spider
Opiliones	Cosmetidae	*Vonones sayi*	a harvestmen
Pseudoscorpiones		*sp.*	a pseudoscorpion
Class Chilopoda			
Geophilomorpha	Geophilidae	*Geophilus sp.*	a centipede
Geophilomorpha	Geophilidae	*Geophilus varians*	a centipede
Geophilomorpha	Linotaeniidae	*Strigamia bidens*	a centipede
Lithobiomorpha	Lithobiidae	*Bothropolys multidentatus*	a centipede
Scolopendromorpha	Cryptopidae	*Theatops posticus*	a centipede
Scolopendromorpha	Scolocryptopidae	*Scolocryptops sexspinosus*	a centipede
Scolopendromorpha	Scolopendridae	*Hemiscolopendra marginata*	a centipede
Class Diplopoda			
Callipodidae	Abacionidae	*Abicon magnum*	a millipede
Julida	Julidae	*Ophyiulus pilosus*	a millipede
Julida	Parajulidae	*Ptyoiulus ectenes*	a millipede
Julida	Parajulidae	*Ptyoiulus ectenes*	a millipede
Polydesmida	Xystodesmidae	*Apheloria tigana*	a millipede
Spirobolida	Spirobolidae	*Narceus americanus*	a millipede
Class Entognatha			
Collembola		*sp.*	a springtail
Class Gastropoda			
Stylommatophora	Haplotrematidae	*Haplotrema concavum*	gray-foot lancetooth
Stylommatophora	Polygyridae	*Mesodon andrewsae*	balsam globe
Stylommatophora	Polygyridae	*Triodopsis tridentata*	northern threetooth
Stylommatophora	Zonitidae	*Mesomphix rugeli*	wrinkled button
Stylommatophora	Zonitidae	*Ventridens intertexus*	pyramid dome
Source: AMEC 2007b			

Aquatic Invertebrates documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Class Entognatha			
Collembola	Sminthuridae	*sp.*	springtail
Class Gastropoda			
Architaenioglossa	Viviparidae	*Campeloma sp.*	a freshwater snail
Basommatophora	Lymnaeidae	*Pseudosuccinea sp.*	a freshwater snail
Basommatophora	Planorbidae	*Helisoma sp.*	a freshwater snail
Class Hirudinea			
Rhynchobdellida	Glossiphoniidae	*Placobdella papillifera*	a leech
Class Insecta			
Coleoptera	Curculionidae	*sp.*	a snout beetle
Coleoptera	Dryopidae	*Helichus lithophilus*	long-toed water beetle
Coleoptera	Dytiscidae	*Acilius sp.*	predaceous diving beetle
Coleoptera	Dytiscidae	*Cybister fimbriolatus*	predaceous diving beetle
Coleoptera	Dytiscidae	*Hydroporus sp.*	predaceous diving beetle
Coleoptera	Elmidae	*Dubiraphia vitatta*	riffle beetle
Coleoptera	Elmidae	*sp.*	riffle beetle
Coleoptera	Elmidae	*Stenelmis spp.*	riffle beetle
Coleoptera	Gyrinidae	*Dineutus sp.*	whirligig beetle
Coleoptera	Hydrophilidae	*Tropisternus sp*	water scavenger beetle
Coleoptera	Psphenidae	*Ectopria sp.*	water penny beetle
Coleoptera	Psphenidae	*Psephenus herricki*	water penny beetle
Diptera	Chironomidae	*Clinotanypus sp.*	a midge
Diptera	Chironomidae	*Kronopelopia sp.*	a midge
Diptera	Chironomidae	*Paratanytarsus sp.*	a midge
Diptera	Chironomidae	*Polypedium flavum*	a midge
Diptera	Chironomidae	*Polypedium sp.*	a midge
Diptera	Chironomidae	*Psectrocladius pilosus*	a midge
Diptera	Chironomidae	*sp.*	a midge
Diptera	Chironomidae	*Stenochironomus spp.*	a midge
Diptera	Culicidae	*Culex territans*	a mosquitoe
Diptera	Tipulidae	*Hexatoma sp.*	a crane fly
Diptera	Tipulidae	*Longurio sp.*	a crane fly
Ephemeroptera	Baetidae	*Callibaetis sp.*	a mayfly
Ephemeroptera	Baetidae	*Centroptilum sp.*	a mayfly
Ephemeroptera	Caenidae	*Caenis spp.*	a mayfly
Ephemeroptera	Ephemeridae	*Hexagenia sp.*	a mayfly
Ephemeroptera	Heptageniidae	*Epeorus dispar*	a mayfly
Ephemeroptera	Heptageniidae	*Heptagenia spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Heptogenia spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Macaffertium spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Stenacron interpunctatum*	a mayfly

Aquatic Invertebrates documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Ephemeroptera	Heptageniidae	*Stenacron pallidum*	a mayfly
Ephemeroptera	Heptageniidae	*Stenacron spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Stenonema femoratum*	a mayfly
Ephemeroptera	Leptophebiidae	*Habrophlebiodes sp.*	a mayfly
Ephemeroptera	Oligoneuridae	*Isonychia sp.*	a mayfly
Heteroptera	Belostomatidae	*Lethocerus griseus*	a giant water bug
Heteroptera	Corixidae	*Hesperocorixa sp.*	a water boatman
Heteroptera	Corixidae	*Palmacorixa buenoi*	a water boatman
Heteroptera	Corixidae	*Trichocorixa calva*	a water boatman
Heteroptera	Gelastocoridae	*Gelastocoris oculatus*	a toad bug
Heteroptera	Gerridae	*Gerris marginatus*	a water strider
Heteroptera	Gerridae	*Trepobates subnitidus*	a water strider
Heteroptera	Mesoveliidae	*Mesovelia sp.*	a water treader
Heteroptera	Naucoridae	*Pelocoris femoraltus*	a creeping water bug
Heteroptera	Nepidae	*Ranatra kirkaldi*	a water scorpian
Heteroptera	Veliidae	*Microvelia sp.*	a broad-shouldered water strider
Heteroptera	Veliidae	*Rhagovelia obesa*	a broad-shouldered water strider
Hymenoptera	Formicidae	*Myrmica sp.*	an ant
Lepidoptera	Tortricidae	*Tortricidae*	a tortricid moth
Megaloptera	Corydalidae	*Corydalus cornutus*	eastern dobsonfly
Megaloptera	Corydalidae	*Nigronia fasciatus*	a fishfly
Megaloptera	Sialidae	*Sialis americana*	an alderfly
Megaloptera	Sialidae	*Sialis sp.*	an alderfly
Odonata	Aeshnidae	*Anax junius*	common green darner
Odonata	Aeshnidae	*Boyeria vinosa*	fawn darner
Odonata	Coenagrionidae	*Argia spp.*	a dancer damselfly
Odonata	Coenagrionidae	*Enallagma spp.*	a bluet damselfly
Odonata	Coenagrionidae	*Ischnura sp.*	a forktail damselfly
Odonata	Coenagrionidae	*sp.*	a damselfly
Odonata	Corduligastridae	*Corduligaster maculata*	twin-spotted spiketail
Odonata	Corduliidae	*Epitheca sp.*	a baskettail
Odonata	Gomphidae	*Erpetogomphus designatus*	eastern ringtail
Odonata	Gomphidae	*sp.*	a clubtail
Odonata	Gomphidae	*Stylogomphis albistylus*	least clubtail
Odonata	Libellulidae	*Erythrodiplax minuscula*	little blue dragonlet
Odonata	Libellulidae	*Libellula lydia*	common whitetail
Odonata	Libellulidae	*Libellula sp.*	a skimmer dragonfly
Odonata	Libellulidae	*Pachydiplax longipennis*	blue dasher
Plecoptera	Perlidae	*Acroneuria sp.*	a stonefly
Plecoptera	Perlidae	*sp.*	a stonefly
Trichoptera	Hydropsychidae	*Cheumatopsyche spp.*	a netspinning caddisfly
Trichoptera	Hydropsychidae	*Hydropsyche sp.*	a netspinning caddisfly
Trichoptera	Limnephilidae	*Pycnopsyche sp.*	northern caddisfly
Trichoptera	Odontoceridae	*Psilotreta sp.*	a caddisfly
Trichoptera	Philopotamidae	*Chimarra spp.*	a fingernet caddisfly

Aquatic Invertebrates documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Class Malacostraca			
Amphipoda	Gammaridae	*Crangonyx sp.*	an amphipod
Decapoda	Cambaridae	*sp.*	a crawfish
Decapoda	Cambaridae	*Cambarus sp.*	a crawfish
Decapoda	Cambaridae	*Procambarus sp.*	a crawfish
Decapoda	Cambaridae	*Procambarus acutus*	White River crawfish
Decapoda	Cambaridae	*Cambarus sp. C*	a crawfish
Decapoda	Cambaridae	*Cambarus reduncus*	a crawfish
Isopoda	Ascellidae	*Caecidotea forbesi*	a sow bug
Source: AMEC 2007b			

Vertebrates Observed During Non-Comprehensive Surveys of CBTS				
Group	**Scientific Name**	**Common Name**	**NCNHP 1994 Observations**	**CBTS 1998-2000 Observations**
Amphibian	*Acris crepitans*	Northern cricket frog	X	
Amphibian	*Bufo woodhousei fowleri*	Fowler's toad	X	
Amphibian	*Desmognathus fuscus*	Dusky salamander	X	
Amphibian	*Eurycea cirrigera*	Southern two-lined salamander	X	
Amphibian	*Hyla chrysoscelis*	Cope's gray treefrog	X	
Amphibian	*Rana clamitans*	Green frog	X	X
Bird	*Accipiter cooperii*	Cooper's hawk		X
Bird	*Archilochus colubris*	Ruby-throated hummingbird	X	X
Bird	*Bombycilla cedrorum*	Cedar waxwing		X
Bird	*Branta canadensis*	Canada goose		X
Bird	*Buteo jamaicensis*	Red-tailed hawk		X
Bird	*Buteo lineatus*	Red-shouldered hawk	X	
Bird	*Buteo platypterus*	Broad-winged hawk	X	
Bird	*Caprimulgus carolinensis*	Chuck-will's-widow		X
Bird	*Caprimulgus vociferus*	Whip-poor-will		X
Bird	*Cardinalis cardinalis*	Northern cardinal	X	X
Bird	*Carduelis tristis*	American goldfinch	X	X
Bird	*Cathartes aura*	Turkey vulture		X
Bird	*Ceryle alcyon*	Belted kingfisher	X	X
Bird	*Chaetura pelagica*	Chimney swift		X
Bird	*Coccyzus americanus*	Yellow-billed cuckoo	X	X
Bird	*Colaptes auratus*	Northern flicker	X	X
Bird	*Colinus virginianus*	Northern bobwhite		X
Bird	*Contopus virens*	Eastern wood pewee		X
Bird	*Coragyps atratus*	Black vulture		X
Bird	*Corvus brachyrhynchos*	American crow	X	X
Bird	*Corvus ossifragus*	Fish crow		X
Bird	*Cyanocitta cristata*	Blue jay	X	X
Bird	*Dendroica discolor*	Prairie warbler	X	X
Bird	*Dendroica pinus*	Pine warbler	X	X
Bird	*Dryocopus pileatus*	Pileated woodpecker	X	X
Bird	*Empidonax virescens*	Acadian flycatcher	X	X
Bird	*Geothlypis trichas*	Common yellowthroat		X
Bird	*Hylocichla mustelina*	Wood thrush		X
Bird	*Icteria virens*	Yellow-breasted chat		X
Bird	*Melanerpes carolinus*	Red-bellied woodpecker	X	X
Bird	*Meleagris gallopavo*	Wild turkey	X	X
Bird	*Mimus polyglottos*	Northern mockingbird		X
Bird	*Molothrus ater*	Brown-headed cowbird	X	X
Bird	*Myiarchus crinitus*	Great crested flycatcher		X
Bird	*Oporornis formosus*	Kentucky warbler		X
Bird	*Parula americana*	Northern parula	X	X
Bird	*Parus bicolor*	Tufted titmouse	X	X
Bird	*Parus carolinensis*	Carolina chickadee	X	X

Vertebrates Observed During Non-Comprehensive Surveys of CBTS				
Group	**Scientific Name**	**Common Name**	**NCNHP 1994 Observations**	**CBTS 1998-2000 Observations**
Bird	*Passerina cyanea*	Indigo bunting	X	X
Bird	*Picoides pubescens*	Downy woodpecker	X	X
Bird	*Picoides villosus*	Hairy woodpecker		X
Bird	*Pipilo erythrophthalmus*	Eastern towhee	X	X
Bird	*Piranga olivacea*	Scarlet tanager	X	X
Bird	*Piranga rubra*	Summer tanager	X	X
Bird	*Polioptila caerulea*	Blue-gray gnatcatcher	X	X
Bird	*Quiscalus quiscula*	Common grackle		X
Bird	*Sayornis phoebe*	Eastern phoebe	X	X
Bird	*Seiurus aurocapillus*	Ovenbird	X	X
Bird	*Seiurus motacilla*	Louisiana waterthrush	X	
Bird	*Sialia sialis*	Eastern bluebird		X
Bird	*Sitta carolinensis*	White-breasted nuthatch		X
Bird	*Spizella passerina*	Chipping sparrow		X
Bird	*Spizella pusilla*	Field sparrow	X	X
Bird	*Strix varia*	Barred owl	X	
Bird	*Thyothorus ludovicianus*	Carolina wren	X	X
Bird	*Toxostoma rufum*	Brown thrasher		X
Bird	*Tyrannus tyrannus*	Eastern kingbird		X
Bird	*Vireo flavifrons*	Yellow-throated vireo	X	X
Bird	*Vireo griseus*	White-eyed vireo		X
Bird	*Vireo olivaceus*	Red-eyed vireo	X	X
Bird	*Vireo solitarius*	Blue-headed vireo	X	
Bird	*Wilsonia citrina*	Hooded warbler	X	X
Bird	*Zenaida macroura*	Mourning dove		X
Mammal	*Didelphis virginiana*	Virginia opossum	X	
Mammal	*Glaucomys volans*	Southern flying squirrel		X
Mammal	*Lutra canadensis*	River otter	X	
Mammal	*Odocoileus virginianus*	White tailed deer	X	X
Mammal	*Peromyscus oeucopus*	White-footed mouse		X
Mammal	*Procyon lotor*	Raccoon	X	
Mammal	*Scalopus aquaticus*	Eastern mole	X	
Mammal	*Sciurus carolinensis*	Gray squirrel	X	X
Mammal	*Sigmodon hispidus*	Hispid cotton rat		X
Mammal	*Sylvilagus floridanus*	Eastern cottontail	X	X
Mammal	*Tamias striatus*	Eastern chipmunk		X
Mammal	*Urocyon cinereoargenteus*	Gray fox	X	
Reptile	*Chelydra serpentina*	Snapping turtle	X	
Reptile	*Crotalus horridus*	Timber rattlesnake	X	
Reptile	*Nerodia sipedon*	Northern water snake	X	
Reptile	*Sceloporus undulatus*	Eastern fence lizard	X	X
Reptile	*Terrapene carolina*	Eastern box turtle	X	X

Invertebrate Species Observed During the 1994 NCNHP Non-Comprehensive Survey (NCNHP 1995)		
Group	**Scientific Name**	**Common Name**
Dragonfly	*Celithemis elisa*	Calico pennant
Dragonfly	*Cordulegaster obliqua*	Arrowhead spiketail
Dragonfly	*Epiaeschna heros*	Swamp darner
Dragonfly	*Erythemis simplicicollis*	Eastern pondhawk
Dragonfly	*Gomphus exilis*	Lancet clubtail
Dragonfly	*Libellula luctuosa*	Widow skimmer
Dragonfly	*Libellula vibrans*	Great blue skimmer
Dragonfly	*Perithemis tenera*	Eastern amberwing
Dragonfly	*Tachopteryx thoreyi*	Gray petaltail
Butterfly	*Achalarus lyciades*	Hoary edge
Butterfly	*Ancyloxypha numitor*	Least skipper
Butterfly	*Cleastrina ladon*	Spring azure
Butterfly	*Enodia portlandia*	Southern pearly eye
Butterfly	*Epargyreus clarus*	Silver-spotted skipper
Butterfly	*Everes comyntas*	Eastern tailed blue
Butterfly	*Hermeuptychia sosybius*	Carolina satyr
Butterfly	*Incisalia niphon*	Eastern pine elfin
Butterfly	*Junonia coenia*	Common buckeye
Butterfly	*Lerema accius*	Clouded skipper
Butterfly	*Limenitis arthemis*	Red-spotted purple
Butterfly	*Megisto cymela*	Little wood satyr
Butterfly	*Papilio glaucus*	Eastern tiger swallowtail
Butterfly	*Papilio polyxenes*	Black swallowtail
Butterfly	*Papilio troilus*	Spicebush swallowtail
Butterfly	*Phyciodes tharos*	Pearl Crescent
Butterfly	*Poanes zabulon*	Zabulon skipper
Butterfly	*Polygonia interrogationis*	Question mark
Butterfly	*Strymon melinus*	Gray hairstreak
Butterfly	*Thorybes pylades*	Northern cloudywing

BIRDS PROTECTED BY THE MIGRATORY BIRD TREATY ACT
List of Migratory Birds

Taxonomic List (from United States Fish and Wildlife Service)

Family GAVIIDAE (Loons)

Gavia stellata, Red-throated Loon
arctica, Arctic Loon
pacifica (=arctica), Pacific (=Arctic) Loon
immer, Common Loon
adamsii, Yellow-billed Loon

Family PODICIPEDIDAE (Grebes)

Tachybaptus dominicus, Least Grebe
Podilymbus podiceps, Pied-billed Grebe
Podiceps auritus, Horned Grebe
grisegena, Red-necked Grebe
nigricollis, Eared Grebe
Aechmophorus occidentallis, Western Grebe
clarkii (=occidentallis), Clark's (=Western) Grebe

Family DIOMEDEIDAE (Albatrosses)

Diomedea albatrus, Short-tailed Albatross
nigripes, Black-footed Albatross
immutabilis, Laysan Albatross
chlororhynchos, Yellow-nosed Albatross

Family PROCELLARIIDAE (Shearwaters and Petrels)

Fulmarus glacialis, Northern Fulmar
Pterodroma hasitata, Black-capped Petrel
phaeopygia, Dark-rumped Petrel externa,
Juan Fernandez (=White-necked) Petrel
cervicalis (=externa), White-necked Petrel
inexpectata, Mottled Petrel
ultima, Murphy's Petrel
neglecta, Kermadec Petrel
arminjoniana, Herald Petrel
cookii, Cook's Petrel
hypoleuca, Bonin Petrel
Bulweria bulwerii, Bulwer's Petrel
diomedea, Cory's Shearwater
Puffinus creatopus, Pink-footed Shearwater
carneipes, Flesh-footed Shearwater
gravis, Greater Shearwater
pacificus, Wedge-tailed Shearwater
bulleri, Buller's Shearwater griseus,
Sooty Shearwater
tenuirostris, Short-tailed Shearwater
nativitatis, Christmas Shearwater
puffinus, Manx Shearwater
opisthomelas, Black-vented Shearwater
auricularis, Townsend's Shearwater
assimilis, Little Shearwater
lherminieri, Audubon's Shearwater

Family HYDROBATIDAE (Storm-Petrels)
Oceanites oceanicus, Wilson's Storm-Petrel
Pelagodroma marina, White-faced Storm-Petrel
Oceanodroma furcata, Fork-tailed Storm-Petrel
leucorhoa, Leach's Storm-Petrel
homochroa, Ashy Storm-Petrel
castro, Band-rumped Storm-Petrel
tethys, Wedge-rumped Storm-Petrel
melania, Black Storm-Petrel
tristrami, Tristram's (=Sooty) Storm-Petrel
microsoma, Least Storm-Petrel

Family PHAETHONTIDAE (Tropicbirds)
Phaethon lepturus, White-tailed Tropicbird
aethereus, Red-billed Tropicbird
rubricauda, Red-tailed Tropicbird

Family SULIDAE (Boobies and Gannets)
Sula dactylatra, Masked Booby
nebouxii, Blue-footed Booby
leucogaster, Brown Booby
sula, Red-footed Booby
Morus (=Sula) bassanus, Northern Gannet (=Gannet)

Family PELECANIDAE (Pelicans)
Pelecanus erythrorhynchos, American White Pelican
occidentalis, Brown Pelican

Family PHALACROCORACIDAE (Cormorants)
Phalacrocorax carbo, Great Cormorant
auritus, Double-crested Cormorant
brasilianus (=olivaceus), Neotropic (=Olivaceous) Cormorant
penicillatus, Brandt's Cormorant
pelagicus, Pelagic Cormorant
urile, Red-faced Cormorant

Family ANHINGIDAE (Anhingas)
Anhinga anhinga, Anhinga

Family FREGATIDAE (Frigatebirds)
Fregata minor, Great Frigatebird
magnificens, Magnificent Frigatebird
ariel, Lesser Frigatebird

Family ARDEIDAE (Bitterns and Herons)
Botaurus lentiginosus, American Bittern
Ixobrychus exilis, Least Bittern
sinensis, Yellow (=Chinese) Bittern
eurhythmus, Schrenk's Bittern
Ardea herodias, Great Blue Heron
alba (=albus), Great Egret
Mesophoyx (=Egretta) intermedia, Intermediate (=Plumed) Egret
Egretta eulophotes, Chinese Egret
sacra, Pacific Reef Heron
thula, Snowy Egret

caerulea, Little Blue Heron
tricolor, Tricolored Heron
rufescens, Reddish Egret
Bubulcus ibis, Cattle Egret
Butorides virescens (=striatus), Green (=Green-backed) Heron
Nycticorax nycticorax, Black-crowned Night-Heron
melanolophus, Malay Night-Heron
goisagi, Japanese Night-Heron
Nyctanassa (=Nycticorax) violacea (=violaceus), Yellow-crowned Night-Heron

Family THRESKIORNITHIDAE (Ibises and Spoonbills)
Eudocimus albus, White Ibis
ruber, Scarlet Ibis
Plegadis falcinellus, Glossy Ibis
chihi, White-faced Ibis
Ajaia ajaja, Roseate Spoonbill

Family CICONIIDAE (Storks)
Jabiru mycteria, Jabiru
Mycteria americana, Wood Stork

Family PHOENICOPTERIDAE (Flamingos)
Phoenicopterus ruber, Greater Flamingo

Family ANATIDAE (Swans, Geese, and Ducks)
Dendrocygna bicolor, Fulvous Whistling-Duck
autumnalis, Black-bellied Whistling-Duck
arborea, West Indian Whistling-Duck
Cygnus columbianus, Tundra Swan
cygnus, Whooper Swan
buccinator, Trumpeter Swan
Anser fabalis, Bean Goose
albifrons, Greater White-fronted Goose
Chen caerulescens, Snow Goose
rossii, Ross' Goose
canagica, Emperor Goose
Branta bernicla, Brant
leucopsis, Barnacle Goose
canadensis, Canada Goose
(=Nesochen) sandvicensis, Hawaiian Goose
Aix sponsa, Wood Duck
Anas crecca, Green-winged Teal
formosa, Baikal Teal
falcata, Falcated Teal
rubripes, American Black Duck
fulvigula, Mottled Duck
platyrhynchos, Mallard
wyvilliana, Hawaiian Duck
laysanensis, Laysan Duck
bahamensis, White-cheeked Pintail
acuta, Northern Pintail
querquedula, Garganey discors,
Blue-winged Teal
cyanoptera, Cinnamon Teal
clypeata, Northern Shoveler
strepera, Gadwall

penelope, Eurasian Wigeon
americana, American Wigeon
Aythya ferina, Common Pochard
valisneria, Canvasback
americana, Redhead
baeri, Baer's Pochard
collaris, Ring-necked Duck
fuligula, Tufted Duck
marila, Greater Scaup
affinis, Lesser Scaup
Somateria mollissima, Common Eider
spectabilis, King Eider
fischeri, Spectacled Eider
Polysticta stelleri, Steller's Eider
Histrionicus histrionicus, Harlequin Duck
Clangula hyemalis, Oldsquaw
Melanitta nigra, Black Scoter
perspicillata, Surf Scoter
fusca, White-winged Scoter
Bucephala clangula, Common Goldeneye
islandica, Barrow's Goldeneye
albeola, Bufflehead
Mergellus albellus, Smew
Lophodytes cucullatus, Hooded Merganser
Mergus merganser, Common Merganser
serrator, Red-breasted Merganser
Oxyura jamaicensis, Ruddy Duck
dominica, Masked Duck

Family CATHARTIDAE (American Vultures)

Coragyps atratus, Black Vulture
Cathartes aura, Turkey Vulture
Gymnogyps californianus, California Condor

Family ACCIPITRIDAE (Kites, Eagles, Hawks, and Allies)

Pandion haliaetus, Osprey
Chondrohierax uncinatus, Hook-billed Kite
Elanoides forficatus, Swallow-tailed (=American Swallow-tailed) Kite
Elanus leucurus (=caeruleus), White-tailed (=Black-shouldered) Kite
Rostrhamus sociabilis, Snail Kite
Ictinia mississippiensis, Mississippi Kite
Milvus migrans, Black Kite
Haliaeetus leucocephalus, Bald Eagle
albicilla, White-tailed Eagle
pelagicus, Steller's Sea-Eagle
Circus cyaneus, Northern Harrier
Accipiter gularis, Asiatic Sparrow Hawk
striatus, Sharp-shinned Hawk
cooperii, Cooper's Hawk
gentilis, Northern Goshawk
Buteogallus anthracinus, Common Black-Hawk
Parabuteo unicinctus, Harris' Hawk
Buteo nitidus, Gray Hawk
lineatus, Red-shouldered Hawk
platypterus, Broad-winged Hawk
brachyurus, Short-tailed Hawk

swainsoni, Swainson's Hawk
albicaudatus, White-tailed Hawk
albonotatus, Zone-tailed Hawk
solitarius, Hawaiian Hawk
jamaicensis, Red-tailed Hawk
regalis, Ferruginous Hawk
lagopus, Rough-legged HawkAquila chrysaetos, Golden Eagle

Family FALCONIDAE (Caracaras and Falcons)

Caracara (=Polyborus) plancus, Crested Caracara
Falco tinnunculus, Eurasian Kestrel
sparverius, American Kestrel
columbarius, Merlin
femoralis, Aplomado Falcon
peregrinus, Peregrine Falcon
rusticolus, Gyrfalcon
mexicanus, Prairie Falcon

Family RALLIDAE (Rails, Gallinules, and Coots)

Coturnicops noveboracensis, Yellow Rail
Laterallus jamaicensis, Black Rail
Crex crex, Corn Crake
Rallus longirostris, Clapper Rail
elegans, King Rail
limicola, Virginia Rail
Porzana carolina, Sora
flaviventer, Yellow-breasted Crake
Porphyrula martinica, Purple Gallinule
Gallinula chloropus, Common Moorhen
Fulica atra, Eurasian Coot
alai (=americana), Hawaiian (=American) Coot
americana, American Coot
caribaea, Caribean Coot

Family ARAMIDAE (Limpkins)

Aramus guarauna, Limpkin

Family GRUIDAE (Cranes)

Grus canadensis, Sandhill Crane
grus, Common Crane
americana, Whooping Crane

Family CHARADRIIDAE (Plovers and Lapwings)

Vanellus vanellus, Northern Lapwing
Pluvialis squatarola, Black-bellied Plover
dominicus (=dominica), American (=Lesser) Golden-Plover
fulva (=dominica), Pacific (=Lesser) Golden-Plover
Charadrius mongolus, Mongolian Plover
leschensultii, Great Sand Plover
alexandrinus, Snowy Plover
wilsonia, Wilson's Plover
hiaticula, Common Ringed Plover
semipalmatus, Semipalmated Plover
melodus, Piping Plover
dubius, Little Ringed Plover
vociferus, Killdeer

montanus, Mountain Plover
morinellus, Eurasian Dotterel

Family HAEMATOPODIDAE (Oystercatchers)

Haematopus palliatus, American Oystercatcher
bachmani, Black Oystercatcher

Family RECURVIROSTRIDAE (Stilts and Avocets)

Himantopus mexicanus, Black-necked Stilt
Recurvirostra americana, American Avocet

Family JACANIDAE (Jacanas)

Jacana spinosa, Northern Jacana

Family SCOLOPACIDAE (Sandpipers, Phalaropes, and Allies)

Tringa nebularia, Common Greenshank
melanoleuca, Greater Yellowlegs
flavipes, Lesser Yellowlegs
stagnatilis, Marsh Sandpiper
erythropus, Spotted Redshank
glareola, Wood Sandpiper
solitaria, Solitary Sandpiper
Catoptrophorus semipalmatus, Willet
Heteroscelus incanus, Wandering Tattler
brevipes, Gray-tailed Tattler
Actitis hypoleucos, Common Sandpiper
macularia, Spotted Sandpiper
Xenus cinereus, Terek Sandpiper
Bartramia longicauda, Upland Sandpiper
Numenius minutus, Little (=Least) Curlew
borealis, Eskimo Curlew
phaeopus, Whimbrel
tahitiensis, Bristle-thighed Curlew
madagascariensis, Far Eastern Curlew
americanus, Long-billed Curlew
Limosa limosa, Black-tailed Godwit
haemastica, Hudsonian Godwit
lapponica, Bar-tailed Godwit
fedoa, Marbled Godwit
Arenaria interpres, Ruddy Turnstone
melanocephala, Black Turnstone
Aphriza virgata, Surfbird
Calidris tenuirostris, Great Knot
canutus, Red Knot
alba, Sanderling
pusilla, Semipalmated Sandpiper
mauri, Western Sandpiper
ruficollis, Red-necked (=Rufous-necked) Stint
minuta, Little Stint
temminckii, Temminck's Stint
subminuta, Long-toed Stint
minutilla, Least Sandpiper
fuscicollis, White-rumped Sandpiper
bairdii, Baird's Sandpiper
melanotos, Pectoral Sandpiper
acuminata, Sharp-tailed Sandpiper

maritima, Purple Sandpiper
ptilocnemis, Rock Sandpiper
alpina, Dunlin
ferruginea, Curlew Sandpiper
himantopus, Stilt Sandpiper
Eurynorhynchus pygmeus, Spoonbill Sandpiper
Limicola falcinellus, Broad-billed Sandpiper
Tryngites subruficollis, Buff-breasted Sandpiper
Philomachus pugnax, Ruff
Limnodromus griseus, Short-billed Dowitcher
scolopaceus, Long-billed Dowitcher
Lymnocryptes minimus, Jack Snipe
Gallinago gallinago, Common Snipe
stenura, Pin-tailed Snipe
megala, Swinhoe's Snipe
Scolopax rusticola, Eurasian Woodcock
minor, American Woodcock
Phalaropus tricolor, Wilson's Phalarope
lobatus, Red-necked Phalarope
fulicaria, Red Phalarope

Family LARIDAE (Skuas, Gulls, Terns, and Skimmers)

Stercorarius pomarinus, Pomarine Jaeger
parasiticus, Parasitic Jaeger
longicaudus, Long-tailed Jaeger
Catharacta skua, Great Skua
maccormicki, South Polar Skua
Larus atricilla, Laughing Gull
pipixcan, Franklin's Gull
minutus, Little Gull
ridibundus, Black-headed (=Common Black-headed) Gull
philadelphia, Bonaparte's Gull
heermanni, Heermann's Gull
canus, Mew Gull
delawarensis, Ring-billed Gull
californicus, California Gull
argentatus, Herring Gull
thayeri, Thayer's Gull
glaucoides, Iceland Gull
fuscus, Lesser Black-backed Gull
schistisagus, Slaty-backed Gull
livens, Yellow-footed Gull
occidentalis, Western Gull
glaucescens, Glaucous-winged Gull
hyperboreus, Glaucous Gull
marinus, Great Black-backed Gull
Rissa tridactyla, Black-legged Kittiwake
brevirostris, Red-legged Kittiwake
Rhodostethia rosea, Ross' Gull
Xema sabini, Sabine's Gull
Pagophila eburnea, Ivory Gull
Sterna nilotica, Gull-billed Tern
caspia, Caspian Tern
maxima, Royal Tern elegans,
Elegant Tern
sandvicensis, Sandwich Tern

dougallii, Roseate Tern
hirundo, Common Tern
paradisaea, Arctic Tern
aleutica, Aleutian Tern
forsteri, Forster's Tern
antillarum, Least Tern
albifrons, Little Tern
sumatrana, Black-naped Tern
lunata, Gray-backed Tern
anaethetus, Bridled Tern
fuscata, Sooty Tern
Chlidonias leucopterus, White-winged Tern
niger, Black Tern
Anous stolidus, Brown Noddy
minutus, Black Noddy
tenuirostris, Lesser Noddy
Procelsterna cerulea, Blue-gray Noddy
Gygis alba, White Tern
Rynchops niger, Black Skimmer

Family ALCIDAE (Auks, Murres, and Puffins)

Alle alle, Dovekie
Uria aalge, Common Murre
lomvia, Thick-billed Murre
Alca torda, Razorbill
Cepphus grylle, Black Guillemot
columba, Pigeon Guillemot
Brachyramphus marmoratus, Marbled Murrelet
brevirostris, Kittlitz's Murrelet
Synthliboramphus hypoleucus, Xantus' Murrelet
craveri, Craveri's Murrelet
antiquus, Ancient Murrelet
Ptychoramphus aleuticus, Cassin's Auklet
Cyclorrhynchus psittaculus, Parakeet Auklet
Aethia pusilla, Least Auklet
pygmaea, Whiskered Auklet
cristatella, Crested Auklet
Cerorhinca monocerata, Rhinoceros Auklet
Fratercula cirrhata, Tufted Puffin
arctica, Atlantic Puffin
corniculata, Horned Puffin

Family COLUMBIDAE (Pigeons and Doves)

Columba squamosa, Scaly-naped Pigeon
leucocephala, White-crowned Pigeon
flavirostris, Red-billed Pigeon
inornata, Plain Pigeon
fasciata, Band-tailed Pigeon
Zenaida asiatica, White-winged Dove
aurita, Zenaida Dove
macroura, Mourning Dove
Columbina inca, Inca Dove
passerina, Common Ground-Dove
talpacoti, Ruddy Ground-Dove
Leptotila verreauxi, White-tipped Dove
Geotrygon chrysia, Key West Quail-Dove

mystacea, Bridled Quail-Dove
montana, Ruddy Quail-Dove

Family CUCULIDAE (Cuckoos, Roadrunners, and Anis)

Cuculus canorus, Common Cuckoo
saturatus, Oriental Cuckoo
fugax, Hodgson's Hawk-Cuckoo
Coccyzus erythropthalmus, Black-billed Cuckoo
americanus, Yellow-billed Cuckoominor, Mangrove Cuckoo
Geococcyx californianus, Greater Roadrunner
Saurothera vieilloti, Puerto Rican Lizard-Cuckoo
Crotophaga ani, Smooth-billed Ani
sulcirostris, Groove-billed Ani

Family TYTONIDAE (Barn Owls)

Tyto alba, Barn Owl (=Common Barn-Owl)

Family STRIGIDAE (Typical Owls)

Otus flammeolus, Flammulated Owl
asio, Eastern Screech-Owl
kennicottii, Western Screech-Owl
trichopsis, Whiskered Screech-Owl
nudipes, Puerto Rican Screech-Owl
Bubo virginianus, Great Horned Owl
Nyctea scandiaca, Snowy Owl
Surnia ulula, Hawk Owl (=Northern Hawk-Owl)
Glaucidium gnoma, Northern Pygmy-Owl
brasilianum, Ferruginous Pygmy-Owl
Micrathene whitneyi, Elf Owl
Speotyto (=Athene) cunicularia, Burrowing Owl
Strix occidentalis, Spotted Owl
varia, Barred Owl
nebulosa, Great Gray Owl
Asio otus, Long-eared Owl
flammeus, Short-eared Owl
Aegolius funereus, Boreal Owl
acadicus, Northern Saw-whet Owl

Family CAPRIMULGIDAE (Goatsuckers)

Chordeiles acutipennis, Lesser Nighthawk
minor, Common Nighthawk
gundlachii, Antillean Nighthawk
Nyctidromus albicollis, Pauraque (=Common Pauraque)
Phalaenoptilus nuttallii, Common Poorwill Caprimulgus
carolinensis, Chuck-will's-widow
ridgwayi, Buff-collared Nightjar
vociferus, Whip-poor-will
noctitherus, Puerto Rican Nightjar
indicus, Jungle Nightjar

Family APODIDAE (Swifts)

Crypseloides niger, Black Swift
Streptoprocne zonaris, White-collared Swift
Chaetura pelagica, Chimney Swift
vauxi, Vaux's Swift
Hirundapus caudacutus, White-throated Needletail

Apus apus, Common Swift
pacificus, Fork-tailed Swift
Aeronautes saxatalis, White-throated Swift
Tachornis phoenicobia, Antillean Palm Swift

Family TROCHILIDAE (Hummingbirds)
Colibri thalassinus, Green Violet-ear
Anthracothorax dominicus, Antillean Mango
viridis, Green Mango
Eulampis holosericeus, Green-throated Carib
Orthorhynchus cristatus, Antillean Crested Hummingbird
Chlorostilbon maugaeus, Puerto Rican Emerald
Cynanthus latirostris, Broad-billed Hummingbird
Hylocharis leucotis, White-eared Hummingbrd
Amazilia beryllina, Berylline Hummingbird
yucatanensis, Buff-bellied Hummingbird
violiceps, Violet-crowned Hummingbird
Lampornis clemenciae, Blue-throated Hummingbird
Eugenes fulgens, Magnificent Hummingbird
Heliomaster constantii, Plain-capped Starthroat
Calliphlox evelynae, Bahama Woodstar
Calothorax lucifer, Lucifer Hummingbird
Archilochus colubris, Ruby-throated Hummingbird
alexandri, Black-chinned Hummingbird
Calypte anna, Anna's Hummingbird
costae, Costa's Hummingbird
Stellula calliope, Calliope Hummingbird
Selasphorus platycercus, Broad-tailed Hummingbird
rufus, Rufous Hummingbird
sasin, Allen's Hummingbird

Family TROGONIDAE (Trogons)
Trogon elegans, Elegant Trogon
Euptilotus neoxenus, Eared Trogon

Family UPUPIDAE (Hoopoes)
Upupa epops, Hoopoe

Family ALCEDINIDAE (Kingfishers)
Ceryle torquata, Ringed Kingfisher
alcyon, Belted Kingfisher
Chloroceryle americana, Green Kingfisher

Family PICIDAE (Woodpeckers and Allies)
Jynx torquilla, Eurasian Wryneck
Melanerpes lewis, Lewis' Woodpecker
erythrocephalus, Red-headed Woodpecker
formicivorus, Acorn Woodpecker
uropygialis, Gila Woodpecker
aurifrons, Golden-fronted Woodpecker
carolinus, Red-bellied Woodpecker
portoricensis, Puerto Rican Woodpecker
Sphyrapicus varius, Yellow-bellied Sapsucker
nuchalis (=varius), Red-naped (=Yellow-bellied) Sapsucker
ruber, Red-breasted Sapsucker
thyroideus, Williamson's Sapsucker

Picoides scalaris, Ladder-backed Woodpecker
nuttallii, Nuttall's Woodpecker
pubescens, Downy Woodpecker
villosus, Hairy Woodpecker
stricklandi, Strickland's Woodpecker
borealis, Red-cockaded Woodpecker
albolarvatus, White-headed Woodpecker
tridactylus, Three-toed Woodpecker
arcticus, Black-backed Woodpecker
Colaptes auratus, Northern Flicker
chrysoides (=auratus), Gilded (=Northern) Flicker
Dryocopus pileatus, Pileated Woodpecker
Campephilus principalis, Ivory-billed Woodpecker

Family TYRANNIDAE (Tyrant Flycatchers)

Elaenia martinica, Caribbean Elaenia
Camptostoma imberbe, Northern Beardless-Tyrannulet
Contopus borealis, Olive-sided Flycatcher
pertinax, Greater Pewee
sordidulus, Western Wood-Pewee
virens, Eastern Wood-Pewee
latirostris, Lesser Antillean Pewee
Empidonax flaviventris, Yellow-bellied Flycatcher
virescens, Acadian Flycatcher
alnorum, Alder Flycatcher
traillii, Willow Flycatcher minimus,
Least Flycatcher
hammondii, Hammond's Flycatcher
oberholseri, Dusky Flycatcher
wrightii, Gray Flycatcher
difficilis, Pacific-slope (=Western) Flycatcher
occidentalis (=difficilis), Cordilleran (=Western) Flycatcher
fulvifrons, Buff-breasted Flycatcher
Sayornis nigricans, Black Phoebe
phoebe, Eastern Phoebe
saya, Say's Phoebe
Pyrocephalus rubinus, Vermilion Flycatcher
Myiarchus tuberculifer, Dusky-capped Flycatcher
cinerascens, Ash-throated Flycatcher
nuttingi, Nutting's Flycatcher crinitus,
Great Crested Flycatcher
tyrannulus, Brown-crested Flycatcher
antillarum, Puerto Rican Flycatcher
Pitangus sulphuratus, Great Kiskadee
Myiodynastes luteiventris, Sulphur-bellied Flycatcher
Tyrannus melancholicus, Tropical Kingbird
couchii, Couch's Kingbird
vociferans, Cassin's Kingbird
crassirostris, Thick-billed Kingbird
verticalis, Western Kingbird
tyrannus, Eastern Kingbird
dominicensis, Gray Kingbird
caudifasciatus, Loggerhead Kingbird
forficatus, Scissor-tailed Flycatcher
savana, Fork-tailed Flycatcher

Pachyramphus aglaiae, Rose-throated Becard

Family ALAUDIDAE (Larks)

Alauda arvensis, Sky (=Eurasian) Lark (=Skylark)
Eremophila alpestris, Horned Lark

Family HIRUNDINIDAE (Swallows)

Progne subis, Purple Martin
cryptoleuca, Cuban Martin
dominicensis, Caribbean Martin
chalybea, Gray-breasted Martin
Tachycineta bicolor, Tree Swallow
thalassina, Violet-green Swallow
cyaneoviridis, Bahama Swallow
Stelgidopteryx serripennis, Northern Rough-winged Swallow
Riparia riparia, Bank Swallow
Hirundo pyrrhonota, Cliff Swallow
fulva, Cave Swallow
rustica, Barn Swallow
Delichon urbica, Common House-Martin

Family CORVIDAE (Jays, Magpies, and Crows)

Perisoreus canadensis, Gray Jay
Cyanocitta stelleri, Steller's Jay
cristata, Blue Jay
Cyanocorax yncas, Green Jay
morio, Brown Jay
Aphelocoma coerulescens, Florida (=Scrub) Scrub-Jay (=Jay)
insularis, Island (=Scrub) Scrub-Jay (=Jay)
californica, Western (=Scrub) Scrub-Jay (=Jay)
ultramarina, Mexican (=Gray-breasted) Jay
Gymnorhinus cyanocephalus, Pinyon Jay
Nucifraga columbiana, Clark's Nutcracker
Pica pica, Black-billed Magpie
nuttalli, Yellow-billed Magpie
Corvus brachyrhynchos, American Crow
caurinus, Northwestern Crow
leucognaphalus, White-necked Crow
imparatus, Mexican Crow
ossifragus, Fish Crow
hawaiiensis, Hawaiian Crow
cryptoleucus, Chihuahuan Raven
corax, Common Raven

Family PARIDAE (Titmice)

Parus atricapillus, Black-capped Chickadee
carolinensis, Carolina Chickadee
sclateri, Mexican Chickadee
gambeli, Mountain Chickadee
cinctus, Siberian Tit
hudsonicus, Boreal Chickadee
rufescens, Chestnut-backed Chickadee
wollweberi, Bridled Titmouse
inornatus, Plain Titmouse bicolor,
Tufted Titmouse

Family REMIZIDAE (Verdins)

Auriparus flaviceps, Verdin

Family AEGITHALIDAE (Bushtits)

Psaltriparus minimus, Bushtit

Family SITTIDAE (Nuthatches)

Sitta canadensis, Red-breasted Nuthatch
carolinensis, White-breasted Nuthatch
pygmaea, Pygmy Nuthatch
pusilla, Brown-headed Nuthatch

Family CERTHIIDAE (Creepers)

Certhia americana, Brown Creeper

Family TROGLODYTIDAE (Wrens)

Campylorhynchus brunneicapillus, Cactus Wren
Salpinctes obsoletus, Rock Wren
Catherpes mexicanus, Canyon Wren
Thryothorus ludovicianus, Carolina Wren
bewickii, Bewick's Wren
Troglodytes aedon, House Wren
troglodytes, Winter Wren
Cistothorus platensis, Sedge Wren
palustris, Marsh Wren

Family CINCLIDAE (Dippers)

Cinclus mexicanus, American Dipper

Family MUSCICAPIDAE (Kinglets, Gnatcatchers, Thrushes, and Allies)

Locustella ochotensis, Middendorff's Grasshopper-Warbler
Phylloscopus borealis, Arctic Warbler
trochilus, Willow Warbler
Regulus satrapa, Golden-crowned Kinglet
calendula, Ruby-crowned Kinglet
Polioptila caerulea, Blue-gray Gnatcatcher
melanura, Black-tailed Gnatcatcher
californica (=melanura), California (=Black-tailed) Gnatcatcher
nigriceps, Black-capped Gnatcatcher
Muscicapa griseisticta, Gray-spotted Flycatcher
narcissina, Narcissus Flycatcher
Luscinia calliope, Siberian Rubythroat
svecica, Bluethroat
Monticola solitarius, Blue Rock Thrush
Oenanthe oenanthe, Northern Wheatear
Sialia sialis, Eastern Bluebird
mexicana, Western Bluebird
currucoides, Mountain Bluebird
Myadestes townsendi, Townsend's Solitaire
(=Phaeornis) myadestinus (=obscurus), Kamao (=Hawaiian Thrush)
(=Phaeornis) lanaiensis, (=obscurus), Olomao (=Hawaiian Thrush)
(=Phaeornis) obscurus, Omao (=Hawaiian Thrush)
(=Phaeornis) palmeri, Puaiohi (=Small Hawaiian Thrush)
Catharus fuscescens, Veery
minimus, Gray-cheeked Thrush
bicknelli (=minimus), Bicknell's (=Gray-cheeked) Thrush

ustulatus, Swainson's Thrush
guttatus, Hermit Thrush
Hylocichla mustelina, Wood Thrush
Turdus plumbeus, Red-legged Thrush
obscurus, Eyebrowed (=Eye-browed) Thrush
naumanni, Dusky Thrush
pilaris, Fieldfare
grayi, Clay-colored Robin
rufopalliatus, Rufous-backed Robin
migratorius, American Robin
Ixoreus naevius, Varied Thrush
Ridgwayia pinicola, Aztec Thrush

Family MIMIDAE (Mockingbirds, Thrashers, and Allies)
Dumetella carolinensis, Gray Catbird
Mimus polyglottos, Northern Mockingbird
Oreoscoptes montanus, Sage Thrasher
Toxostoma rufum, Brown Thrasher
longirostre, Long-billed Thrasher
bendirei, Bendire's Thrasher
redivivum, California Thrasher
crissale, Crissal Thrasher
lecontei, Le Conte's Thrasher
Margarops fuscatus, Pearly-eyed Thrasher

Family PRUNELLIDAE (Accentors)
Prunella montanella, Siberian Accentor

Family MOTACILLIDAE (Wagtails and Pipits)
Motacilla flava, Yellow Wagtail
cinerea, Gray Wagtail
alba, White Wagtail
lugens, Black-backed Wagtail
Anthus hodgsoni, Olive-backed (=Olive) Pipit (=Tree-Pipit)
gustavi, Pechora Pipit
cervinus, Red-throated Pipit
rubescens (=spinoletta), American (=Water) Pipit
spragueii, Sprague's Pipit

Family BOMBYCILLIDAE (Waxwings)
Bombycilla garrulus, Bohemian Waxwing
cedrorum, Cedar Waxwing

Family PTILOGONATIDAE (Silky-flycatchers)
Phainopepla nitens, Phainopepla

Family LANIIDAE (Shrikes)
Lanius excubitor, Northern Shrike
ludovicianus, Loggerhead Shrike

Family STURNIDAE (Starlings)
Sturnus philippensis, Violet-backed Starling

cineraceus, Ashy Starling

Family VIREONIDAE (Vireos)

Vireo griseus, White-eyed Vireo
latimeri, Puerto Rican Vireo
bellii, Bell's Vireo
atricapillus, Black-capped Vireo
vicinior, Gray Vireo
solitarius, Solitary Vireo
flavifrons, Yellow-throated Vireo
huttoni, Hutton's Vireo
gilvus, Warbling Vireo
philadelphicus, Philadelphia Vireo
olivaceus, Red-eyed Vireo
flavoviridis (=olivaceus), Yellow-green (=Red-eyed) Vireo
altiloquus, Black-whiskered Vireo

Family EMBERIZIDAE (Emberizids)
Subfamily PARULINAE (Wood-Warblers)

Vermivora bachmanii, Bachman's Warbler
pinus, Blue-winged Warbler
chrysoptera, Golden-winged Warbler
peregrina, Tennessee Warbler
celata, Orange-crowned Warbler
ruficapilla, Nashville Warbler
virginiae, Virginia's Warbler
crissalis, Colima Warbler
luciae, Lucy's Warbler
Parula americana, Northern Parula
pitiayumi, Tropical Parula
Dendroica petechia, Yellow Warbler
pensylvanica, Chestnut-sided Warbler
magnolia, Magnolia Warbler tigrina,
Cape May Warbler
caerulescens, Black-throated Blue Warbler
coronata, Yellow-rumped Warbler
nigrescens, Black-throated Gray Warbler
townsendi, Townsend's Warbler
occidentalis, Hermit Warbler
virens, Black-throated Green Warbler
chrysoparia, Golden-cheeked Warbler
fusca, Blackburnian Warbler
dominica, Yellow-throated Warbler
graciae, Grace's Warbler
adelaidae, Adelaide's Warbler
pinus, Pine Warbler
kirtlandii, Kirtland's Warbler
discolor, Prairie Warbler
palmarum, Palm Warbler
castanea, Bay-breasted Warbler
striata, Blackpoll Warbler
cerulea, Cerulean Warbler
angelae, Elfin Woods Warbler
varia, Black-and-white Warbler
Setophaga ruticilla, American Redstart
Protonotaria citrea, Prothonotary Warbler

Helmitheros vermivorus, Worm-eating Warbler
Limnothlypis swainsonii, Swainson's Warbler
Seiurus aurocapillus, Ovenbird
noveboracensis, Northern Waterthrush
motacilla, Louisiana Waterthrush
Oporornis formosus, Kentucky Warbler
agilis, Connecticut Warbler
philadelphia, Mourning Warbler
tolmiei, MacGillivray's Warbler
Geothlypis trichas, Common Yellowthroat
poliocephala, Gray-crowned Yellowthroat
Wilsonia citrina, Hooded Warbler
pusilla, Wilson's Warbler
canadensis, Canada Warbler
Cardellina rubrifrons, Red-faced Warbler
Myioborus pictus, Painted Redstart
miniatus, Slate-throated Redstart
Basileuterus culicivorus, Golden-crowned Warbler
rufifrons, Rufous-capped Warbler
Icteria virens, Yellow-breasted Chat
Peucedramus taeniatus, Olive Warbler

Subfamily THRAUPINAE (Tanagers)

Spindalis zena, Stripe-headed Tanager
Neospingus speculiferus, Puerto Rican Tanager
Piranga flava, Hepatic Tanager
rubra, Summer Tanager
olivacea, Scarlet Tanager
ludoviciana, Western Tanager
Euphonia musica, Antillean Euphonia

Subfamily CARDINALINAE (Cardinals, Grosbeaks, and Allies)

Rhodothraupis celaeno, Crimson-collared Grosbeak
Cardinalis cardinalis, Northern Cardinal
sinuatus, Pyrrhuloxia
Pheucticus chrysopeplus, Yellow Grosbeak
ludovicianus, Rose-breasted Grosbeak
malanocephalus, Black-headed Grosbeak
Guiraca caerulea, Blue Grosbeak
Passerina amoena, Lazuli Bunting
cyanea, Indigo Bunting
versicolor, Varied Bunting
ciris, Painted Bunting
Spiza americana, Dickcissel

Subfamily EMBERIZINAE (Sparrows and Allies)

Arremonops rufivirgatus, Olive Sparrow
Pipilo chlorurus, Green-tailed Towhee
erythrophthalmus, Eastern (=Rufous-sided) Towhee
maculatus (=erythrophthalmus), Spotted (=Rufous-sided) Towhee
fuscus, Canyon (=Brown) Towhee
crissalis (=fuscus), California (=Brown) Towhee
aberti, Abert's Towhee
Sporophila torqueola, White-collared Seedeater
Tiaris olivacea, Yellow-faced Grassquit
bicolor, Black-faced Grassquit
Loxigilla portoricensis, Puerto Rican Bullfinch
Aimophila aestivalis, Bachman's Sparrow
botterii, Botteri's Sparrow

cassinii, Cassin's Sparrow
carpalis, Rufous-winged Sparrow
ruficeps, Rufous-crowned Sparrow
Spizella arborea, American Tree Sparrow
passerina, Chipping Sparrow
pallida, Clay-colored Sparrow
breweri, Brewer's Sparrow
pusilla, Field Sparrow
wortheni, Worthen's Sparrow
atrogularis, Black-chinned Sparrow
Pooecetes gramineus, Vesper Sparrow
Chondestes grammacus, Lark Sparrow
Amphispiza bilineata, Black-throated Sparrow
belli, Sage Sparrow
quinquestriata, Five-striped Sparrow
Calamospiza melanocorys, Lark Bunting
Passerculus sandwichensis, Savannah Sparrow
Ammodramus bairdii, Baird's Sparrow
savannarum, Grasshopper Sparrow
henslowii, Henslow's Sparrow
leconteii, Le Conte's Sparrow
caudacutus, Saltmarsh Sharp-tailed (=Sharp-tailed) Sparrow
nelsoni (=caudacutus), Nelson's Sharp-tailed (=Sharp-tailed) Sparrow
maritimus, Seaside Sparrow
Passerella iliaca, Fox Sparrow
Melospiza melodia, Song Sparrow
lincolnii, Lincoln's Sparrow
georgiana, Swamp Sparrow
Zonotrichia albicollis, White-throated Sparrow
atricapilla, Golden-crowned Sparrow
leucophrys, White-crowned Sparrow
querula, Harris' Sparrow
Junco hyemalis, Dark-eyed Junco
phaeonotus, Yellow-eyed Junco
Emberiza rustica, Rustic Bunting
pallasi, Pallas' Bunting (=Reed-Bunting)
schoeniculus, Reed (=Common) Bunting (=Reed-Bunting)
Calcarius mccownii, McCown's Longspur
lapponicus, Lapland Longspur
pictus, Smith's Longspur
ornatus, Chestnut-collared Longspur
Plectrophenax nivalis, Snow Bunting
hyperboreus, McKay's Bunting

Subfamily ICTERIDAE (Blackbirds and Allies)

Dolichonyx oryzivorus, Boblink
Agelaius phoeniceus, Red-winged Blackbird
tricolor, Tricolored Blackbird
humeralis, Tawny-shouldered Blackbird
xanthomus, Yellow-shouldered Blackbird
Sturnella magna, Eastern Meadowlark
neglecta, Western Meadowlark
Xanthocephalus xanthocephalus, Yellow-headed Blackbird
Euphagus carolinus, Rusty Blackbird
cyanocephalus, Brewer's Blackbird
Quiscalus mexicanus, Great-tailed Grackle
major, Boat-tailed Grackle

quiscula, Common Grackle
niger, Greater Antillean Grackle
Molothrus bonariensis, Shiny Cowbird
aeneus, Bronzed Cowbird
ater, Brown-headed Cowbird
Icterus dominicensis, Black-cowled Oriole
wagleri, Black-vented Oriole
spurius, Orchard Oriole
cucullatus, Hooded Oriole
pustulatus, Streak-backed Oriole
gularis, Altamira Oriole
graduacauda, Audubon's Oriole
galbula, Baltimore (=Northern) Oriole
bullockii (=galbula), Bullock's (=Northern) Oriole
parisorum, Scott's Oriole

Family FRINGILLIDAE (Finches)

Fringilla montifringilla, Brambling
Leucosticte atrata (=arctoa), Black (=Rosy) Rosy-Finch (=Finch)
australis (=arctoa), Brown-capped (=Rosy) Rosy-Finch (=Finch)
tephrocotis (=arctoa), Gray-crowned (=Rosy) Rosy-Finch (=Finch)
Pinicola enucleator, Pine Grosbeak
Carpodacus erythrinus, Common Rosefinch
purpureus, Purple Finch
cassinii, Cassin's Finch
mexicanus, House Finch
Loxia curvirostra, Red Crossbill
leucoptera, White-winged Crossbill
Carduelis flammea, Common Redpoll
hornemanni, Hoary Redpoll
pinus, Pine Siskin
psaltria, Lesser Goldfinch
lawrencei, Lawrence's Goldfinch
tristis, American Goldfinch
sinica, Oriental Greenfinch
Pyrrhula pyrrhula, Eurasian Bullfinch
Coccothraustes vespertinus, Evening Grosbeak
coccothraustes, Hawfinch

APPENDIX G

LAWS, REGULATIONS, POLICIES AND EXECUTIVE ORDERS

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CONTENTS

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LAWS, REGULATIONS, POLICIES, AND EXECUTIVE ORDERS

Federal

American Indian Religious Freedom Act (42 USC §1196) – requires the U.S. to protect and preserve religious rights of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

Animal Damage Control Act (7 USC §426 *et seq*.) – provides broad authority for investigation, demonstrations and control of mammalian predators, rodents and birds.

Environmental Safeguard for Activities for Animal Damage Control on Federal Lands (EO 11870) - restricts the use of chemical toxicants for mammal and bird control.

American Antiquities Act of 1906 (16 USC §431-433) – provides for the protection of items of archeological significance, both historic and prehistoric.

Archeological and Historical Preservation Act of 1974 (16 U.S.C 469 *et seq*.) – provides for the preservation of historical and archeological data (including relics and specimens).

Archeological Resources Protection Act of 1979 (16 USC §470 *et seq*.) – prohibits the excavation or removal from Federal or Indian lands any archeological resources without a permit from the land manager.

Bald Eagle Protection Act (16 USC §668a-d) – prohibits taking or harming bald or golden eagles, their eggs, nests, or young without appropriate permit.

Clean Air Act, as amended (42 USC §7401 *et seq*.) – regulates air emissions from area, stationary, and mobile sources. This law authorizes the USEPA to establish NAAQS to protect public health and the environment.

Clean Water Act (CWA): Section 401 Water Quality Certification, 1986, 33 USC §1341 – requires state certification of federal permits that result in actions that discharge into navigable waters. Under Section 401, states have authority to review federal permits that may result in a discharge to wetlands or water bodies under state jurisdiction.

Clean Water Act (CWA): Section 404, Permits for Dredged or Fill Material, 1977, 33 USC §1344 – establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404regulation (e.g. certain farming and forestry activities.

Endangered Species Act of 1973, as amended (16 USC §1531 *et seq.*) – provides for the identification and protection of threatened and endangered plants and animals and their critical habitats. Requires federal agencies to conserve T/E species and cooperate with State and local authorities to resolve water resources issues in concert with the conservation of T&E species.

Federal Insecticide, Fungicide, and Rodenticide Act (7 USC §136) – Governs the use and application of pesticides in natural resource management programs.

Federal Land Policy and Management Act (43 USC §1701) – Establishes public land policy and guidelines for its administration and provides for the management, protection, development, and enhancement of the public lands.

Federal Noxious Weed Act of 1974 (7 USC §2801 *et seq*.) – Establishes control and eradication of noxious weeds and regulates them in interstate and foreign commerce.

Federal Water Pollution Control Act as amended by the CWA of 1977 (33 USC §1251) – Regulates dredging and filling of wetlands and waterbodies and establishes procedures for identifying and regulating non-point sources of pollutants, including turbidity, into waterways.

Federal Water Pollution Control Act: Section 404, as amended by the CWA of 1977 (33 USC §1251) – Prohibits the discharge of dredged or filled materials into waters of the United States, including wetlands, without first obtaining a permit from USACE. Activities in wetlands that require federal permits include, but are not limited to: placement of fill material; ditching activities when the excavated material is sidecast, mechanized land clearing; land leveling; and most road construction.

Fish and Wildlife Conservation Act (16 USC §2901) – Provides for the protection of non-game fish and wildlife.

Fish and Wildlife Coordination Act (16 USC §661 *et seq*.) – Provides mechanism for wildlife conservation to receive equal consideration and be coordinated with water-resource development programs.

Floodplain Management (EO 11988) – Requires agencies to assess the effects that their actions may have on floodplains and to consider alternatives to avoid adverse effects and incompatible development on floodplains.

Forest and Rangeland Renewable Resources Planning Act (16 USC §1601 *et seq*.) – Requires and inventory of potential renewable resources and an evaluation of opportunities for improving their yield on goods and services. Agencies must provide an opportunity for public involvement and consultation with other agencies in establishing policies for multiple use and sustained yield.

Greening the Government through Leadership in Environmental Management (EO 13148) – This EO (Section 207, Environmentally and Economically Beneficial Landscaping) states that "each agency shall strive to promote the sustainable management of Federal facility lands through the implementation of cost-effective, environmentally sound landscaping practices, and programs to reduce adverse impacts to the natural environment."

Hunting and Fishing on Federal Lands (10 USC §2671 *et seq*.) – establishes requirements for regulating hunting, fishing, and trapping on military lands.

Indian Sacred Sites (EO 13007) – Provides for the protection of and access to Indian sacred sites.

Invasive Species (EO 13112) – Requires Federal agencies to: "prevent the introduction of invasive species"; "detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner"; "monitor invasive species populations accurately and reliably, provide for restoration of native species and habitat conditions in ecosystems that have been invaded"; "conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species"; and "promote public education on invasive species and the means to address them."

Land and Water Conservation Act of 1965 (16 USC §4601 *et seq*.) – assists in preserving, developing, and assuring accessibility to outdoor recreation resources.

Legacy Resource Protection Program Act (P.L. 101-511) – established a program for the stewardship of biological, geophysical, cultural and historic resources on DoD lands.

Migratory Bird Conservation Act (16 USC §715 *et seq*.) – Establishes a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds.

Migratory Bird Treaty Act, as amended (16 USC §703-712) – Prohibits the taking or harming of a migratory bird, its eggs, nests, or young without the appropriate permit.

National Environmental Policy Act of 1969, as amended (42 USC §4321) – Provides a national charter for protection of the environment and requires Federal agencies to prepare a statement of environmental impact in advance of each major action that may significantly affect the quality of the human environment.

National Historic Preservation Act of 1966 (16 USC §470 *et seq*.) – provides for the preservation of historic properties throughout the U.S.

Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended (16 U.S.C 4701 *et seq*.) – established a program to prevent the introduction of and to control the spread of introduced aquatic nuisance species and the brown tree snake.

Off Road Vehicle Use on Public Lands (EO 11989) – limits the use of off-road vehicles on federal lands soil, water, or natural resources could be adversely affected.

Oil Pollution Prevention Act of 1990, Public Law 101-380 – Redefines the requirements of the National Contingency Plan to include planning for, rescue of, minimization of injury to, and assessment of damages for injury to fish and wildlife resources.

Outleasing for Grazing and Agriculture on Military Lands (10 USC §2667) – provides for the outleasing of public lands.

Protection and Enhancement of Environmental Quality (EO 11514) – provides for environmental protection of federal lands and enforces requirements of NEPA.

Protection and Enhancement of the Cultural Environment (EO 11593) – supports previous laws and provides for additional protection of cultural resources.

Protection of Wetlands (EO 11990) – requires agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands.

Recreational Fisheries (EO 12962) – requires Federal agencies, to the extent practicable and where permitted by law, "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities".

Sale of Certain Interests in Land, Logs (10 USC §2665) – Authorizes the sale of forest products and the reimbursement of the costs of managing forest resources for timber production.

Sikes Act "Conservation Programs on Military Reservations" (16 USC §670a *et seq*.) – Requires Federal military installations with adequate wildlife habitat to implement cooperative agreements with other agencies and develop long-range integrated natural resources management plans. Thereby, it is appropriate to manage natural resources for multipurpose uses and provide the public access to those uses to the extent consistent with the military mission. The act also sets guidelines for the collection of fees for the use of natural resources such as hunting and fishing.

Soil Conservation Act (16 USC §590a *et seq*.) – provides for soil conservation practices on Federal lands.

State

Endangered and Threatened Wildlife and Wildlife Species of Special Concern (Article 25 NCGS Annotated § 113-331 – 377). This North Carolina statutory section comprises the state's endangered species provisions. Endangered species is defined as any native or once-native species of wild animal whose continued existence as a viable component of the State's fauna is determined by the Wildlife Resources Commission to be in jeopardy or any species of wild animal determined to be an "endangered species" pursuant to the Endangered Species Act. The statute empowers the Wildlife Resources Commission to list species and also outlines the criteria for listing. Under the act, it is unlawful to take, possess, transport, sell, barter, trade, exchange, export, or offer for sale, barter, trade, exchange or export, or give away for any purpose including advertising or other promotional purpose any animal on a protected wild animal list.

North Carolina Prescribed Burning Act (Article 4E of NCGS § 113-60.40 to 60.45). The General Assembly finds that prescribed burning of forestlands is a management tool that is beneficial to North Carolina's public safety, forest and wildlife resources, environment, and economy. **NCGS § 113-60.43** outlines the requirements for prescribed burning as follows:

(a) Prior to conducting a prescribed burning, the landowner shall obtain a prescription for the prescribed burning prepared by a certified prescribed burner and filed with the Division of Forest Resources, Department of Environment and Natural Resources. A copy of the prescription shall be provided to the landowner. A copy of this prescription shall be in the possession of the responsible burner on site throughout the duration of the prescribed burning. The prescription shall include:

(1) The landowner's name and address.
(2) A description of the area to be burned.
(3) A map of the area to be burned.
(4) An estimate in tons of the fuel located on the area.
(5) The objectives of the prescribed burning.
(6)) A list of the acceptable weather conditions and parameters for the prescribed burning sufficient to minimize the likelihood of smoke damage and fire escaping onto adjacent areas.
(7) The name of the certified prescribed burner responsible for conducting the prescribed burning.
(8) A summary of the methods that are adequate for the particular circumstances involved to be used to start, control, and extinguish the prescribed burning.
(9) Provision for reasonable notice of the prescribed burning to be provided to nearby homes and businesses to avoid effects on health and property.

(b) The prescribed burning shall be conducted by a certified prescribed burner in accordance with a prescription that satisfies subsection (a) of this section. The certified prescribed burner shall be present on the site and shall be in charge of the burning throughout the period of the burning. A landowner may conduct a prescribed burning without being a certified prescribed burner if the landowner is burning a tract of forestland of 50 acres or less owned by that landowner and is following all conditions established in a prescription prepared by a certified prescribed burner.

(c) Prior to conducting a prescribed burning, the landowner or the landowner's agent shall obtain an open-burning permit under Article 4C of this Chapter from the Division of Forest Resources, Department of Environment and Natural Resources. This open-burning permit must remain in effect throughout the period of the prescribed burning. The prescribed burning shall be conducted in compliance with all the following:

(1) The terms and conditions of the open-burning permit under Article 4C of this Chapter.
(2) The State's air pollution control statutes under Article 21 and Article 21B of Chapter 143 of the General Statutes and any rules adopted pursuant to these statutes.
(3) Any applicable local ordinances relating to open burning.
(4) The voluntary smoke management guidelines adopted by the Division of Forest Resources, Department of Environment and Natural Resources.
(5) Any rules adopted by the Division of Forest Resources, Department of Environment and Natural Resources, to implement this Article. (1999-121, s. 1.)

Regulation of Open Fires (Article 4C of NCGS § 113-60.21 to 60.31). The purpose of this Article is to regulate certain open burning in order to protect the public from the hazards of forest fires and air pollution and to adapt such regulation to the needs and circumstances of the different areas of North Carolina. The General Assembly finds that open burning in proximity to woodlands must be regulated in all counties to protect against forest fires and air pollution. The General Assembly further finds that in certain counties a high percentage of the land area contains organic soils or forest types which may pose greater problems of forest fire and air pollution controls, and that in counties in which a great amount of land-clearing operations is taking place on these organic soils or these forest types, additional control of open burning is required. The counties subject to the need for additional control are classified as high hazard counties for purpose of this Article. High harzard communities include: Beaufort, Bladen, Camden, Carteret, Chowan, Craven, Currituck, Dare, Duplin, Gates, Hyde, Jones, Onslow, Pamlico, Pasquotank, Perquimans, Tyrrell, and Washington.

Plant Protection and Conservation Act (Article 19B of NCGS § 106-202.12-22). The General Assembly finds that the recreational needs of the people, the interests of science, and the economy of the State require that threatened and endangered species of plants and species of plants of special concern be protected and conserved, that their numbers should be enhanced and that propagative techniques be developed for them; however, nothing in this Article shall be construed to limit the rights of a property owner, without his consent, in the management of his lands for agriculture, forestry, development or any other lawful purpose.

North Carolina Plant Pest Law (Article 36 NCGS § 106-419). Any plant, plant product, object or article which has been, or which the Commissioner of Agriculture or his agents have reasonable grounds to believe has been exposed to a plant pest, may be treated as a plant pest for the purposes of this Article.

Aquatic Weed Control Act of 1991 (Article 15 of NCGS § 113A-220 *et seq)*. This act provides the Department of Agriculture with the authority to regulate the importation, sale, use, and distribution of noxious aquatic weeds. As implemented, the law and regulations provide the long-term mechanisms for protecting North Carolina agriculture and its citizens from the threat of terrestrial and aquatic noxious weeds. The Department works extensively with noxious weed pests such as witchweed, itchgrass, orobanche, purple loosestrife and musk thistle.

North Carolina Pesticide Law of 1971 (Article 52 of NCGS § 143-434, *et seq)*. The purpose of this Article is to regulate in the public interest the use, application, sale, disposal and registration of insecticides, fungicides, herbicides, defoliants, desiccants, plant growth regulators, nematicides, rodenticides, and any other pesticides designated by the North Carolina Pesticide Board.

Open Burning (15A NCAC 02D .1901 *et seq*). The purpose of this Section is to control air pollution resulting from the open burning of combustible materials and to protect the air quality in the immediate area of the open burning. This regulation provides information on what types of open burning are permissible without an air quality permit. Violations to the open burning rule (15A NCAC 2D.1900 et seq.) can be fined up to $25,000 per violation or more for serious cases.

Noxious Weeds (02 NCAC 48A .1701-1708). These regulations were adopted under the authority of the North Carolina Plant Pest Law. They permit the Department of Agriculture to aggressively prevent the entry and subsequent spread of noxious weeds into North Carolina and to address the movement of noxious weeds and regulated articles within the state. Within these regulations, the Department has established three classes of noxious weeds (Classes: A, B and C).

North Carolina Surface Water and Wetland Standards (15A NCAC 2B .0100 *et. seq.*). These regulations outline the procedures the Environmental Management Commission uses to classify water quality standards of surface waters and wetland in the State of North Carolina and how they are used.

North Carolina Section 401 Certification (15A NCAC 2H; 15A NCAC 2B). 401 Water Quality Certifications are required for all 401 Permits issued by the Corps as well as for other federal permits, such as Federal Energy Regulatory Commission permits. The procedures for applying for a 401 certification in North Carolina are outlined in 15A NCAC 2H .0500 and generally follow the 404(b)(1) guidelines (avoid, minimize, and then mitigate). The State has adopted a list of activities which are exempt from state wetland permitting in 15ANCAC 2B .0230 that are very similar to the 404 exemptions. The State has adopted comprehensive riparian buffer protection rules for the Neuse (15A NCAC 2B .0243). Finally, the State has adopted rules regulating the fill of isolated wetlands and isolated waters in 15A NCAC 2H .1300 based on the existing authority of the State to regulate impacts to state waters.

North Carolina Sedimentation Pollution Control Act of 1973 (Article 4 of GS 113A; 15A NCAC 4). It is the purpose of this Article to provide for the creation, administration, and enforcement of a program and for the adoption of minimal mandatory standards which will permit development of this State to continue with the least detrimental effects from pollution by sedimentation.

North Carolina Forest Practices Guidelines Related To Water Quality (FPG): (15A NCAC 01I .0100 - .0209). The FPGs are statewide, mandatory rule requirements that were developed to assure that forestry activities are conducted in a manner that protects our water quality. These regulations are administered as part of the North Carolina Sedimentation Pollution Control Act of 1973 (SPCA). All sections of the FPG must be in compliance for your forestry-related, land-disturbing activity if it is to remain exempt from the full requirements of the SPCA.

Forest Development Act (Article 11 of NCGS § 113A-176 et seq.). The purpose of this Article is to direct the Secretary to implement a forest development program to: (1) provide financial assistance to eligible landowners to increase the productivity of the privately owned forests of the State through the application of forest renewal practices and other practices that improve tree growth and overall forest health; (2) insure that forest operations in the State are conducted in a manner designed to protect the soil, air, and water resources, including but not limited to streams, lakes and estuaries through actions of landowners on lands for which assistance is sought under provisions in this Article; and (3) implement a program of voluntary landowner participation through the use of a forest development fund to meet the above goals.

DoD Regulations and Guidance

32 CFR 651	Environmental Effects of Army Actions
AR 200-1	Environmental Protection and Enhancement
AR 210-9	Use of Off-Road Vehicles on Army Lands
AR 405-80	Granting Use of Real Estate
AR 420-40	Historic Preservation
DoDI 4150.7M	DoD Pest Management Training and Certification
DoDI 4150.7P	DoD Plan for the Certification of Pesticide Applicators
DoDI 4715.3	Environmental Conservation Program
TC 25-1	Training Land
TM 5-630	Land Management
TM 5-631	Forest Management
TM 5-633	Fish and Wildlife Management

JFHQ – NC Regulation 215-2

Morale, Welfare and Recreation

Deer Hunting on Camp Butner Training Site (CBTS)

Joint Force Headquarters
North Carolina National Guard
Raleigh, NC Effective
Date October 2008

UNCLASSIFIED

SUMMARY OF CHANGES

JFHQ-NC Reg 215-2
Morale, Welfare, and Recreation – Deer Hunting on Camp Butner Training Site (CBTS)

This regulation provides updated information about the Subject Title, specifically –

- Regulation reformatted to comply with AR 25-30.
- Renamed in accordance with Office of the Adjutant General guidance

Joint Force Headquarters
North Carolina National Guard
Raleigh, NC
October 2008

*JFHQ-NC REGULATION 215-2

MORALE, WELFARE, AND RECREATION

DEER HUNTING ON CAMP BUTNER TRAINING SITE (CBTS)

By order of the Adjutant General:

WILLIAM E. INGRAM, JR.
Major General
Adjutant General
Official:

CHARLES E. JACKSON
Colonel, GS, NCARNG
Deputy Chief of Staff, Operations

History. This publication replaces OTAGNC Regulation 215-2 dated 15 August 2004. Changes are, for the most part, to comply with the publication format dictated by AR 25-30 and doctrinal changes are few.

Summary. This regulation provides policies and procedures relative to hunting on the North Carolina National Guard's Camp Butner Training Site (CBTS).

Applicability. This regulation applies to all military personnel and civilians hunting on Camp Butner Training Site.

Proponent and exception authority. The proponent of this regulation is the Deputy Chief of Staff, Operations, North Carolina National Guard. The proponent has the authority to approve exceptions or waivers to this regulation that are consistent with controlling law and regulations.

Army Management Control Process. This regulation does not contain management control provisions.

Supplementation. Local supplementation of this regulation is prohibited without prior approval of Deputy Chief of Staff, Operations.

Suggested Improvements. The proponent of this regulation is the Deputy Chief of Staff, Operations. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Office of the Adjutant General, ATTN: DCSOPS, 4105 Reedy Creek Road, Raleigh, North Carolina 27607-6410

Contents

Chapter 2

Chapter 1. Hunting - General Provisions

1-1. Purpose.
To establish a controlled and safe deer hunting program for Camp Butner Training Site, Stem, North Carolina.

1-2. References.
There are no required publications. Related publications are as listed in Appendix A, References.

1-3. Explanation of Abbreviations and Terms.
Abbreviations and special terms used in this regulation are explained in the glossary, Appendix B.

1-4. Responsibilities.
- The Adjutant General will establish policies and procedures for the operation and use of all facilities at Camp Butner Training Site.

- The Deputy Chief of Staff, Operations will implement the Adjutant General's policies and procedures.

- The Camp Butner Facility Manager will conduct the day-to-day operations, schedule training areas, supervise the full-time staff, enforce the rules and regulations, and supervise the maintenance of the facilities and administration.

- Butner Public Safety Officers, NC Dept. of Wildlife Officers and other law enforcement agencies will enforce the state and local laws, regulations and restrictions on Camp Butner Training Site and provide law enforcement support to the range staff.

1-5. Policies and Procedures
This regulation for hunting activities on the facility is essential to permitting concurrent use by the military, hunters and/or other authorized personnel without interference or threat to anyone's safety. Should conflicts arise, military operations take priority and hunters will be required to relocate to an alternate hunting area. Failure to abide by this regulation will result in suspension of hunting privileges on CBTS for the remainder of the hunting season.

Seasonal hunting periods for the State of North Carolina, Granville and Durham Counties will apply unless further limited by the facility. Hunting is authorized by permit and in designated areas only. Minors (under 16 years of age) must have a parent or legal guardian co-sign their request for hunting permit and release forms. They must be accompanied by a parent, legal guardian or other responsible adult when hunting on CBTS property. Refer to Chapter 3 (Requirements) and Chapter 4 (Camp Butner Hunting Areas Limitations).

Camp Butner range staff, law enforcement, and other duly authorized personnel have authority to:

- Limit, restrict, or deny access to permit holders as necessary due to prevailing requirements and/or conditions and/or previous experience with a specific permit holder.

- Revoke a hunting permit as appropriate to ensure the legal and safe operation of the facility and the safety and welfare of others. Reissue will require a new application. Appeals on revoked permits may be submitted to Camp Butner Training Site, 539 Roberts Chapel Road, Stem, North Carolina 27581-9549 within 15 days after the permit revocation date.

- Inspect a hunter's licenses and permit.

The loaning or transferring of a hunting permit is prohibited. A loaned or transferred hunting permit will be subject to revocation by authorized personnel.

Law enforcement personnel have arrest authority for violations committed on Camp Butner Training Site property.

1-6. Safety

It is the responsibility of everyone to ensure safety is a priority. Hunters should be aware of potential dangers at all times.

It is recommended that hunters have a noise producing device, such as a whistle, that can be used in the event that an injury occurs. This would be used to summon help and assist in identifying the location of the injured person.

Camp Butner Training Site is open to military training, horseback riding and hunting. It is imperative that personnel comply with the constraints and limitations that are issued from range headquarters. The first priority for use of Camp Butner Training Site is given to military small arms live fire training and other military training.

All hunters must wear HUNTER'S BLAZE ORANGE at all times while hunting on Camp Butner Training Site property.

Chapter 2
Facility Description and Boundaries

2-1. General.
CBTS is a former World War II training camp. Most of the area currently known as CBTS lies in what was once a major impact zone. Unexploded ammunition (UXO), also known as "DUDS", of all types are still being found. If a "DUD" is discovered, do not disturb it in any way and clearly mark the area if possible. Contact Range Headquarters and report the location. Range Headquarters will contact Explosive Ordnance Disposal, (EOD) at Fort Bragg, North Carolina for appropriate action. Do not in any way attempt to remove the object from its location. "DUDS" may explode causing injury and/or death.

Camp Butner Range Headquarters (Bldg 3400) is located at 539 Roberts Chapel Road, Stem, North Carolina 27581-9549, CML 919-620-5400. Hours of normal operation are 8:00 a.m. to 4:30 p.m. seven days a week. Range Headquarters may be closed during federal holidays. All closings will be posted at Range Headquarters. Camp Butner is patrolled 24 hours a day by Butner Public Safety Officers. Butner Public Safety can be reached at 919-575-6561 Extension 0, or by dialing 911.

2-2. BOUNDARIES Camp Butner Training Site is NOT an open range. Anyone caught damaging a gate or gate lock will have their privilege of hunting on CBTS permanently revoked and will be prosecuted to the fullest extent of the law. Damage to a gate along the impact area perimeter or on the north boundary could result in someone walking or driving into the impact area during a live fire exercise possibly causing serious injury or death. See Figure 2 for a copy of the facility map overprinted to show the hunting area.

Chapter 3. Requirements

3-1. Permit Requirement ALL HUNTERS ENTERING CAMP BUTNER PROPERTY MUST HAVE A PERMIT. Minors, under age 16 years of age, must be co-signed by a parent or legal guardian.

3-2. License Requirements.

- A valid North Carolina State Wildlife Hunting License (Age 16 years and older).
- A properly completed application form.

3-3. Fees. A fee, per applicant, per one-week hunting period must be paid at the time the application is submitted. Fees must be paid to Camp Butner Training Site. This fee is non refundable in the event of a permit revocation. The hunting permit fee for each one-week hunting period is $50.00 per person. All hunting permit fees collected will be deposited into the CBTS Unit Fund account.

3-4. Hunting Coordination Requirements.
All hunters must have the appropriate licenses and permits in their possession while on Camp Butner Training Site property. Hunters should ensure they do not hunt on or cross private property adjoining Camp Butner Training Site without the specific land owner's permission. Failure to do so may constitute trespassing by the property owner. Applications will be distributed from and accepted at Range Headquarters, Bldg 3400. Permits will be issued at the above location throughout the hunting season, Monday through Sunday from 9:00 a.m. until 3:00 p.m. Permits are valid only during the one-week period for which they are issued.

3-5. Rules of Conduct.

- Open fires are prohibited unless authorized in writing by Range Headquarters. Any hunter observing an uncontrolled fire will immediately leave the area and notify Range Headquarters or Butner Public Safety. Telephone number for Range Headquarters is (9l9) 620-5400 and Butner Public Safety (919) 575-5761 then press 0.
- There will be NO dumping of trash on CBTS property. Trash will be taken off the facility for disposal. Anyone caught littering on the facility will have their permit revoked for the remainder of the hunting season.
- No digging is allowed on the facility.
- No alcoholic beverages are allowed on the facility.

- Hunters may not enter onto the facility more than 60 minutes prior to official hunting start time as prescribed by the N C Wildlife Hunting Regulation. **(Official hunting time is dawn to dusk).**

- Removal or damage of trees, shrubs, bushes, or plants is prohibited.

- Privately owned vehicles (POV) are prohibited from entering Camp Butner Training Site property except in designated parking areas. This includes any motorized form of transportation. **Do not park any POV in front of or near any CBTS yellow or cable gates.**

- Entry onto CBTS property other than during authorized hunting periods is prohibited.

- Access to Holt Lake from within the facility boundary and/or fishing from within the boundary is prohibited.

- Construction and/or use of any tree-stand, platform, or other device attached by nails, screws, bolts, or wire, is prohibited.

- The use of dogs for hunting is prohibited. Dogs found on the property are subject to capture. At such time, they will be turned over to the appropriate agency. Violators are subject to the provisions of paragraph 1-5 of this regulation.

- Any hunter observing another hunter acting in an unsafe manner should report the incident to Range Headquarters.

- At no time shall any hunter aim a weapon, loaded or unloaded, towards any building, vehicle or another person.

- Anyone caught shooting at signs or other CBTS property will have his/her permit revoked and will be liable for the cost of repairs to the damaged property.

- Loaded weapons are allowed in appropriate hunting areas only. Guns (loaded or unloaded) are only allowed in gun hunting area during gun hunting periods.

Chapter 4. Camp Butner Deer Hunting Areas and Limitations

4-1. Authorization. Range Headquarters will authorize hunting in hunting area designations as shown in paragraph 4-2 and Figure 2. Hunters will be restricted to those assigned areas

4-2. Hunting Areas. Hunting is authorized in the areas listed below with the type hunting allowed noted: See map at Figure 2

4-3. Access to Hunting Areas is allowed only from exterior gates or public roads. Entry into a hunting area via adjoining landowners' private property without permission is prohibited and subject to prosecution by the property owner for trespassing.

4-4. Buffer A fifty foot (50') buffer must be maintained from CBTS's outer boundaries. No hunting is allowed in these buffer areas.

4-5. Weapons and Ammunition.

Authorized weapons include:

- Shotguns 20 through 10 gauge firing buck shot, no slugs.
- Crossbows – Allowed as directed and permitted by NC Hunting Laws.
- Muzzle loading rifles .40 caliber and larger.

Unauthorized for hunting, or in the possession while hunting:

- Rifled slugs.

Appendix A
References

Section I
Required Publications

None

Section II
Related Publications

AR 200-1 (Environmental Protection and Enhancement)

AR 210-20 (Master Planning for Army Installations)

AR 210-21 (Ranges and Training Areas)

AR 385-30 (Safety Color Codes, Markings and Signs)

AR 385-63 and FORSCOM Supplement 1 (Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat)

OTAGNC Reg 350-7 (Camp Butner Range Operations and Administration)

Section III
Prescribed Forms

Application for Deer Hunting Permit and Liabilities Release Form (Adjusted annually)

Section IV
Referenced Forms

None

Appendix B
Glossary

Definitions

For the purpose of this regulation the following shall be interpreted to mean:

Authorize: Having obtained permission from the appropriate office, agency, person or persons to perform a certain act.

Cancellation: To render null and void.

DUDS: Any type of explosive ammunition that has failed to detonate since fired from its respective weapon, yet may remain in an explosive stage for years. Touching or disturbing a DUD in any way may cause it to explode.

Facility: All property owned by the North Carolina National Guard that is defined as Camp Butner Training Site.

Facility Manager, Camp Butner Training Site(CBTS): The full-time person authorized to act on behalf of the Adjutant General of the State North Carolina and is responsible for the day-to-day management and operation of the facility.

Impact Zone/Impact Area: An area down range from a live ammunition firing point where expended ammunition may travel and hit. The area is clearly identified by markers that read, "DANGER UNEXPLODED AMMUNITION, KEEP OUT, TRESPASSING ON OR REMOVAL OF ANY ITEM FROM RANGE IS PROHIBITED BY LAW".

Law Enforcement Personnel: Butner Public Safety Officers, North Carolina Wildlife Officers, County Sheriff's Deputies, and other duly sworn policing authority with jurisdiction on the facility.

Loaded Weapons: A weapon containing ammunition either in the chamber or magazine.

Privately Owned Vehicle (POV): Any vehicle being rented, owned or otherwise in the possession of an individual for private use. This includes any motorized form of transportation.

Staff: Personnel assigned to and responsible for the safe, legal and efficient operation of the facility.

Figure 1 (Established yearly as hunting periods are established for current years.)

☐ **Pd 1 Bow Only, xx-xx Oct XX**	**$50 per**	☐ **Pd 3 XX-XX Nov XX**
☐ **Pd 2 Bow Only, XX-XX Oct XX**	**Period**	☐ **Pd 4 XX-XX Dec XX**
		☐ **Pd 5 XX-XX Dec XX**

APPLICANT INFORMATION (PLEASE PRINT CLEARLY)
Applicants Name:

LAST: FIRST: MI:

STREET ADDRESS CITY STATE ZIP

DRIVERS LICENSE # STATE HOME PHONE/CELL PHONE

WILDLIFE LICENSES

HUNTING PERMIT # (SAME # AS DRIVERS LICENSE #)

LIFE HUNTING PERMIT #

RELEASE STATEMENT

KNOW ALL MEN BY THESE PRESENTS: In consideration of the privilege afforded me and/or my minor family member(s) or minor child(ren) under my supervision and sponsorship to utilize the facilities of Camp Butner Training Site, a North Carolina National Guard Training Facility, for the purpose of deer hunting, and as a condition precedent to the issuance of a permit and/or permission therefore I,_____, do hereby covenant not to sue or otherwise make claim upon, and do hereby release and agree to forever hold harmless the United States Government, the State of North Carolina, and the authorized agents and officials of the forenamed military installations from all claims, demands, actions, debts, liabilities, judgments, costs, attorney's fees, and all other expenses resulting from or incident to any loss or injury to myself and/or my family member(s) or minor family member(s) or minor child(ren) under my supervision and sponsorship, arising from any inherent or otherwise dangerous condition whether hidden or obvious, which might exist on, in, under, above, or near any hunting area whether or not any such inherent or otherwise dangerous condition is known to said United States Government, the State of North Carolina, or officials or agents thereof, and whether or not notice made known to the public or users of said facilities; also, for any loss or injury arising from hazardous conditions referred to herein include but are not limited to : DUDS, mines, barbed or concertina wire, falling into shell holes, emplacements, or the negligent acts of others. The provisions contained herein shall be binding upon my heirs, executors, administrators, guardians, representatives, and assigns.

This certifies that I have fully read and understand the provisions of this Release Statement and the Office of the Adjutant General or North Carolina Regulation (OTAGNCR 215-2), dated 1, March 2004 and accepted these as the terms and conditions under which the Camp Butner Training Site **Deer Hunting Permit** will be issued.

SIGNATURE OF APPLICANT **DATE**

SIGNATURE OF PARENT/LEGAL GUARDIAN **DATE**

SIGNATURE OF WITNESS **DATE**

****

CAMP BUTNER STAFF USE ONLY

PD 1 PERMIT # _____ **PD 2 PERMIT #** _____

PD 3 PERMIT # _____ **PD 4 PERMIT #** _____

200X

APPROVED BY: TITLE: DATE:

Figure 2

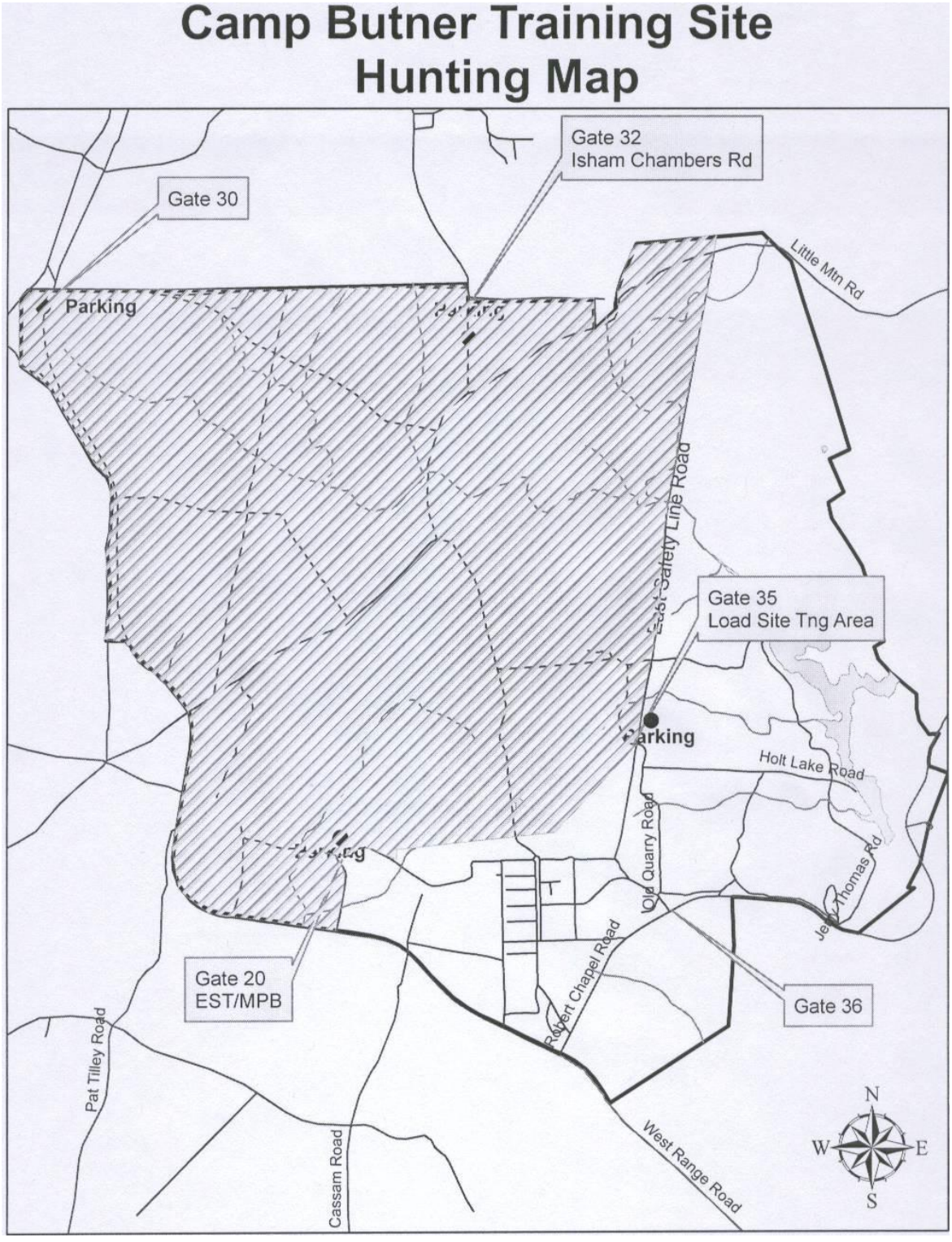
Camp Butner Training Site
Hunting Map
Gate 32
Isham Chambers Rd
Gate 30
Little Mtn Rd
Parking
East Safety Line Road
Gate 35
Load Site Tng Area
Parking
Holt Lake Road
Old Quarry Road
Jerry Thomas Rd
Robert Chapel Road
Gate 20
EST/MPB
Gate 36
Pat Tilley Road
Cassam Road
West Range Road
N
W
E
S

Figure 3

CAMP BUTNER HUNTING RULES - 200X

1. Camp Butner will have deer hunting this year in one week increments.

Bow Season Only	Bow/Muzzle/Pistol/Shotgun
xx-xx October 200x	xx-xx November 200x
xx-xx October 200x	xx-xx December 200x
	xx-xx December 200x

2. Application Process:

   a. Applications accepted beginning 1 August 200x.
   b. 50 hunter maximum per period
   c. $50 per period per person
   d. First come, first serve
   e. Money order only by mail. Cash accepted in person only.
   f. Address:

      CBTS
      Attn: Hunting Permit
      539 Roberts Chapel Road
      Stem, NC 27581-9549

   g. Telephone: (919) 620-5400

3. Requirements:

   a. All NC hunting laws apply.
   b. Valid NC Hunting License and applicable permits required.
   c. Picture ID required.
   d. NC State Hunting Laws regarding tagging and dressing apply.

4. Hunters will have access to all applicable gates.

5. Different colored passes will be issued for each period

6. Other Information:

   a. NO Rifles (except muzzle-loaders), no rifled slugs (buckshot only)
   b. NO ATVs
   c. Crossbows allowed as directed and permitted by State Law only.
   d. Two deer (either sex) limit per day
   e. Durham and Granville County laws apply
   f. Still hunting only
   g. **NO DOGS!**
   h. No dumping of deer parts/guts/carcasses anywhere on Camp Butner and adjacent roads.

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APPENDIX H

Camp Butner Training Site Invasive Species Management Plan

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Camp Butner Training Site

Stem, North Carolina

Invasive Species Management Plan

Final Report

Prepared for: North Carolina National Guard

Prepared by: AMEC Earth & Environmental, Inc.
4513 Creedmoor Road, Suite 400
Raleigh, NC 27612

Mission Statement: Provide ready forces to support Federal and State requirements; develop and participate in programs that add value to our members, families, employers, and communities.

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EXECUTIVE SUMMARY

This document is a product of contract between the North Carolina National Guard and AMEC Earth & Environmental, Inc (AMEC). The contract was established to identify and document invasive and exotic vegetation species occurring on Camp Butner Training Site (CBTS) and to produce an invasive species management plan that will provide an environmentally sound control of invasive and exotic vegetation species. The management of invasive and exotic species is required by several Federal regulations, including the Federal Noxious Weed Act of 1974 (7USC 2801 ct seq.) and Executive Order (EO) 13112.

Invasive species are found throughout the United States (US) and cause extensive damage to crops, rangelands, waterways, and other ecosystems. Annual cost of this damage is estimated in the billions of dollars. In addition to economic costs, invasive species can have a devastating effect on natural areas. The CBTS is charged to provide a variety of environmental conditions and ecosystems in which to train soldiers. This objective must be met in a way that provides for sustainable, healthy ecosystems, complies with all applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. The development of an Invasive Species Management Plan (ISMP) will aid installation commanders in managing natural resources more effectively and ensure that installation lands remain available and in good condition to support the installation's military mission.

The purpose of the ISMP is to identify and describe invasive exotic vegetation populations at CBTS. Maps of invasive populations are included to provide an inventory of invasive species populations. Taxonomic and biological characteristics of the established invasives are included as an educational tool for staff and management to aid in indentification and control of each species found at CBTS. Objectives of the investigation are to:

1) locate, map, and describe established populations of invasive plant species

2) estimate the area and density of invasive exotic plant populations

3) develop guidance for control and monitoring invaded areas

Invasive exotic vegetation were identified through field surveys. Man-made habitats or artificial areas, such as lawns, early successional areas, and recently cleared areas were areas of particular interest. CBTS rare natual communities were also a focus due to sensitivity of the habitats and ease of invasion by exotic species. Nine invasive species were found to have established populations at CBTS, and approximately six acres of Camp Butner is inhabited by invasive plant species.

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LIST OF APPENDICES

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ACRONYNMS AND ABBREVIATIONS

AFRC	Armed Forces Readiness Center
AMEC	AMEC Earth & Environmental, Inc.
CBTS	Camp Butner Training Site
GIS	Geographical Information Systems
GPS	Global Positioning System
EO	Executive Order
EPA	Environmental Protection Agency
ISMP	Invasive Species Management Plan
NC	North Carolina
NCDA&CS	North Carolina Department of Agriculture and Consumer Services
NCNG	North Carolina National Guard
US	United States
USDA	United States Department of Agriculture

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1.1 INTRODUCTION

Invasive species are found throughout the United States and cause extensive damage to crops, rangelands, waterways, and other ecosystems that is estimated in the billions of dollars annually. In addition to their economic costs, invasive species can have a devastating effect on natural areas. Many scientists believe that approximately 50% of the species on the threatened or endangered species list are at risk due to competition or predation from invasive species. After habitat loss, invasive species are the greatest threat to the survival of native flora and fuana. In addition to environmental effects invasive species have a direct affect on human health. West Nile, monkeypox, and SARS were all introduced through invasive species. The cumulative impacts of invasive species are only now being recognized and are currently regarded as one of the most serious threats of the twenty-first century.

CBTS is charged to provide a variety of environmental conditions and ecosystems in which to train soldiers. This objective must be met in a way that provides for sustainable, healthy ecosystems, complies with all applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. Several Federal regulations, including the Federal Noxious Weed Act of 1974 (7 USC § 2801 *et seq*.) and Executive Order (EO) 13112, require Federal agencies to: "prevent the introduction of invasive species"; "detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner"; "monitor invasive species populations accurately and reliably, provide for restoration of native species and habitat conditions in ecosystems that have been invaded"; "conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species"; and "promote public education on invasive species and the means to address them.

Invasive species that gain a foothold on military installations impair military operations in numerous ways:

1. negate realistic conditions for training or testing operations and/or directly limit training activities.
2. exotic plants that ignite easily increase the frequency and severity of wildland fires
3. can block vision and compromise security around sensitive military facilities
4. over-run large areas of land required for training rendering it useless
5. require the diversion of funding from other natural resource or operation priorities.
6. act as one of the leading causes of habitat destruction and biodiversity loss, which can further reduce training land
7. pose a security risk and/or create potentially life-threatening situations.

With the main goal of providing troops with realistic training conditions in order to be prepared for missions, controlling invasive species becomes necessary and at the same time protects America's natural resources. An Invasive Species Managemnt Plan (ISMP) is a proactive tool to halt significant damage and gain advantage over invasive problems. It is an important tool that provides assistance to NCNG CBTS commanders to manage natural resources more effectively and ensures that installation lands remain available and in good condition to support the installation's military mission. ISMP objectives are the following:

1. To provide a formal inventory of invasive and exotic vegetation species (including noxious weeds) occurring on CBTS lands.
2. To provide taxonomic and ecological descriptions for existing populations of invasive exotic species established on CBTS.
3. To provide best management practices for invasive exotic species with guidance on the control and eradication of invasive species populations found at CBTS.

2.0 LOCATION DESCRIPTION

CBTS is approximately 4,880 acres in size, and is located in Durham and Granville Counties in the north central Piedmont section of North Carolina (Figure 1.1), approximately 35 miles northwest of Raleigh, 15 miles northeast of the city of Durham, and 4 miles northwest of the town of Butner and Interstate 85. The primary access to CBTS is provided by Range Road, approximately 2 miles north of its intersection with Old North Carolina Route 75. The Durham-Granville County line bisects CBTS, with the western portion of the installation included in Durham County and the eastern portion in Granville County. Holt Reservoir (historically Lake Butner), which is not a part of CBTS, separates a small southeastern section of CBTS property from the primary CBTS lands.

3.0 ISMP METHODS

AMEC conducted a review of existing data and a subsequent field investigation of the CBTS to identify and map invasive species populations. A description of the methods employed for the field investigation is provided below.

3.1 BACKGROUND DATA REVIEW

An "invasive species" is defined as a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and microorganisms. Because these new species are introduced to a new environment that has none of their natural enemies, they have the potential to persist, multiply, and spread very rapidly. Since invasive species are transported, either accidentally or intentionally, from one country to another, global trade and travel have significantly increased the number of invasions by harmful non-native species in every part of the world.

AMEC reviewed literature to determine new vegetative invasive fronts beginning to establish in the State of North Carolina (NC) and identified the existing list of invasive exotic species in NC. North Carolina Department of Agriculture & Consumer services (NCDA&CS) recognizes all class A Noxious Weeds on the Federal-listed species, as well as, fifteen additional species ranked from class A to class C on North Carolina's noxious weed list. Plant species were identified and mapped as invasive species at Camp Butner when the species occurred on the National and/or North Carolina Noxious Weed list.

3.2 FIELD INVESTIGATION

Surveying CBTS occurred over two growing seasons, in the fall of 2007 and the spring of 2008. The survey was conducted twice in order to more accurately describe and identify invasive species. The fall season aided the estimation of perennial cover and the spring sampling allowed for the greatest diversity of plants identification. Man-made habitats or artificial areas, such as lawns and other manicured sites, early successional areas, and recently clear areas were the primary focus of the survey. Secondary focus was on CBTS's rare plant communities and areas with potential rare plants. Tertiary focus was on well established vegetative communities those with the least risk for exotic invasion. Representative transects were planned to survey the established natural communities.

Vegetation stands with exotic species infestation varied by species type and percent cover. In order to accurately summarize an infestation, stands were chosen by isolating an area most representative of the typical condition of the stand. A reference frame was used for estimating percent cover. The reference frame was place on the ground forming 10 square meters in area. The frame provided a small focus area to estimate percent cover by the exotic vegetation in relation to native plants or bare ground.

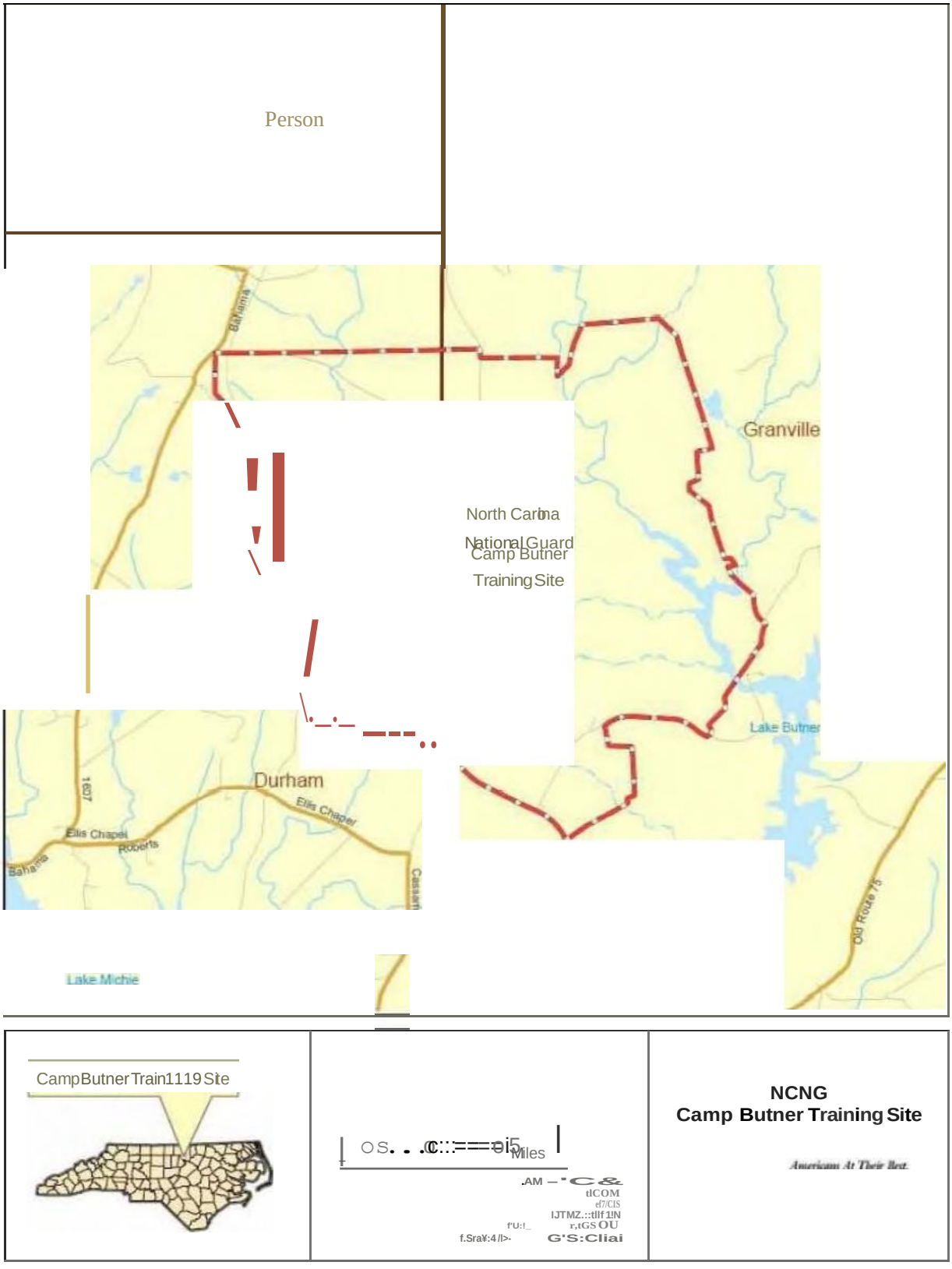


FIGURE 1· Site Vicinity Map

A GPS reading was taken for each reference frame and species composition, percent cover, area of the invasive population were recorded. If a population of invasive species was larger than 1 acre, the perimeter of the area was represented as a GIS polygon. Invasive species populations less than one acre in area were mapped as GIS points.

3.3 BIOLOGICAL DESCRIPTIONS, SPECIES MAP, AND BMP

A literature review was conducted to provide current taxonomic and biological characteristics of the established invasive vegeation on CBTS. For each species an indentification summary, plant ecology and pictures to aid in the identification were summarized. A map was created for each invasive species showing location and severity of individual populations found at CBTS.

In order to prioritize the management of invasive plant populations, a variety of factors were weighed. Factors included cost, time needed for eradication, area of population, and accessability. Plant populations were ranked into three categories represented by the colors green, yellow, and red. Green populations will take the least effort, money, and time to suppress or eradicate the population. Effort required to eradicate the invasives is greater as the color moves from green to yellow and from yellow to red. Red populations require the most effort, money, and time to control or eradicate the population. Each population mapped was characterized by representative color.

4.0 BMP FOR CONTROLLING NONNATIVE INVASIVE PLANTS

Defending against non-native plant invasions takes constant surveillance of right-of-ways, streambanks and internal roads and trails followed by effective control measures at the first appearance of the new species. Early detection and treatment will minimize efforts and costs that come with treating well-established plants or widespread infestations. More effort is required for successful eradication of established infestations, but it still can be accomplished with proper treatments, although costs may be prohibitive. In severe cases, conversion of the existing invasive exosystem back to a more native one is the only solution. Conversion involves eradication procedures and the reestablishment of native plants.

4.1 EFFECTIVE TREATMENTS

Once an invasive species infestation is spotted, then proper and aggressive eradication measures should be taken to avoid the inevitable spread. Continued treatment and retreatments will be necessary. Most nonnative invasive plants are perennials, having extensive tough roots and runners. This means that effective herbicide applications offer the best means of containment or eradication, because herbicide kills roots without baring soil for reinvasion or erosion. In order to be successful with herbicide treatments the following steps should be taken:

1. Use the most effective herbicide for the species.
2. Follow the application methods prescribed on the herbicide label.
3. Choose an optimum time period to apply treatments; for foliar-applied herbicides this is usually mid-summer to early fall and not later than a month before expected frost. Evergreens and semi-evergreens with leaves can be treated effectively in the winter.
4. Adhere to all label prohibitions, precautions, and Best Management Practices during herbicide transport, storage, mixing, and application.
5. Remember that some herbicides require up to a month or more before herbicidal activity is detectable as yellowing of foliage or leaves with dead spots or margins. Thus, after application, be patient; allow herbicides to work for several months before resorting to other treatment options.

4.2 SELECTIVE HERBICIDE APPLICATION METHODS

Although treating extensive inaccessible infestations may require broadcast treatments of herbicide sprays or pellets by helicopter or tractor mounted application systems, the best approach is usually selective applications of herbicides to target nonnative plants while avoiding or minimizing application to desirable plants. The selective methods described are directed foliar sprays, stem injection; cut-treat, basal sprays, and soil spots.

4.2.1 Directed Foliar Sprays

Directed foliar sprays are herbicide-water sprays aimed at target plant foliage to cover all leaves to the point of run off, usually applied with a backpack sprayer (using low pressure, drift retardants, and spray shields to avoid drift). Herbicide application by directed foliar spray is the most cost-effective method for treating most types of invasive plant species. To safeguard surrounding plants from damage by spray drift, suspend applications during windy conditions. A spray shield that attaches to the end of the wand can further minimize drift. Adding a drift retardant to the spray mixture can eliminate drift although effectiveness may be diminished.

Plants up to 6 feet tall can be treated with this equipment, while the additions of a commercially available wand extension can slightly increase height capabilities. To treat plants up to about 18 feet tall, use higher spray pressures with a straight-stream or narrow flat fan tip. Directed foliar sprays are also applied using wands on hoses attached to spraying systems mounted on all-terrain vehicles, trucks, or tractors. Also, a spray gun with a narrow flat fan tip can replace a wand for some applications. Another useful alternative for treating different sized woody plants is a spray gun with a swivel that holds two tips—narrow and wide-angled—that can be quickly changed during application.

4.2.2 Stem Injection

Stem injection (including hack-and-squirt) involves herbicide concentrate or herbicide-water mixtures applied into downward incision cuts spaced around woody stems made by an ax, hatchet, machete, brush ax, or tree injector. Tree injection, including the hack-and-squirt often used with a non-ionic surfactant, and applied to the foliage and growing tips of woody plants or to completely cover herbaceous plants.

Directed sprays are usually applied with a backpack sprayer and a spray wand equipped with a full cone, flat fan, or adjustable cone spray tip. These tips and spraying pressures of 20 to 30 pounds per square inch can ensure the hack-and-squirt technique, is a selective method of controlling larger trees and shrubs (more than 2 inches in diameter) with minimum damage to surrounding plants. It requires cuplike downward incisions spaced around the stem with a measured amount of herbicide applied into each of the incisions. Special tree injectors are available to perform this operation, or a narrow-bit ax, hatchet, or machete along with a spray bottle can be used in sequence to perform the hack-and-squirt method. Completely frilling the stem with edge-to-edge cuts or injections is required for very large stems or difficult-to-control species. The herbicide should remain in the injection cut to avoid wasting herbicide on the bark and to prevent damage of surrounding plants. All injected herbicides can be transferred to untreated plants by root grafts and uptake of root exudates. Herbicides with soil activity can damage nearby plants when washed from incisions into the soil by unexpected rainfall soon after application. Avoid injection treatments when rainfall is predicted within 48 hours.

Tree injection treatments are most effective when applied in late winter and throughout the summer. Heavy spring sap flow in spring can wash herbicide from incision cuts, making this an ineffective period.

4.2.3 Cut-treat

Cut-treat involves herbicide concentrates or herbicide-water mixtures applied to the outer circumference of freshly cut stumps or the entire top surface of cut stems, applied with a backpack sprayer, spray bottle, wick, or paint brush. Freshly cut stems and stumps of woody stems, including canes and bamboo, can be treated with herbicide mixtures to prevent resprouting and to kill roots. Cutting is usually by chainsaw or brush saw, but can be accomplished by handsaws or cutting blades. To minimize deactivation of the herbicide, remove sawdust from stumps before treatment. Treat stems and stumps as quickly as possible after cutting with a backpack sprayer or utility spray bottle for spray applications or a wick applicator, lab wash bottle, or paintbrush for small stems. Add a non-ionic surfactant to the mix to aid in penetration, if permitted by the label.

For stumps over 3 inches in diameter, completely wet the outer edge with the herbicide or herbicide mixture. Completely wet the tops of smaller stumps and all cut stems in a clump. Apply a basal spray mixture of herbicide, oil, and penetrant to stumps that have remained untreated for over 2 hours or use Pathfinder II and wet stump sides too.

The most effective time for the stump spray method is late winter and summer. Although winter treatments are slightly less effective than growing season applications, the absence of foliage on cut stems and branches produces some offsetting gains in application efficiency.

4.2.4 Basal Sprays

Basal sprays are herbicide-oil-penetrant mixtures sprayed or daubed onto the lower portion of woody stems, usually applied with a backpack sprayer or wick applicator. Full basal treatments require that the lower 12 to 20 inches of target woody stems be completely wetted on all sides with oil-based spray mixture. Application is to smooth juvenile bark. Full basal sprays are usually effective in controlling woody stems less than about 6 inches in diameter or larger diameters of susceptible species, before bark becomes thick, corky, and furrowed. The appropriate equipment for this treatment is a backpack sprayer with a wand or spray gun fitted with a narrow-angle flat fan, cone, or adjustable tip. A wick applicator can also be used. Herbicides that are soluble in oil (mainly Garlon 4) are mixed with a commercially available basal oil, vegetable oil, crop oil, diesel fuel, or kerosene often adding a special penetrant. Some herbicides, such as Pathfinder II and Vine-X, are sold ready-to-use with these ingredients.

A modified method, streamline basal sprays, is effective for many woody species up to 2 inches in diameter, as well as trees and shrubs up to 6 inches in diameter if the species is susceptible. Equipment for this treatment is a backpack sprayer with a spray gun and a low-flow straight-stream or narrow-angle spray tip. To prevent waste, maintain pressure below 30 pounds per square inch with a pressure regulator. At this pressure, an effective reach of 9 feet is possible while bark splash is minimized. To treat stems less than 2 inches in diameter, apply the stream of spray up-and down single stems for about 6 to 8 inches, or apply across multiple stems creating 2 to 3 inch-wide bands. This same multiple band treatment can be effective on larger stems. Direct the spray stream to smooth juvenile bark at a point about 4 to 18 inches from the ground. Stems that are thick barked or near 3 inches in diameter require treatment on all sides. Applications are usually in late winter and early spring, when leaves do not hinder spraying the stem. Summer applications are effective but more difficult. Avoid ester herbicide formulations on hot days to prevent vapor drift injury to nontarget plants.

4.3 SELECTING AN EFFECTIVE HERBICIDE

Only herbicides registered by the U.S. Environmental Protection Agency (EPA) for forestry use and noncroplands in the Southern States will be discussed here, although herbicides for other "land use areas," such as right-of-ways, pastures, and rangelands, may be just as effective or may contain the same active ingredient. The herbicides that will be identified by trade name (and common active-ingredient name) are:

Table 1. U.S. EPA registered Herbicides

Foliar Active Herbicides	Foliar and soil-active herbicides
Glyphosate herbicides (glyphosate) such as: Accord Concentrate, Gly-Flo Herbicide, and etc.	Aresenal AC (imazapyr)
Garlon 3A (triclopyr)	Escort XP (metsulfuron)
Garlon 4 (triclypyr)	Pathway (2,4-D + picloram)
Krenite S (fosamine)	Plateau (imazapic)
Pathfinder II (triclopyr)	Tordon 101 (2,4-D + picloram)
Milestone VM (aminopyralid)	Tordon K (picloram)
	Transline (clopyralid)
	Vanquish (dicamba)
	Velpar L (hexazinone)

Because nonnative invasive plants are usually difficult to control, selecting the most effective herbicide(s) is important. Often herbicides that have both soil and foliar activity are most effective with the least number of applications. However, applying herbicides with soil activity can damage desirable plants when their roots are present within the treatment zone or when herbicides move downhill to untreated areas following heavy rainfall. Wetland areas are particularly sensitive to herbicides due to the free flow of water. When treating aquatic areas extreme caution must be taken to avoid desirable plants. Each listed herbicide will make an herbicide variety that is safe for use in wet areas.

Garlon herbicides are mainly foliar active, but they have some soil activity at high rates or when mixed with oils. Garlon 4 and Vanquish can volatilize at high temperatures and their residues can move by air currents to affect surrounding plants; therefore, avoid applicant on days when temperatures exceed 80° F. If possible, also avoid applications when rainfall is anticipated within 8 hours, unless soil activation is needed, and during periods of severe drought as effectiveness can be reduced during these times. When possible, use selective herbicides that target specific nonnative species, such as Transline that controls mainly legumes and composites, and minimize damage to surrounding desirable plants even though they receive herbicide contact. Minimizing damage to desirable cohorts can also be achieved by making applications when the cohorts are dormant. For example, apply basal sprays to the bark of invasives in late winter before most other plants emerge, or foliar spray evergreen or semi-evergreen invasive after surrounding plants have entered dormancy. Remember that desirable woody plants can be damaged through transfer of herbicides by root exudates following stem injection and cut-treat treatments or when soil active herbicides wash off treated stems. Damage to surrounding native plants can be minimized with care and forethought during planning and application.

Read and thoroughly understand the herbicide label and its prohibitions before and during use. Many herbicides require the addition of a non-ionic surfactant to the spray tank. Always use clean water in an herbicide mixture and mix spray solutions thoroughly before applying. Do not mix in the sprayer but in a bucket with a stirring stick—stirring for several minutes or more—before transferring to the sprayer. Water that is highly basic (pH greater than 7) and contains high amounts of calcium and

magnesium interferes with glyphosate herbicide effectiveness, requiring the addition of ammonium sulfate or appropriate additives. When changing from a water based mix to an oil-based mix in a backpack sprayer, thoroughly evacuate the water from the pump and run a small amount of oil through the pumping system before filling with the oil-based mix, otherwise, a white sludge will clog the sprayer. And, always wear personal protective equipment prescribed on the label and in supplementary materials.

4.4 OTHER TREATMENTS FOR AN INTEGRATED APPROACH

Overgrazing is a way to reduce the vigor of palatable invasive plants like kudzu, but this rarely yields eradication and may spread seeds. Mechanical treatments and prescribed burning can assist eradication measures, but are limited in effectiveness. Prescribed burning cannot control root crowns or rhizomes of perennial plants and usually only deadens small aboveground shoots, providing only temporary aboveground control. In a similar way, cutting woody plants (by chainsaw and brush saw felling or brush mowing) and mowing vines and herbs without killing roots remove only aboveground plant parts. Mechanical root raking and discing can actually intensify and spread infestations of invasive plants with runners by chopping them into resprouting segments and transporting them on the equipment. Fire plows can also spread invasive plant rhizomes and roots.

However, root raking, piling, brush mowing, or burning may be the only way to start controlling dense infestations of multiple woody invasive plants. Small infestations may respond to hand pulling, grubbing with a stout hoe, or shrub pulling with newly introduced devices. Hand pulling or grubbing may be the quickest and easiest way to halt invaders when first spotted and stop them from gaining a foothold. String trimmers can reduce infestation on densities and injure thick waxy leaves to improve herbicide uptake and effectiveness.

Although ineffective by themselves to achieve eradication, both mechanical and burning treatments can give added kill of herbicide-weakened plants and have a place in an integrated pest management. The stumps and stems of nonnative trees, shrubs, and bamboos can be treated with herbicides immediately after cutting to kill roots. Resprouts of trees, shrubs, and vines that are topkilled by burning or brush mowing can be more easily treated with foliar sprays, often the most cost-effective way to use herbicides. Herbicide applications should be delayed after burning, discing, or mowing to permit adequate resprouting of target plants and, thereby maximizing herbicide uptake and effectiveness. Prescribed burning can also destroy invasive plant seeds and often stimulate germination for efficient herbicide control treatments.

Burning can prepare the site for effective herbicide applications by clearing debris and revealing application hazards, such as old wells and pits. Disking and root raking, if applied correctly, can dislodge herbicide-damaged woody roots and large runners, leaving them to dry and rot. With mechanical and burning treatments, take precautions, such as burning in late winter or spring leaf-out, to minimize the period of bare soil. The most effective time for controlling woody invasive plants and their germinants with fire is after plants have initiated growth in spring. An eradication program for infestations of invasive plants usually requires several years of treatment and many more years of surveillance to check for rhizome sprouts, root sprouts, seed germination, or new invasions. Following these steps in a planned manner and with persistence is the only successful strategy to safeguard land access, productivity, native plants, and suitable habitats for wildlife.

5.0 INVASIVE SPECIES AT CBTS

Nine species were identified to be established at CBTS as shown in Table 2.0. A map of the locations of invasive species unidentified in this survey is presented in Appendix A. The following section is a summary of the individual species' biological descriptions, species scientific name, common name

and ID, species population map and individual herbicide prescription summaries. Identification photographs were obtained from *Nonnative invasive plants of southern forests: a field guide for indetification and control,* published by the USDA in 2003.

The herbicide prescriptions have been assembled from published research results, unpublished trials, State reports, weed council manuals, magazines, and Web sites. Very few species-specific experiments have been reported that compare a full array of treatments for nonnative invasive plant species. Further specific understanding of each species is being studied but current knowledge and technology has been used in this report to address treatment options. Herbicides are mentioned in order of effectiveness or alphabetically when such information is lacking.

Table 2: Invasive Species Present at Camp Butner Training Site, Seth NC

Scientific Name	Common Name	Plant Type
Ailanthus altissima	Tree of heaven	Tree
Albizia julibrissin	Mimosa, Silk tree	Tree
Lonicera japonica	Japanese honeysuckle	Vine
Hedera helix	English Ivy	Vine
Lespedeza cuneata	Chinese lespedeza	Forb
Microstegium vimineum	Nepalese browntop, Japanese stilt-grass	Grass
Paulownia tomentosa	Princess tree	Tree
Pueraria montana var. *lobata*	Kudzu	Vine
Wisteria sinensis	Chinese wisteria	Vine

5.0

AILANTHUS ALTISSIMA, TREE-OF-HEAVEN BIOLOGICAL DESCRIPTION

Ailanthus altissima (P. M_ll.) Swingle **AIAL**
Synonyms: ailanthus, Chinese sumac, stinking sumac, paradise-tree, copal-tree

Plant. Deciduous tree to 80 feet (25 m) in height and 6 feet (1.8 m) in diameter, with long pinnately compound leaves and circular glands under lobes on leaflet bases. Strong odor from flowers and other parts, sometimes likened to peanuts or cashews.

Stem. Twigs stout, chestnut brown to reddish tan, and smooth-to-velvety with light dots (lenticels) and heart-shaped leaf scars. Buds finely hairy, dome-shaped, and partially hidden by the leaf base. Branches light gray to dark gray, smooth and glossy, with raised dots becoming fissures with age. Bark light gray and rough with areas of light-tan fissures.

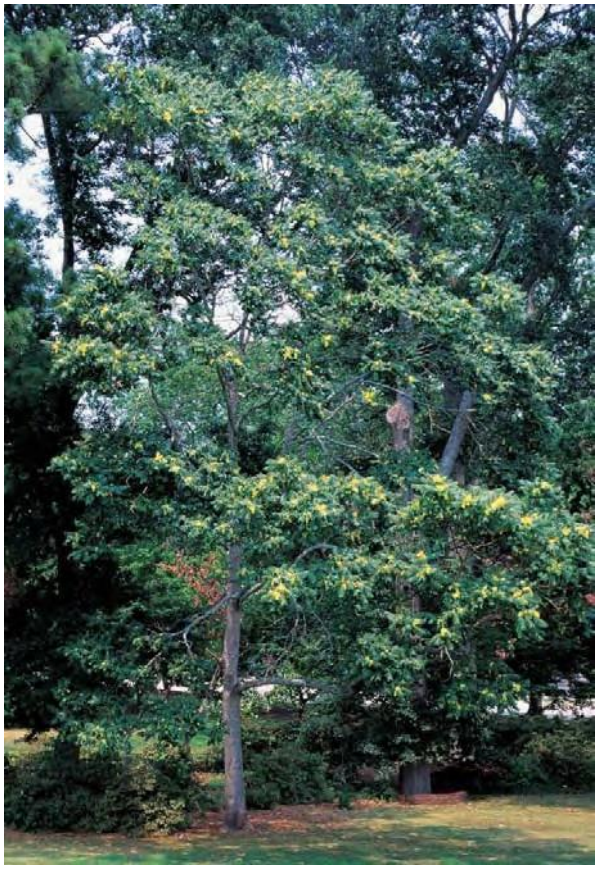
Leaves. Alternate, odd or even pinnately compound, 10 to 41 leaflets on 1-to 3-foot (30 to 90 cm) light-green to reddish-green stalks with swollen bases. Leaflets lanceolate and asymmetric and not always directly opposite, each 2 to 7 inches (5 to 18 cm) long and 1 to 2 inches (2.5 to 5 cm) wide. Long tapering tips and lobed bases with one or more glands beneath each lobe (round dots). Margins entire. Dark green with light-green veins above and whitish green beneath. Petioles 0.2 to 0.5 inch (5 to 12 mm) long.

Flowers. April to June. Large terminal clusters to 20 inches (50 cm) long of small, yellowish-green flowers, with five petals and five sepals. Male and female flower on separate trees.

Fruit and seeds. July to February. Persistent clusters of wing-shaped fruit with twisted tips on female trees, 1 inch (2.5 cm) long. Single seed. Green turning to tan then brown.

Ecology. Rapid growing, forming thickets and dense stands. Both shade and flood intolerant and allelopathic. Colonizes by root sprouts and spreads by prolific wind-and water-dispersed seeds. Viable seed can be produced by 2-and 3-year-old plants.

States with suspected infestations are shown in gray.



Tree-of-Heaven - July

resembles hickories, *Carya* spp., and sumacs, *Rhus* spp., but neither has glands at leaflet bases. Hickories distinguished by a braided bark, sumacs by shrub shape.

History and use. Introduced in 1784 from Europe, although originally from Eastern China. Ornamental.

July
February
July
August
October
August
August
September

5.1.1 Tree-of-heaven at CBTS

Several well established populations of *Ailanthus altissima* were identified at CBTS (Figure 2). An estimated .6 acres of land is inhabitant by *Ailanthus*. Most individuals of this species are seedlings and young trees. Only a few mature trees exist and most of the populations are near roadways and high traffic areas of the Camp. The observed colonies of Ailanthus at CBTS are numerous, but ease of access to their locations offer some oppourtun ities for control and eradication. This species tends to form dense thickets but can not tolerate low light situations preventing it from invading established forests. Open fields and cleared areas are of greatest concern at CBTS. Many of the man made berms surrounding firing ranges are infested with this species and thickets are starting to develop.

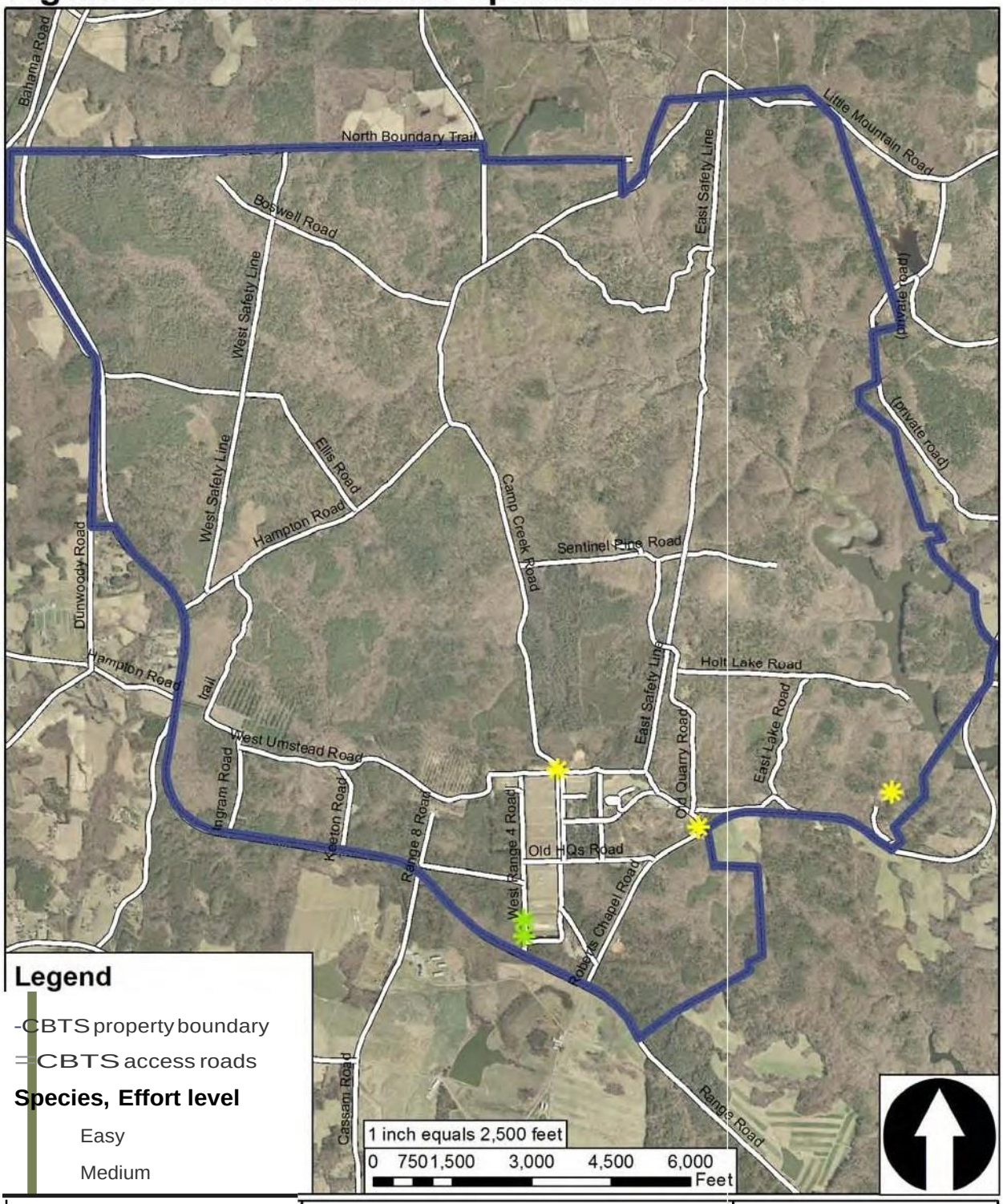
5.1.2 Recommended control procedures for Tree-of-heaven

Large Trees. Stem injections are suggested for this species along with the use of Garlon 3A, Pathway*, Pathfinder II, or Aresenal AC. Apply herbicide in dilution and space cut according to the herbicide label. Use technique in midsummer for best results or late winter for somewhat less effectiveness. Felling trees is also an accepted technique for *Ailanthus,* apply the herbicide to stem and stump tops immediately after cutting.

Saplings. Use Garlon 4 as a 20-percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II to young bark as a basal spray.

Seedlings and saplings. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October): Arsenal AC* as a 1-percent solution (4 ounces per 3-gallon mix), Krenite S as a 15-percent solution (3 pints per 3-gallon mis), Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix), or Escort XP* at 1 ounce per acre.

Figure 3. Tree-of-heaven Populations on CBTS



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5.2 ALBIZIA JULIBRISSIN, SILK TREE - BIOLOGICAL DESCRIPTION

Albizia julibrissin Durazz. **ALJU** Synonym: silky acacia, mimosa

Plant. Deciduous leguminous tree 10 to 50 feet (3 to 15 m) in height with single or multiple tunks, smooth light-brown bark, feathery leaves, and showy pink blossoms that continually yield dangling flat pods during summer. Pods persistent during winter.

Stem. Twigs slender to stout, lime green turning shiny grayish brown with light dots (lenticels). No terminal bud. Bark glossy, thin, light brown turning gray with raised corky dots and dashes.

Leaves. Alternate, bipinnately compound 6 to 20 inches (15 to 50 cm) long with 8 to 24 pairs of branches and 20 to 60 leaflets per branch, feathery and fernlike. Leaflets asymmetric, 0.4 to 0.6 inch (1 to 1.5 cm) long, dark green, with midvein nearer and running parallel to one margin. Margins entire.

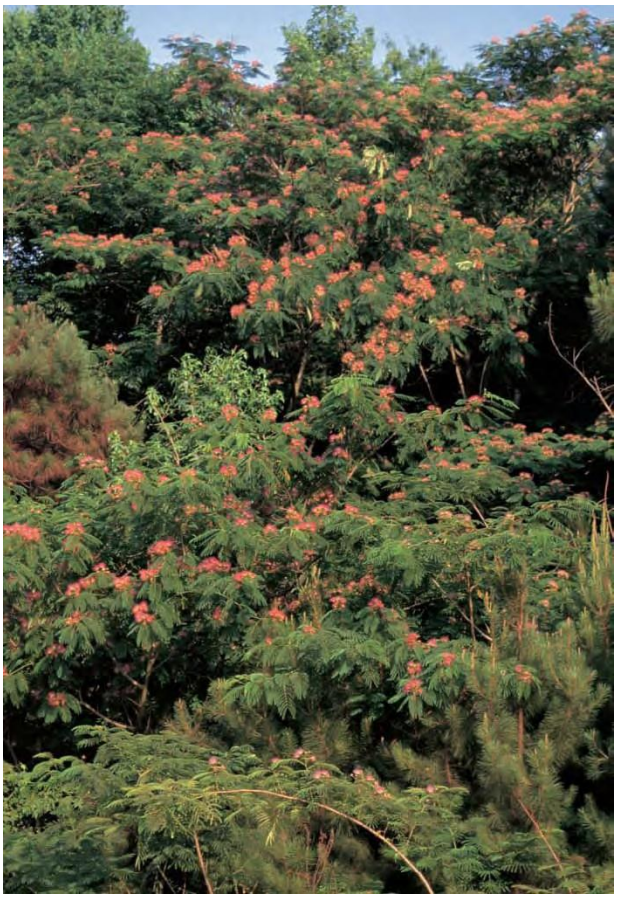
Flowers. May to July (and sporadically to November). Terminal clusters at the base of the current year's twigs, each with 15 to 25 sessile flowers 1.4 to 2 inches (3.5 to 5 cm) long. Pom-pom like with numerous filaments, bright-pink feathery tufts with white bases. Fragrant.

Fruits and seeds. June to February. Legume pods in clusters, flat with bulging seeds, each pod 3 to 7 inches (8 to 18 cm) long, splitting in winter along the edges to release 5 to 10 oval seeds. Initially light green turning dark brown in fall and whitish tan in winter.

Ecology. Occurs on dry-to-wet sites and spreads along stream banks, preferring open conditions but also persisting in shade. Seldom found above 3,000 feet (900 m). Forms colonies from root sprouts and spreads by abundant animal-and water-dispersed seeds. Seeds remain viable for many years. Nitrogen fixer.

Resembles honeylocust, *Gleditsia triacanthos* L., which has longer leaflets - 1 inch (2.5 cm) long. Seedlings resemble partridge pea, *Chamaecrista fasciculata* (Michx.) Greene, an annual plant with once pinnately compound leaves.

States with suspected infestations are shown in gray.



Silktree - June

History and use. A traditional ornamental introduced from Asia in 1745. Potential use for forage and biofuel.

Silktree, Mimosa

T. Bodner

5.2.1 Silktree at CBTS

One silktree population was found at CBTS (figure 4). Silktree reproduces through abundant seeds and root sprouts. Seedpods remain on the trees throughout the winter, can float in water, and remain viable for many years. CBTS's population is easily manageable, but will require monitoring in subsequent years due to the plant's prolific seed source. Several populations were located off of CBTS lands and will remain a threat to CBTS. Surveys should be conducted yearly to locate new populations of silktree as well as resprout.

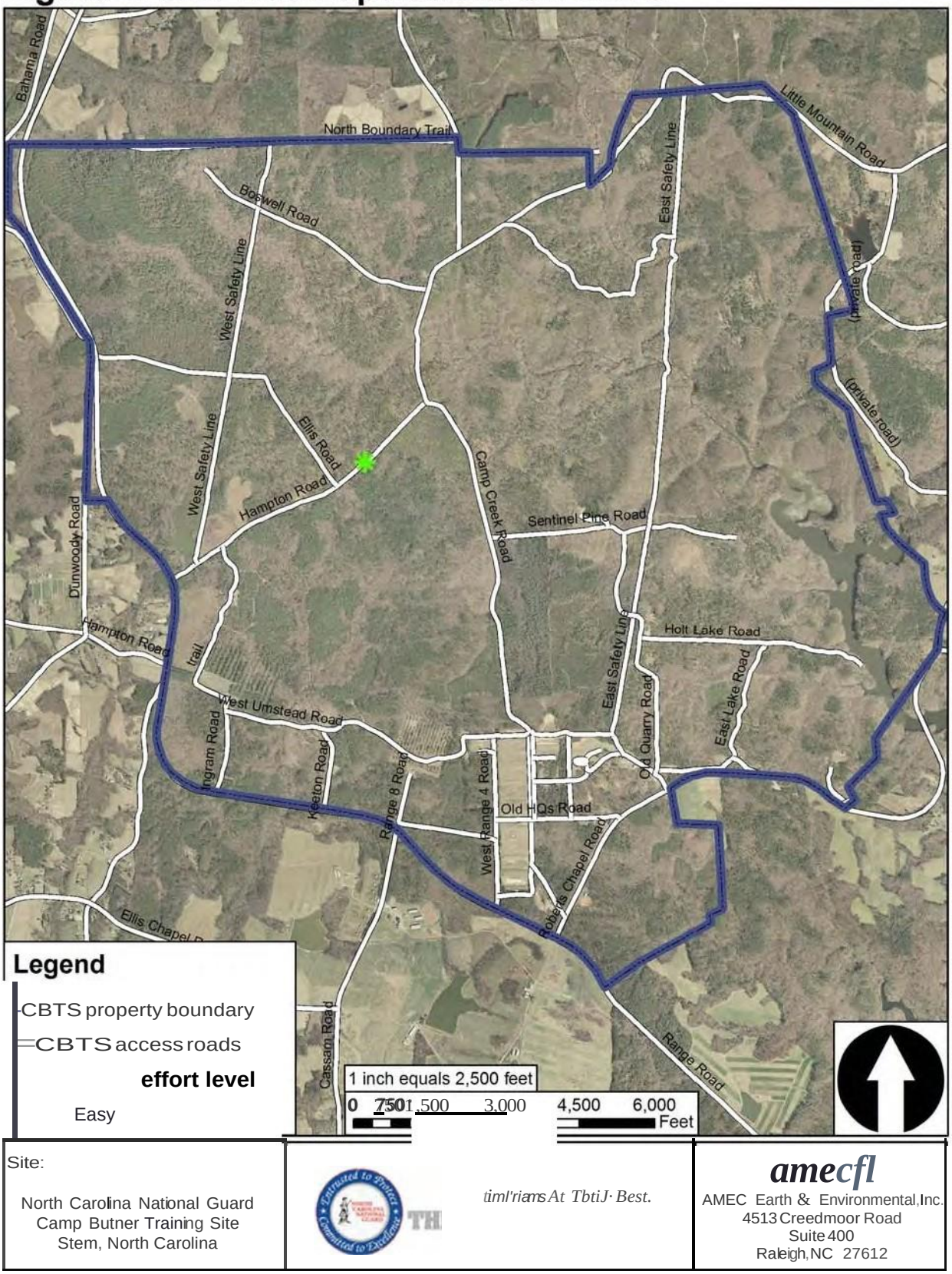
5.2.2 Recommended control procedures for Silktree

Large Trees. Make stem injections using Arsenal AC* or Garlon 3A in dilutions as specified on the herbicide label (anytime except March and April). When felling trees apply the herbicide to stem and stump tops immediately after cutting.

Saplings. Use Garlon 4 as a 20-percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II to young bark as a basal spray.

Seedlings and saplings. Thoroughly wet all leaves with one of the flowing herbicides in water with a surfactant. July through October Garlon 3A, Garlon 4, or glyphosate herbicide can be used as a two percent solution (8 ounces per 3-gallon mix).

Figure 4. Silk Tree Populations on CBTS



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5.3 LONICERA JAPONICA, JAPANESE HONEYSUCKLE – BIOLOGICAL DESCRIPTION

Lonicera japonica Thunb. **LOJA**

Plant. Semievergreen to evergreen woody vine, high climbing and trailing to 80 feet (24 m) long, branching and often forming arbors in forest canopies and/or ground cover under canopies and forming long woody rhizomes that sprout frequently.

Stem. Slender woody vine becoming stout to 2 inches (5 cm) in diameter, with cross section round and opposite branching. Brown and hairy becoming tan barked, fissured, and sloughing with age. Rooting at low nodes.

Leaves. Opposite, broadly ovate to elliptic to oblong, base rounded, tips blunt-pointed to round. Length 1.6 to 2.6 inches (4 to 6.5 cm) and width 0.8 to 1.5 inches (2 to 4 cm). Margins entire but often lobed in early spring. Both surfaces smooth to rough hairy, with undersurface appearing whitish.

Flowers. April to August. Axillary pairs, each 0.8 to 1.2 inches (2 to 3 cm) long, on a bracted stalk. White (or pink) and pale yellow. Fragrant. Thin tubular flaring into five lobes in two lips (upper lip four-lobed and lower lip single-lobed), with the longest lobes roughly equal to the tube. Five stamens and one pistil, all projecting outward and becoming curved. Persistent sepals.

Fruit and seeds. June to March. Nearly spherical, green ripening to black, glossy berry 0.2 inch (5 to 6 mm) on stalks 0.4 to 1.2 inches (1 to 3 cm) long. Two to three seeds.

Ecology. Most commonly occurring invasive plant, overwhelming and replacing native flora in all forest types over a wide range of sites. Occurs as dense infestations along forest margins and right-of-ways as well as under dense canopies and as arbors high in canopies. Shade tolerant. Persists by large woody rootstocks and spreads by rooting at vine nodes and animal-dispersed seeds.

resembles yellow jassamine, *Gelsemium sempervirens* (L.) St. Hil., which has thinner leaves and hairless stems. **Also resembles** native honeysuckles, *Lonicera* spp., that usually have reddish hairless stems and hairless leaves and do not form extensive infestations.

States with suspected infestations are shown in gray.

Japanese honeysuckle - April

History and use. Introduced from Japan in the early 1800s. Traditional ornamental, valued as deer browse, with some value for erosion control. Still planted in wildlife food plots.

T. Bodner

T. Bodner

5.3.1 Japanese honeysuckle at CBTS

Japanese honeysuckle is seen in two forms at CBTS. It is commonly seen covering established vegetation forming dense canopies, and it is also seen spreading across the forest floors beginning to form mats of sprawling vines. Japanese honeysuckle is semi-evergreen and is difficult to control due to woody rhizomes that sprout frequently. Correct area estimation is difficult due to the plant's growth forms; however CBTS is estimate to have 1.9 acres of Japanese honeysuckle. The largest area most established infestation is CBTS property South of Roberts Chapel Road. Plants that have become established along the access road form canopies on native vegetation and are invading the surrounding forest floor.

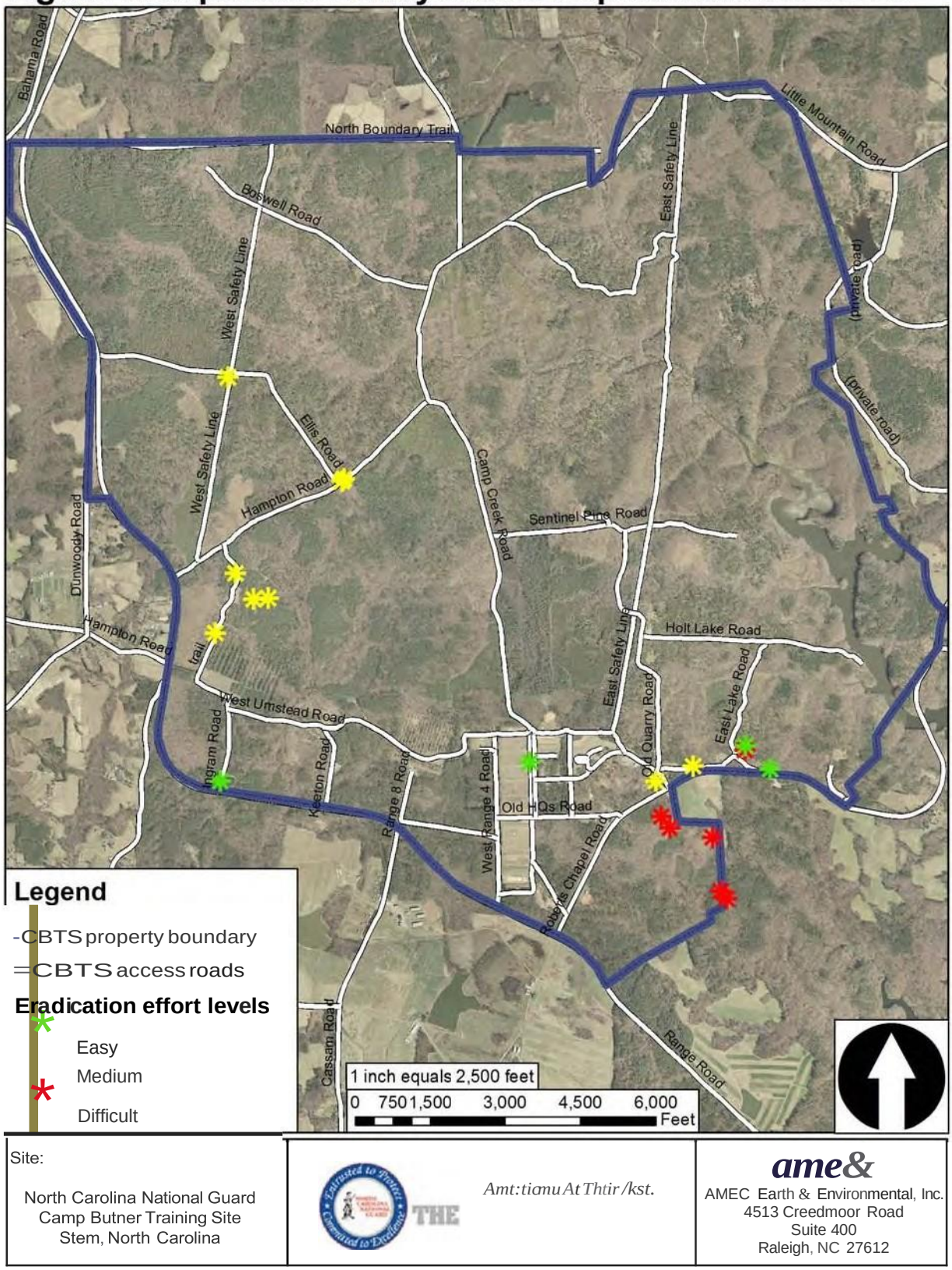
5.3.2 Recommended control procedures for Japanese honeysuckle

Foliar Control. June through August apply Escort* XP with a surfactant by broadcast spraying 2 ounces per acre in water (0.6 dry ounces per 3-gallon mix) or by spot spraying 2 to 4 ounces per acre in water (0.6 to 1.2 dry ounces per 3-gallon mix). Or, treat foliage with one of the following herbicides in water with surfactant (July to October or during warm days in early winter) keeping spray away from desirable plants: a glyphosate herbicide as a 2-percent solution (8 ounces per 3-gallon mix) or Garlon 3A or Garlon 4 as a 3-to-5-percent solution (12 to 20 ounces per 3-gallon mix).

Cut-treat. Cut large vines just above the soil surface and immediately treat the freshly cut stem with a glyphosate herbicide or Garlon 3A as a 20-percent solution (2.5 quarts per 3-gallon sprayer in water with a surfactant July to October (safe to surround plants).

Integrate approach. Prescribed burning in spring will reduce dense ground mats and sever climbing vines for more effective herbicide treatments to resprouting vines.

Figure 5. Japanese Honeysuckle Populations on CBTS



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5.4 *HEDERA HELIX*, ENGLISH IVY BIOLOGICAL DESCRIPTION

Hedera helix L. **HEHE**

Plant. Evergreen woody vine climbing to 90 feet (28 m) by clinging aerial roots and trailing to form dense ground cover. Thick dark-green leaves with whitish veins and three to five pointed lobes when juvenile. Maturing at about 10 years into erect plants or branches with unlobed leaves and terminal flower clusters that yield purplish berries. **Toxic to humans when eaten and triggering dermatitis in sensitive individuals.**

Stem. Woody slender vines when a ground cover and growing to 10 inches (25 cm) in diameter when climbing infested trees and rocks by many fine to stout aerial rootlets. Vines pale green (sometimes reddish tinged), rooting at nodes, becoming covered with gray-brown shiny bark, segmented by encircling and raised leaf scars, and roughened by tiny ridges. Bark light gray to brown, bumpy and gnarly, with aerial rootlets developing along the side where clinging to vertical structures. Aerial rootlets exuding a gluelike substance. Older vines sometimes grown together where crossed.

Leaves. Alternate, with shapes varying according to age—typical juvenile plants having three to five pointed lobes and mature plants broadly lanceolate and unlobed, 2 to 4 inches (5 to 10 cm) long and 2.5 to 5 inches (6 to 12 cm) wide. Thick and waxy, smooth and hairless, dark green with whitish veins radiating from the petiole and pale green beneath. Petioles to 6 inches (15 cm) long, pale green and often reddish tinged.

Flowers. June to October. Terminal hairy-stemmed umbel clusters of small greenish-yellow flowers on mature plants. Five thick and pointed petals, 0.1 inch (3 mm) long. Each petal radiating from a five-sided domed green floral disk, 0.1 inch (3 mm) wide, tipped by a short pistil.

Fruit and seeds. October to May. Clusters of spher_cal drupes, 0.2 to 0.3 inch (7 to 8 mm). Pale green in late summer ripening to dark blue to purplish in late winter to spring.

States with suspected infestations are shown in gray.

English Ivy - June

Ecology. Thrives in moist open forests, but adaptable to a range of moisture and soil conditions, including rocky cliffs. Shade tolerance allowing early growth under dense stands, but becoming adapted to higher light levels with maturity. Avoids wet areas. Amasses on infested trees, decreasing vigor, and increasing chance of windthrow. Serves as a reservoir for bacterial leaf scorch that infects oaks (*Quercus* spp.), elms (*Ulmus* spp.), and maples (*Acer* spp.). Spreads by bird-dispersed seeds and colonizes by trailing and climbing vines that root at nodes. Drupes mildly toxic, discouraging over consumption by birds.

resembles grape, *Vitis* spp., which has a leaf that is similarly shaped but not thick and often hairy.

History and use. Introduced from Europe in colonial times. Traditional ornamental and still widely planted as an ornamental. Source of varnish resin, dye, and tanning.


June


January


July


July


July


July


July


June

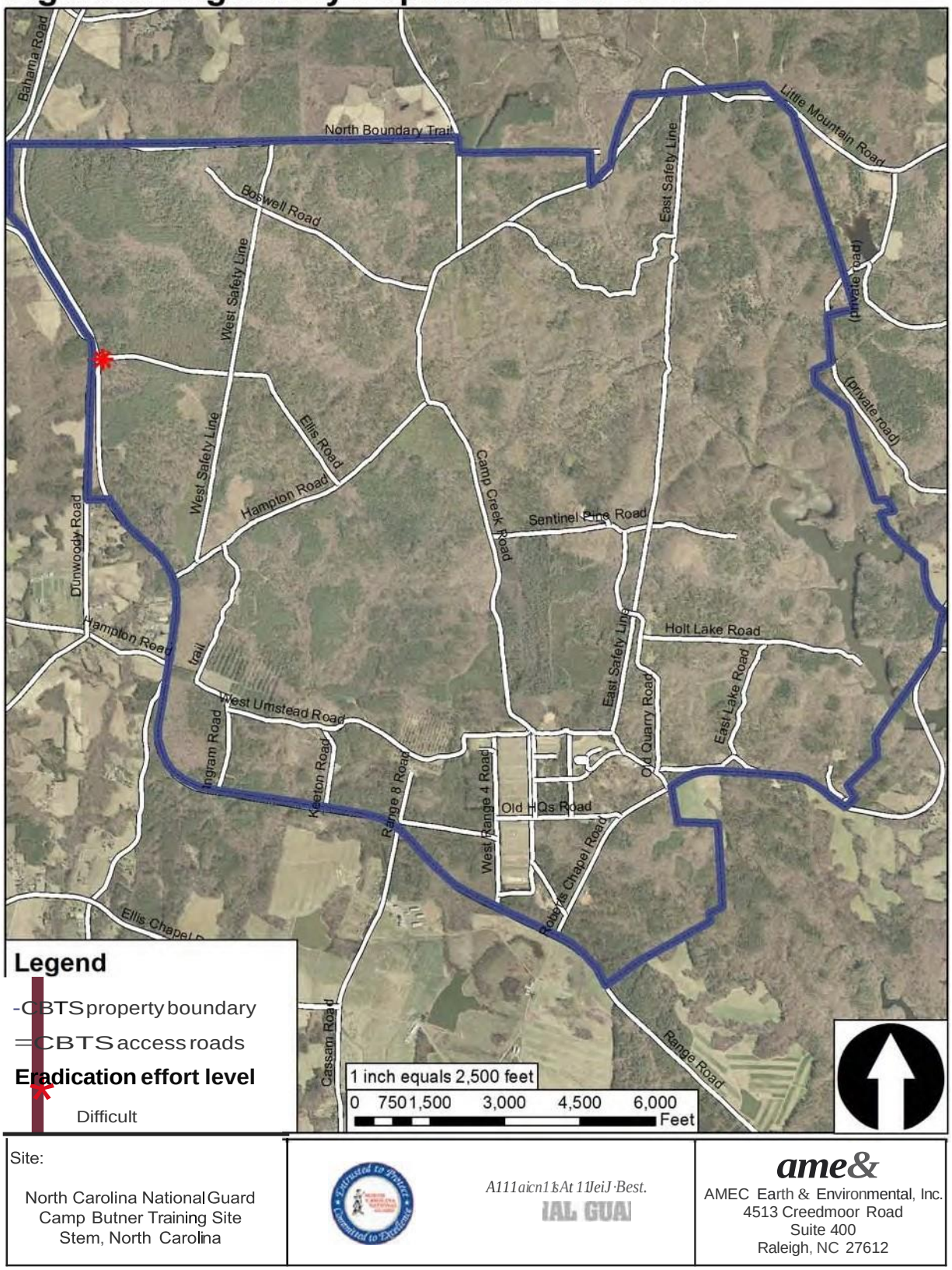
5.4.1 English Ivy at CBTS

A small population of English Ivy is established at CBTS. The area is approximately .04 acres and although the infestation is small in size it is a large threat to the Pine Oak forest community it inhabits. English Ivy is very shade tolerant when yound, allowing establishment of early growth; however at maturity it is adapted to higher light levels. English ivy will eventually cover the tree canopy to reach needed sunlight harming the host forest. The ivy population at CBTS can be addressed while still accessible. The eradication will be difficult, requiring several years to monitor the progress. English ivy is a popular landscaping plant and is spread from neighbours through bird droppings. Although no neighbouring populations were identified in the immediate surrounding area, new populations of English ivy should be monitored yearly.

5.4.2 Recommended control procedures for English Ivy

Foliar Control. Wet leaves (until runoff) with one of the following herbicides in water with a surfactant (July to October for successive years): Garlon 3A or Garlon 4 as a 3-to-5-percent solution (12 to 20 ounces per 3-gallon mix) or a glyphosate herbicide as a 4-percent solution (1pint per 3-gallon mix) or a glyphosate herbicide as a 4-percent solution (1 pint per 3-gallon mix). Use a string trimmer to reduce growth layers and injure leaves for improved herbicide uptake. Cut large vines and apply these herbicides to cut surfaces. Or, apply Garlon 4 as a 20-percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II as a basal spray to large vines being careful to avoid the bark of the host tree.

Figure 6. English Ivy Populations on CBTS



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LESPEDEZA CUNEATA, CHINESE LESPEDEZA BIOLOGICAL DESCRIPTION

Lespedeza cuneata (Dum.-Cours.) G. Don **LECU** Synonym: sericea lespedeza

Plant. Perennial ascending-to-upright leguminous forb, 3 to 6 feet (1 to 2 m) in height, with one-to-many leafy slender stems often branching at midplant, three-leaflet leaves, and tiny whitish flowers. Plant arising from a woody rootcrown. Dormant brown plants remaining upright during most of the winter.

Stems. Often gray green with lines of hairs along the stem.

Leaves. Alternate, crowded and numerous, three-leaflet leaves. Each leaflet oblong to linear with a hairlike tip, 0.4 to 0.8 inch (1 to 2 cm) long and 0.1 to 0.3 inch (3 to 8 mm) wide. Green above and dense whitish hairy to light gray green beneath. Hairy petioles 0.2 to 0.6 inch (5 to 15 mm) long, absent for upper leaves. Stipules narrowly linear.

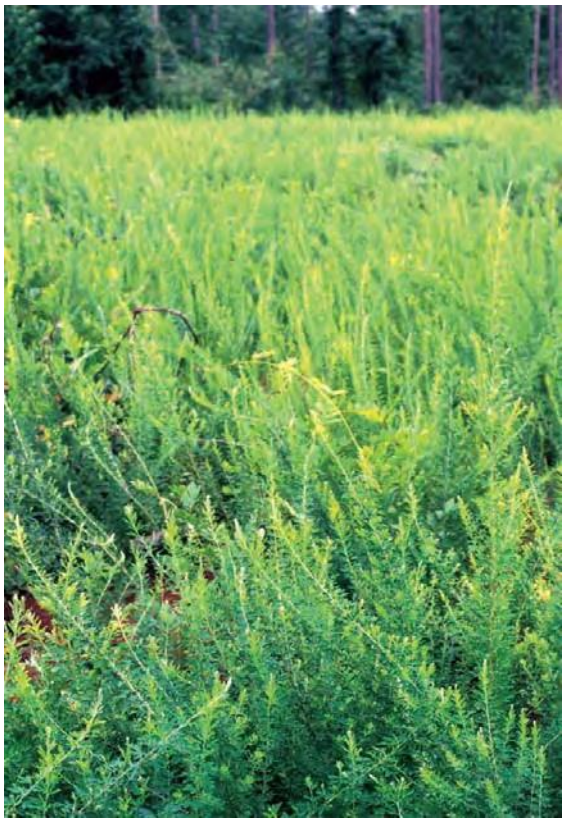
Flowers. July to September. Clusters of 1 to 3 pealike flowers crowded in upper leaf axils. Flowers white with purple marks, 0.1 to 0.3 inch (4 to 7 mm) long and shorter than leaves. Hairy five-lobed calyx shorter than petals.

Fruit and seeds. October to March. Flat ovate to round single-seeded legume pod 0.12 to 0.15 inch (3 to 4 mm) wide. Pods clustered in terminal axils, scattered along the stem, and clasped by persistent sepals. Green becoming tan.

Ecology. Occurs in new and older forest openings, dry upland woodlands to moist savannas, old fields, right-of-ways, and cities. Flood tolerant. Forms dense stands by sprouting stems from rootcrowns that prevent forest regeneration and land access. Cross-and self-pollinates. Spreads slowly from plantings by seeds that have low germination, but remain viable for decades. Nitrogen fixer.

Resembles native lespedeza, *L. virginica* (L.) Britt., which grows in tufted clumps instead of infestations, has crowded clusters of pink-purple to violet flowers and somewhat larger leaflets 0.6 to 1.2 inches (1.5 to 3 cm) long, and brown stems.

States with suspected infestations are shown in gray.



Service lespedeza - Julyl

History and use. Introduced from Japan in 1899—first near Arlington, VA, and soon afterwards in north-central Tennessee—and escaped. Benefited from government programs that promoted plantings for erosion control. Still planted for quail food plots, soil stabilization, and grazing. Plant improvement breeding programs still underway.

February

July

July

September

July

5.4.3 Chinese lespedeza at CBTS

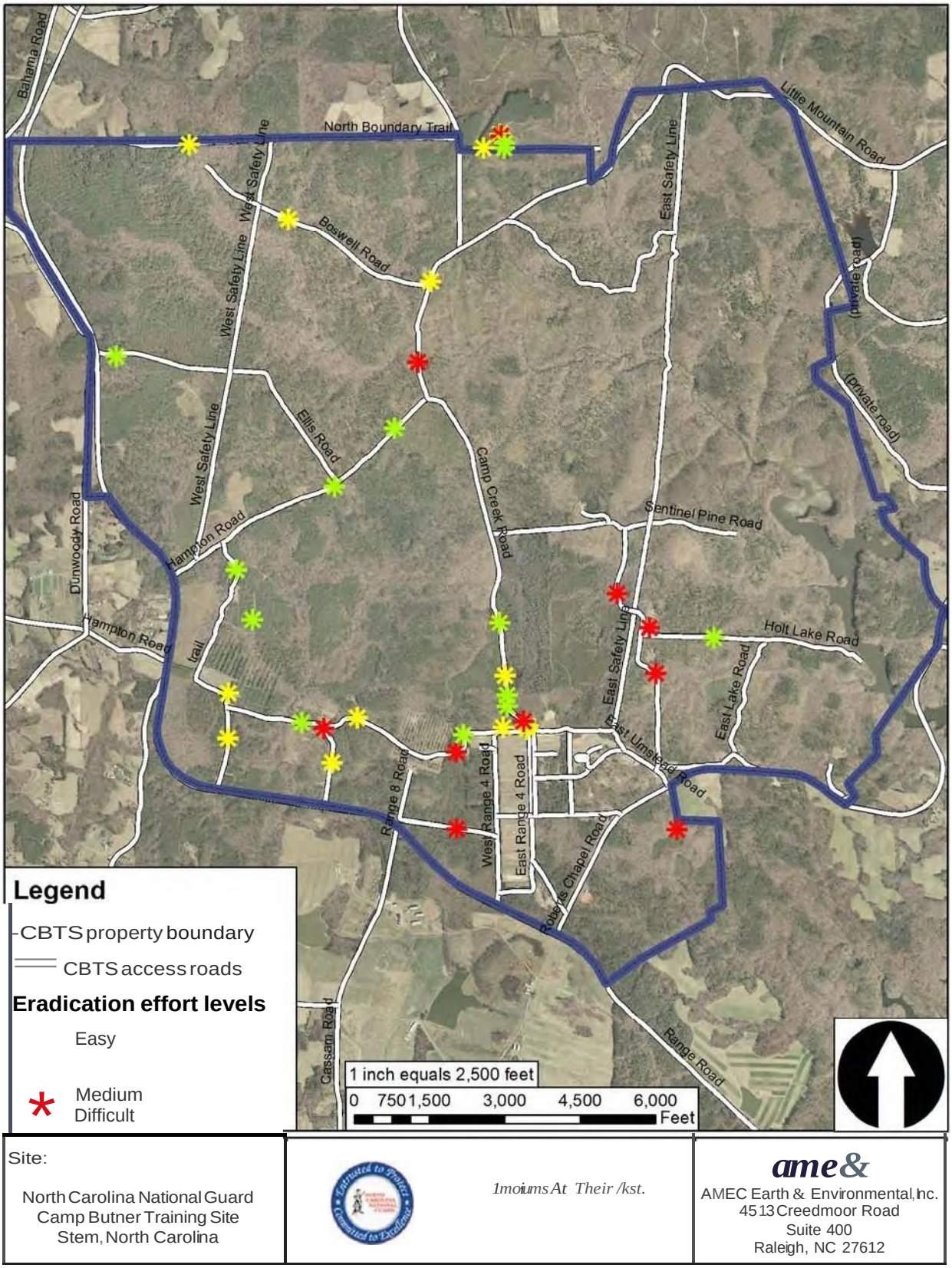
Chinese lespedeza was found along the majority of roads and trails at CBTS. An estimated 2.6 acres of CBTS land is invaded by Chinese lespedeza. At CBTS the populations are their densest when in direct sun. Strands start to thin in shaded areas. Populations at CBTS are easily accessible due to growth along roadways and can be treated with minimal effort. Focus on dense areas for primary treatment and mowing for 2 to 3 months before chemical treatment will aid in eradication. All populations will require long term monitoring.

5.4.4 Recommended control procedures for Chinese lespedeza

Foliar Control. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to September): Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix), Escort * XP at three-fourths of an ounce per acre (0.2 dry ounces per 3-gallon mix), Transline+ as a 0.2-percent solution (1ounce per 3-gallon mix), a glyphosate herbicide as a 2-percent solution (8ounces per 3-gallon mix), or Velpar L* as a 2-percent solution (8ounces per 3-gallon mix).

Integrate approach. Mowing 1 to 3 months before herbicide applications can assist control.

Figure 7. Chinese lespedeza Populations on CBTS



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5.0 MICROSTEGIUM VIMINEUM, NEPALESE BROWNTOP

Microstegium vimineum (Trin.) A. Camus **MIVI**
Synonyms: Japanese stilt grass, Mary's grass, basketgrass

Plant. Sprawling, annual grass, 0.5 to 3 feet (15 to 90 cm) in height. Flat short leaf blades, with off-center veins. Stems branching near the base and rooting at nodes to form dense and extensive infestations. Dried whitish-tan grass remains standing in winter.

Stem. Ascending to reclining, slender and wiry, up to 4 feet (120 cm) long, with alternate branching. Covered by overlapping sheaths with hairless nodes and internodes. Green to purple to brown. Aerial rootlets descend from lower nodes.

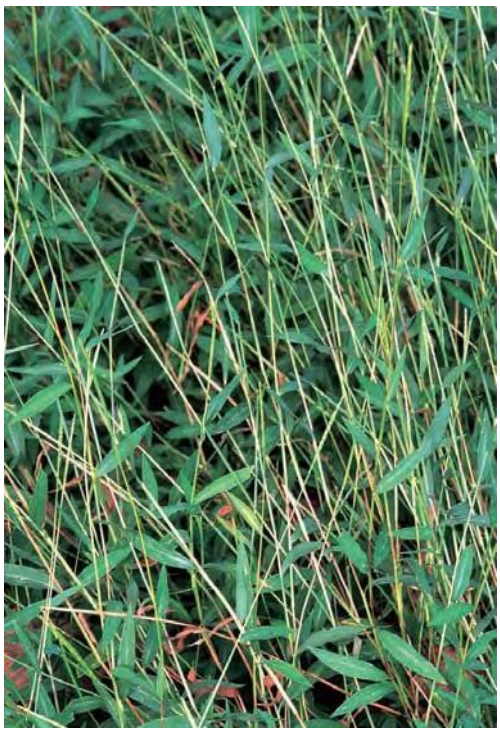
Leaves. Alternate (none basal) projecting out from stem, lanceolate to oblanceolate, 2 to 4 inches (5 to 10 cm) long and 0.07 to 0.6 inch (2 to 15 mm) wide. Blades flat, sparsely hairy on both surfaces and along margins. Midvein white and off center. Ligule membranous with a hairy margin.

Flowers. July to October. Terminal, thin and spikelike raceme, to 3 inches (8 cm) long. Unbranched or with one to three lateral branches on an elongated wiry stem. Other thin racemes of self-pollinating flowers enclosed or slightly extending from lower leaf sheaths. Spikelets paired, with the outer stemmed and inner sessile.

Seeds. July to December. Husked grain, seed head thin, grain ellipsoid, 0.1 inch (2.8 to 3 mm) long, with seedstalks partially remaining during winter.

Ecology. Flourishes on alluvial floodplains and streamsides, mostly colonizing flood-scoured banks, due to water dispersal of seed and flood tolerance. Also common at forest edges, roadsides, and trailsides, as well as damp fields, swamps, lawns, and along ditches. Occurs up to 4,000 feet (1200m) elevation Very shade tolerant. Consolidates occupation by prolific seeding, with each plant producing 100 to 1,000 seeds that can remain viable in the soil for 3 years. Spreads on trails and recreational areas by seeds hitchhiking on hikers' and shoes and clothes.

States with suspected infestations are shown in gray.



Nepalese Browntop - September

Resembles crabgrass, *Digitaria* spp., and nimblewill, *Muhlenbergia schreberi* J.F. Gmel., both having broad short leaves, but distinguished from Nepalese browntop by branching seed heads and stout stems. **Also resembles** whitegrass, *Leersia virginica* Willd., which is a perennial with flat, compressed seed heads.

History and use. Native to temperate and tropical Asia, and first identified near Knoxville, TN, around 1919. Ground cover with little wildlife food value.

December
September
T. Bodner
September
May
T. Bodner
June
May

5.5.1 Microstegium at CBTS

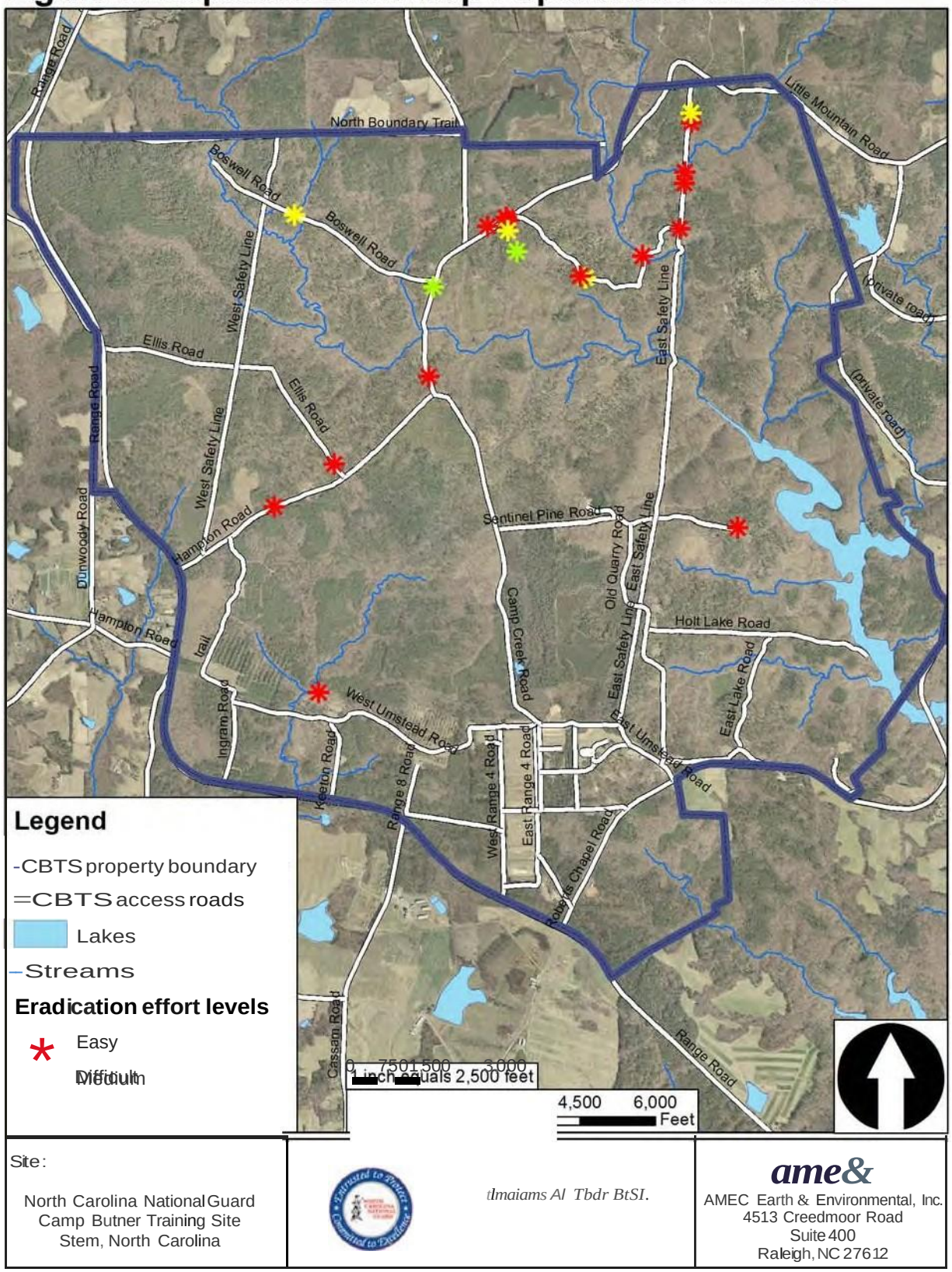
Microstegium is a common invader of forested floodplains, ditches, forest edges, fields, and trails and was found on CBTS in all of the listed areas. This invasive is a significant problem at CBTS. Microstegium was located at CBTS on floodplains along most streams, on wet depressions within mesic mixed hardwood forest, and in piedmont bottomland forest. An estimated 3.2 acres of Butner property contains established Microstegium populations (Figure 8.). Microstegium is spread by regular mowing, tilling, foot traffic, as well as natural disturbances such as scouring associated with flooding. Populations found at CBTS along streams will most likely have populations established throughout the floodplain along drainage paths. Populations are spreading along tails at CBTS due to vehicle movement and foot traffic.

5.5.2 Recommended control procedures for Microstegium

Foliar Control. Apply a glyphosate herbicide as a 2-percent solution in water (8ounces per 3-gallon mix) with a surfactant in summer. Or, apply Vantage (see label) for situation that require more selective control and less impact on associated plants and wetlands.

Integrate approach. Mowing or pulling just before seed set will also prevent seed build-up in the soil seed bank. Repeat treatments for several years to control abundant germinating seeds.

Figure 8. Nepalese Browntop Populations on CBTS



Site: North Carolina National Guard Camp Butner Training Site Stem, North Carolina	*tlmaiams Al Tbdr BtSI.*	ame& AMEC Earth & Environmental, Inc. 4513 Creedmoor Road Suite 400 Raleigh, NC 27612

5.6 PAULOWNIA TOMENTOSA, PRINCESS TREE – BIOLOGICAL DESCRIPTION

Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud. **PAtO2** Synonym: empresstree

Plant. Deciduous tree to 60 feet (18 m) in height and 2 feet (60 cm) in diameter with large heart-shaped leaves, fuzzy hairy on both sides, showy pale-violet flowers in early spring before leaves, and persistent pecan-shaped capsules in terminal clusters in summer to winter. Abundant flower buds present on erect stalks over winter.

Stem. Twigs and branches stout, glossy gray brown and speckled with numerous white dots (lenticels). No terminal bud. Lateral leaf scars raised, circular, and becoming larger, dark, and sunken. Bark light-to-dark gray, roughened, and becoming slightly fissured. Stem pith chambered or hollow and wood white.

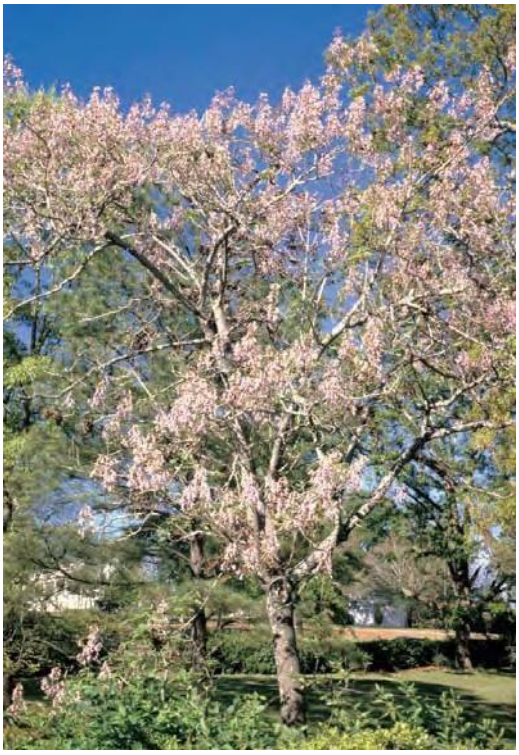
Leaves. Opposite, heart-shaped and fuzzy hairy on both surfaces, 6 to 12 inches (15 to 30 cm) long and 5 to 9 inches (13 to 23 cm) wide. Leaves larger on resprouts, 16 to 20 inches (40 to 50 cm) across, with extra tips often extending at vein tips. Petioles rough hairy, 2 to 8 inches (5 to 20 cm) long.

Flowers. April to May. Covered with showy erect panicles of pale-violet flowers before leaves in early spring, tubular with five unequal lobes. Fragrant. Flower buds fuzzy, linear, and becoming ovoid in summer and persistent on erect stalks over winter.

Fruit and seeds. June to April. Terminal clusters of pecan-shaped capsules 1 to 2 inches (2.5 to 5 cm) long and 0.6 to 1 inch (1.5 to 2.5 cm) wide. Pale green in summer turning to tan in winter and eventually black and persistent into spring. Capsules splitting in half during late winter to release tiny winged seeds.

Ecology. Common around old homes, on roadsides, riparian areas, and forest marigins in infested areas. Infrequently planted in plantations. Spreads by wind and water dispersed seeds. Invades after fire, harvesting, and other disturbances. Forms colonies from root sprouts.

States with suspected infestations are shown in gray.



Princesstree - April

Resembles southern catalpa, *Catalpa bignonioides* Walt., and northern catalpa, *C. speciosa* (Warder) Warder *ex* Engelm., which have leaves with sparsely hairy upper surfaces and rough hairy lower surfaces and long slender, persistent beans.

History and use. Introduced in the early 1800s from East Asia. Has been widely planted as an ornamental and grown in scattered plantations for speculative high-value wood exports to Japan.

October
June
June
June
March
June
June
October

5.6.1 Princess tree at CBTS

One population of princess tree was located at CBTS (Figure). Princess tree population was estimated to cover approximately .001 acres. Several mature trees were seen along the borders of CBTS on neighboring properties. Princess tree seeds are winged and can spread in strong winds. This species should be monitored yearly for additional populations.

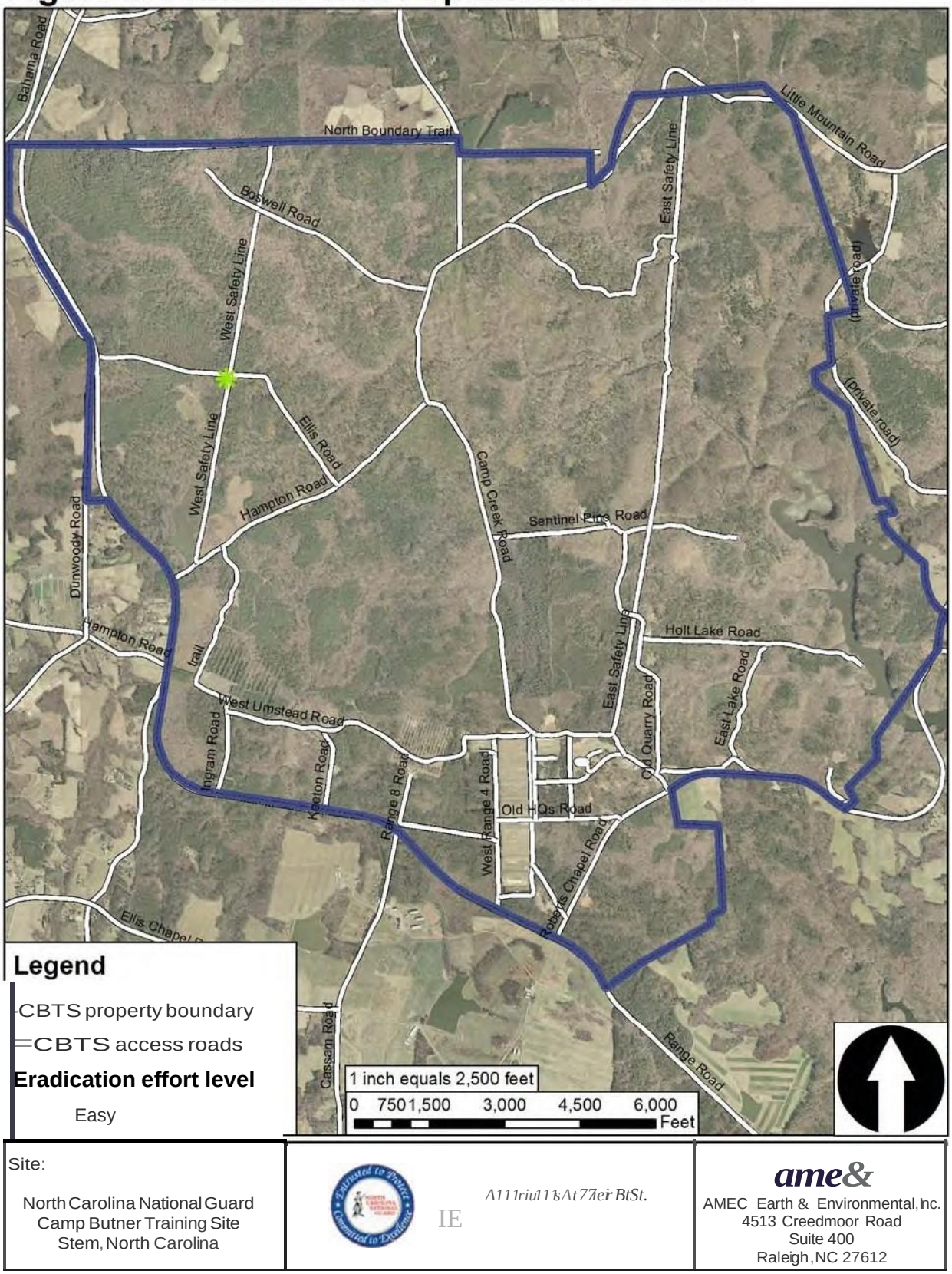
5.6.2 Recommended control procedures for Princess tree

Large trees. Make stem injections using Arsenal AC* or a glyphosate herbicide in dilutions and cut spacings specified on the herbicide label. Treat anytime except March and April. When felling trees, apply the herbicides listed to the stems and stump tops immediately after cutting.

Saplings. Apply Garlon 4 as a 20-percent solution in basal oil, begetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II to yound bark as a basal spray.

Resprouts and seedling. Wet leaves with on of the following herbicides in water with a surfactant (July to October): Aresenal AC* as a 1-[ercent solution (4 ounces per 3-gallon mix); a glyphosate herbidide, Garlon 3A or Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix).

Figure 9. Princess Tree Populations on CBTS



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5.7 PUERARIA MONTANA VAR. LOBATA, KUDZU BIOLOGICAL DESCRIPTION

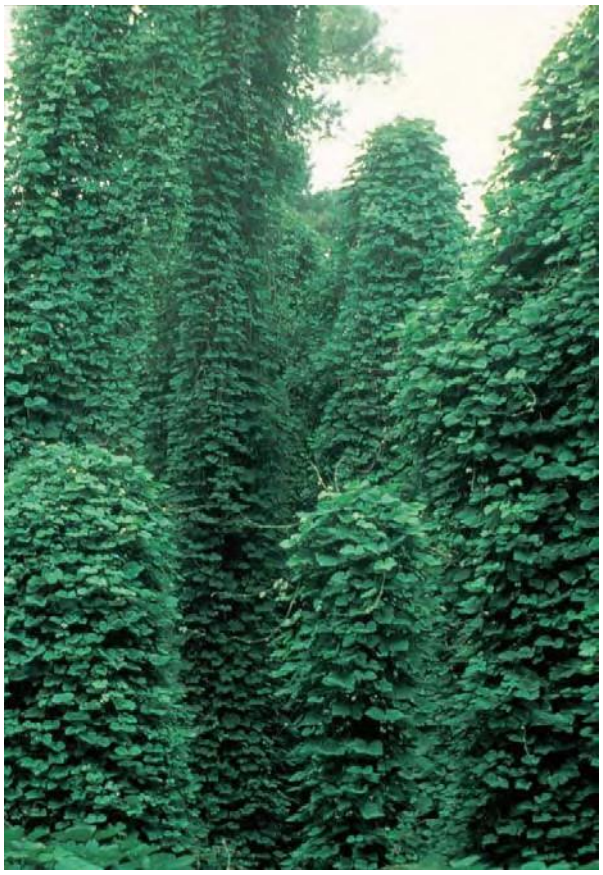
Pueraria montana (Lour.) Merr. **PUMOL**
Synonyms: *P. lobata* (W_lld.) Ohwi, *P. montana var. lobata* (Willd.) Maesen & S. Almeida

States with suspected infestations are shown in gray.

Plant. Deciduous twining, trailing, mat-forming, ropelike woody leguminous vine, 35 to 100 feet (10 to 30 m) long with three-leaflet leaves. Large semiwoody tuberous roots reaching depths of 3 to 16 feet (1 to 5 m). Leaves and small vines dying with first frost and matted dead leaves persistent during winter.

Stem. Woody vines to 10 inches (25 cm) in diameter, round in cross section, with infrequent branching. Stems yellow green with dense erect golden hairs and upward matted silver hairs, aging to ropelike, light gray, and hairless. Frequent unswollen nodes that root when on the ground. Mature bark eventually rough, rigid, and usually dark brown.

Leaves. Alternate, pinnately compound three-leaflet leaves, each leaflet 3 to 7 inches (8 to 18 cm) long and 2.5 to 8 inches (6 to 20 cm) wide. Usually slightly lobed (unless in shade): a two-lobed symmetric middle leaflet and two one-lobed side leaflets, all petioles swollen near leaflets. Tips pointed. Margins thin membranous and fine golden hairy. Leafstalks 6 to 12 inches (15 to 30 cm) long, long hairy, base swollen, with deciduous stipules.



Kudzu - July

Flowers. June to September. Axillary slender clusters (racemes), 2 to 12 inches (5 to 30 cm) long, of pealike flowers in pairs (or threes) from raised nodes spiraling up the stalk, opening from the base to top. Petals lavender to wine colored with yellow centers.

Fruit and seeds. September to January. Clustered dry, flattened legume pods (bulging above the seeds) each 1.2 to 3 inches (3 to 8 cm) long and 0.3 to 0.5 inch (8 to 12 mm) wide. Green ripening to tan with stiff golden-brown hairs. Splitting on one to two sides to release a few ovoid seeds.

Ecology. Occurs in old infestations, along right-of-ways and stream banks. Forms dense mats over the ground, debris, shrubs, and mature trees forming dense patches by twining on objects less than 4 inches (10 cm) in diameter. Colonizes by vines rooting at nodes and spreads by wind, animal, and water dispersed seeds. Seed viability variable. Leguminous nitrogen fixer.

History and use. Introduced from Japan and China in early 1900s with continued seed importation. Erosion control, livestock feed, and folk art.

Kudzu
October
April
June
July
November
T. Bodner

5.7.1 Kudzu at CBTS

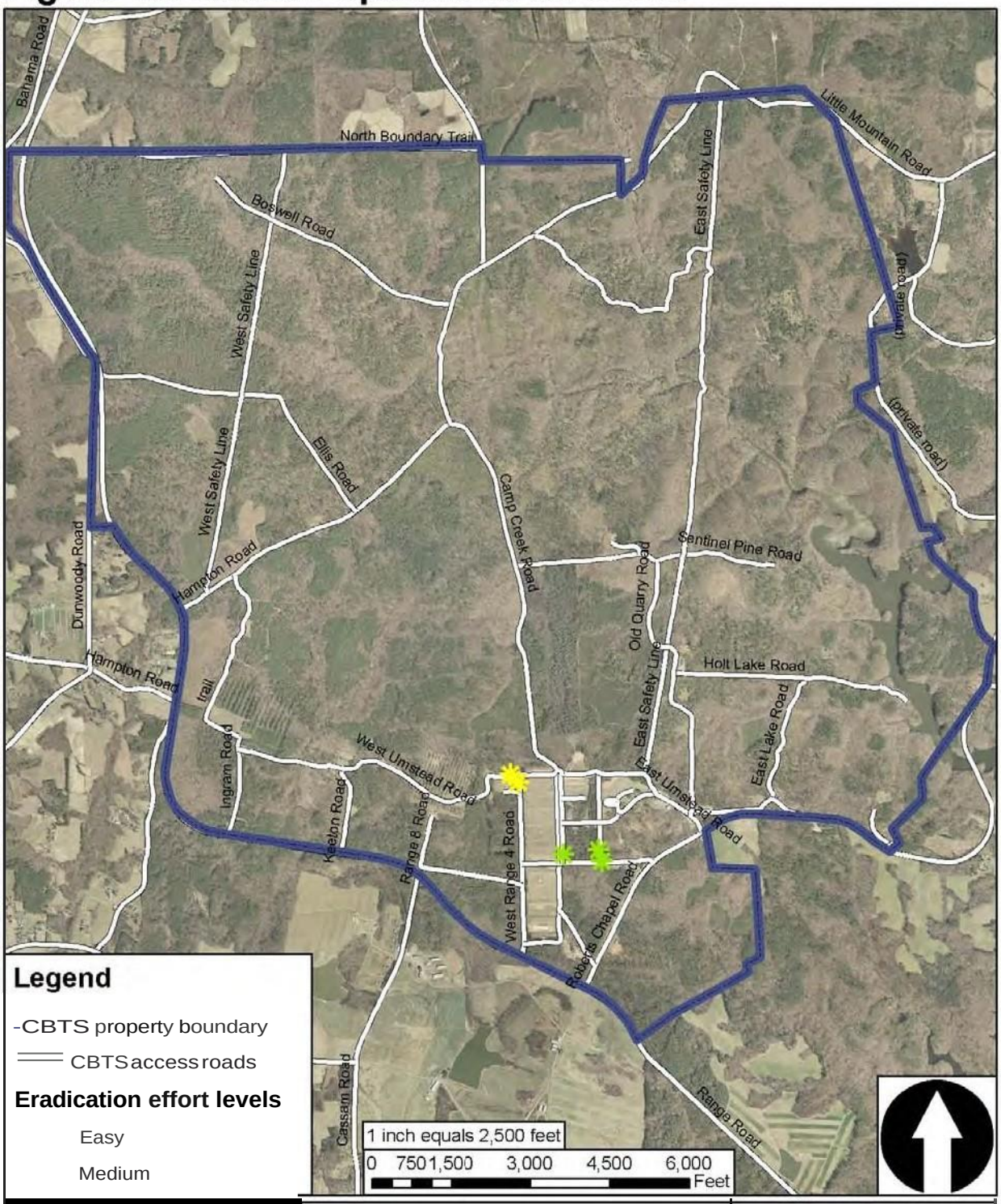
Although kudzu is not currently a major problem at CBTS, kudzu will remain a constant threat to CBTS due to neighbouring populations. Large infestations of Kudzu are found along all roads surrounding CBTS property. An estimated .2 acres of kudzu is established at CBTS currently. Large root crowns develop as plants age and are a reason Kudzu is difficult to control. Populations should be treated immediately to stop the spread and monitored yearly for resprout. In addition, CBTS should monitor its borders yearly to prevent new populations from establishing on CBTS lands. Kudzu can spread via wind, water, and animal movement.

5.7.2 Recommended control procedures for Kudzu

Foliar Control. Wet all leaves (until runoff occurs) with one of the following herbicides in water with a surfactant for successive years until regrowth does not occur – July to September, Escort * XP (nontarget plants may be killed or injured by root uptake) at 3 to 4 ounces per acre in water (0.8 to 1.2 dry ounces per 3-gallon mix). When safety to surrounding vegetation is necessary, Transline (Transline control a narrow spectrum of plant species) as a 0.5-percent solution in water (2ounces per 3-gallon mix); spray climbing vines as high as possible or cut vines that are not controlled after herbicide treatment.

Partial Control. Apply Garlon 4 or a glyphosate herbicide as a 4-percent solution in water (1 pint per 3-gallon mix) with a surfactant during the growing season and apply repeatedly. Cut large vines and immediately apply these herbicides to the cut surfaces. For controlling vines less than 2 inches in diameter, apply Garlon 4 as a 20 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II as a basal spray to large vines as a basal spray (January to April).

Figure 10. Kudzu Populations on CBTS



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Raleigh, NC 27612

5.0 WISTERIA SINENSIS, CHINESE WISTERIA BIOLOGICAL DESCRIPTION

Chinese wisteria, *Wisteria sinensis* (Sims) DC. **WISI Japanese wisteria, *W. floribunda*** (Willd.) DC. **WIFL**

Plant. Deciduous high climbing, twining, or trailing leguminous woody vines (or cultured as shrubs) to 70 feet (20 m) long. Chinese and Japanese wisteria difficult to distinguish due to possible hybridization.

Stem. Woody vines to 10 inches (25 cm) in diameter with infrequent alternate branching. Twigs densely short hairy. Older bark of Chinese wisteria tight and dark gray with light dots (lenticels) compared to white bark of Japanese wisteria.

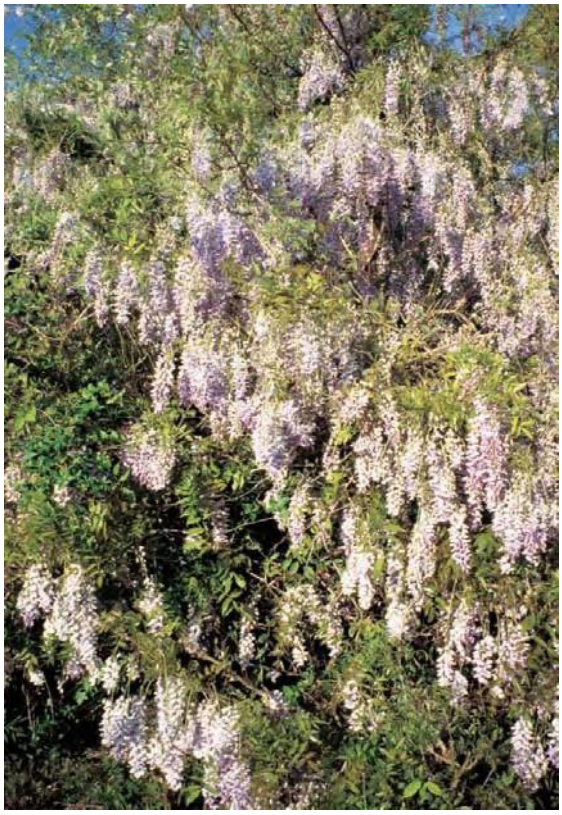
Leaves. Alternate, odd pinnately compound 4 to 16 inches (10 to 40 cm) long, with 7 to 13 leaflets (Chinese) or 13 to 19 leaflets (Japanese), and stalks with swollen bases. Leaflets oval to elliptic with tapering pointed tips
1.6 to 3 inches (4 to 8 cm) long and 1 to 1.4 inches (2.5 to 3.5 cm) wide. Hairless to short hairy at maturity but densely silky hairy when young. Margins entire and wavy. Sessile or short petioled.

Flowers. March to May. Dangling and showy, stalked clusters (racemes) appearing when leaves emerge, 4 to 20 inches (10 to 50 cm) long and 3 to 3.5 inches (7 to 9 cm) wide. All blooming at about the same time (Chinese) or gradually from base (Japanese). Pealike flowers, corolla lavender to violet (to pink to white). Fragrant.

Fruit and seeds. July to November. Flattened legume pod, irregularly oblong to oblanceolate, 2.5 to 6 inches (6 to 15 cm) long and 0.8 to 1.2 inches (2 to 3 cm) wide. Velvety hairy, greenish brown to golden, splitting on two sides to release one to eight flat round brown seeds, each 0.5 to 1 inch (1.2 to 2.5 cm) in diameter.

Ecology. Form dense infestations where previously planted. Occur on wet to dry sites. Colonize by vines twining and covering shrubs and trees and by runners rooting at nodes when vines covered by leaf litter. Seeds are water-dispersed along riparian areas. Large seed size a deterrent to animal dispersal.

States with suspected infestations are shown in gray.



Chinese wisteria - April

resemble native or naturalized American wisteria, *W. frutescens* (L.) Poir., which does not form extensive infestations, occurs in wet forests, flowers in June to August after leaves developed, and has 6-inch (15-cm) flower clusters, 9 to 15 leaflets, hair-less pods, and slender old vines. **Also may resemble** trumpet creeper, *Campsis radicans* (L.) Seem. ex Bureau, which has leaflets with coarsely toothed margins.

History and use. Introduced from Asia in the early 1800s. Traditional southern porch vines.

Chinese wisteria shown in images

Non-native Wisterias

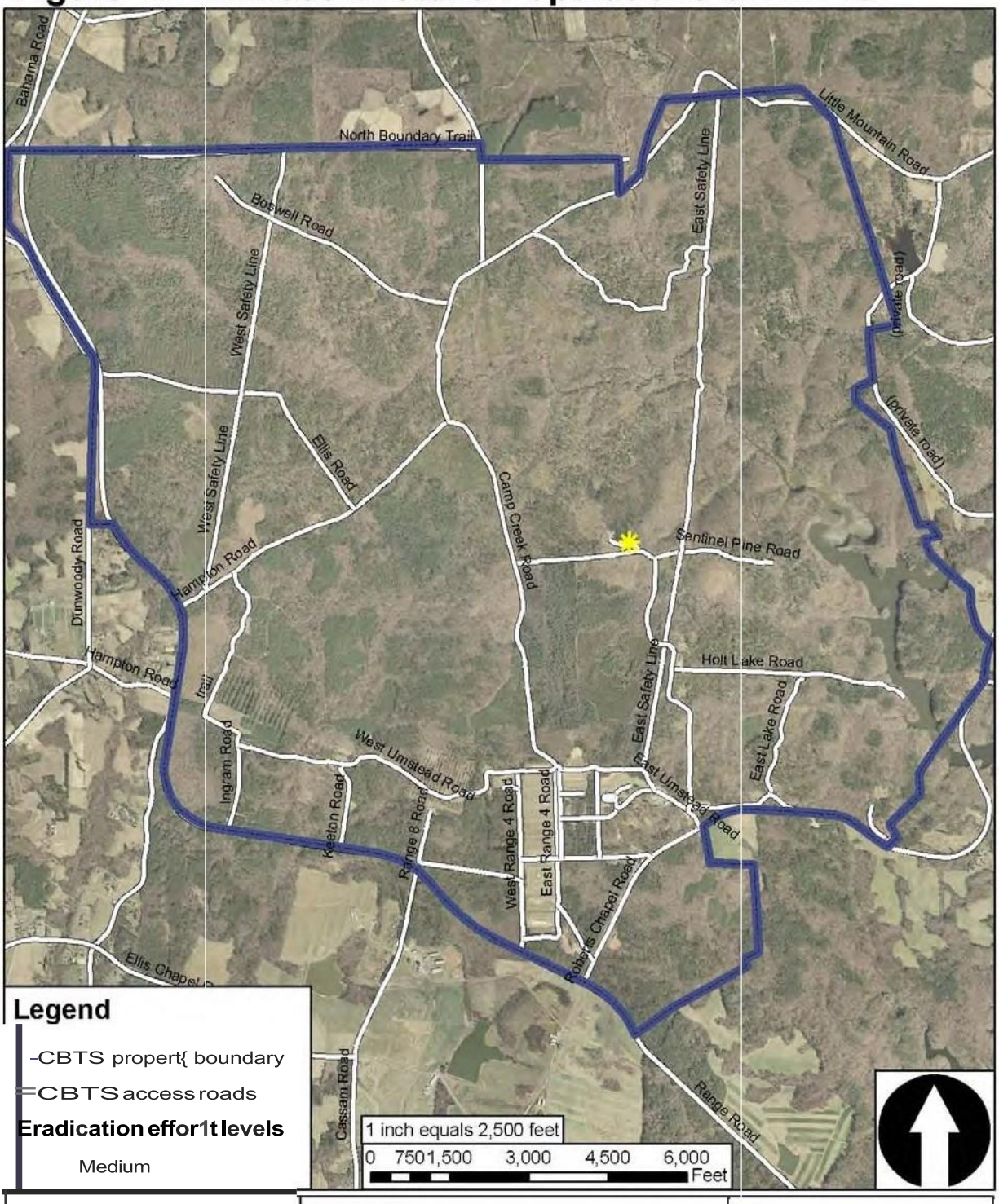
5.8.1 Chinese wisteria at CBTS

Chinese wisteria and Japanese wisteria are difficult to distinguish apart due to hybridization between the species. One population of Chinese wisteria was sighted at CBTS and was approximately.4 acres in size. Wisteria is a popular landscaping plant and although it was not sighted in the neighbourhood immediately surrounding CBTS, it could have been introduced to the site.

5.8.2 Recommended control procedures for Chinese wisteria

Foliar Control. Wet all leaves (until runoff occurs) with one of the following herbicides in water with a surfactant: In July to October for successive years when regrowth appears use Garlon 4 as a 4-percent solution (15ounces per 3-gallon mix). For July to September for successive years when regrowth appears use Transline (controls a narrow spectrum of plant species) as a 0.5 percent solution in water (2 ounces per 3-gallon mix when safety to surrounding vegetation is desired. In September through October with repeated application use a glyphosate herbicide as a 4-percent solution (1 pint per 3-gallon mix).

Figure 11. Chinese Wisteria Populations on CBTS



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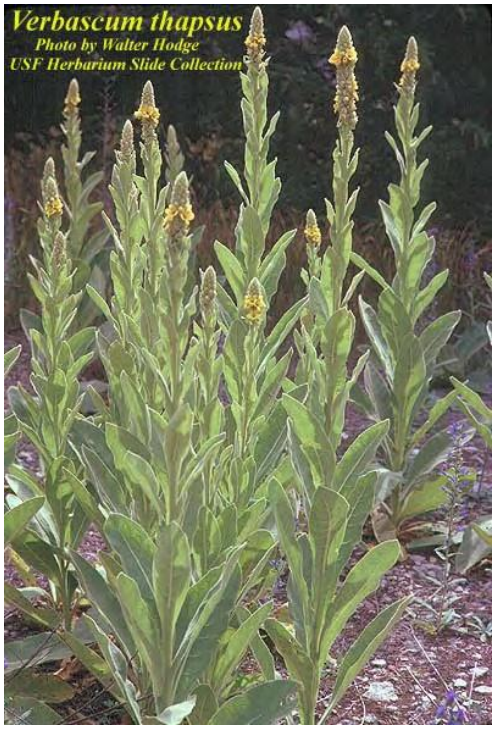
6.0 OTHER NOXIOUS WEEDS

Common mullein was sighted during the field survey on CBTS (Figure 10). *Verbascum thapsus* is considered noxious weeds in current literature and is listed on State lists in Colorado and Hawaii. It is not currently listed on the Federal Noxious Weeds list or North Carolina's State list of invasives. This plant can be weedy or invasive according to several sources and is considered a Class C noxious weed*.



Common names for *Verbascum thapsus* include: big taper, common mullein, flannel plant, velvet dock, velvet plant, and woolly mullein. Common mullein is a weed of landscapes, perennial crops, and roadsides, often found in gravel where the soil is dry. The biennial herb forms a large basal rosette the first year and an erect, usually non-branched stem the second year. Leaves of the basal rosette and stem are densely hairy. After the stem has grown, fused yellow petals are present from June through September. The plant is found throughout the US.

Common mullein was seen along newly graded road at CBTS and although individuals were few, totalling .001 acres, the species should be monitored. If the plants begin to grow a monoculture along roadsides eradication measures should be taken. The primary areas of concern at CBTS are newly upturned roads with soil that have high gravel content, are dry upland soil, and receive full sun.

* Uva, R.H., J.C. Neal, & J.M. DiTomaso. 1997. *Weeds of the Northeast*. Cornell University Press. Ithaca, New York. 397pp.

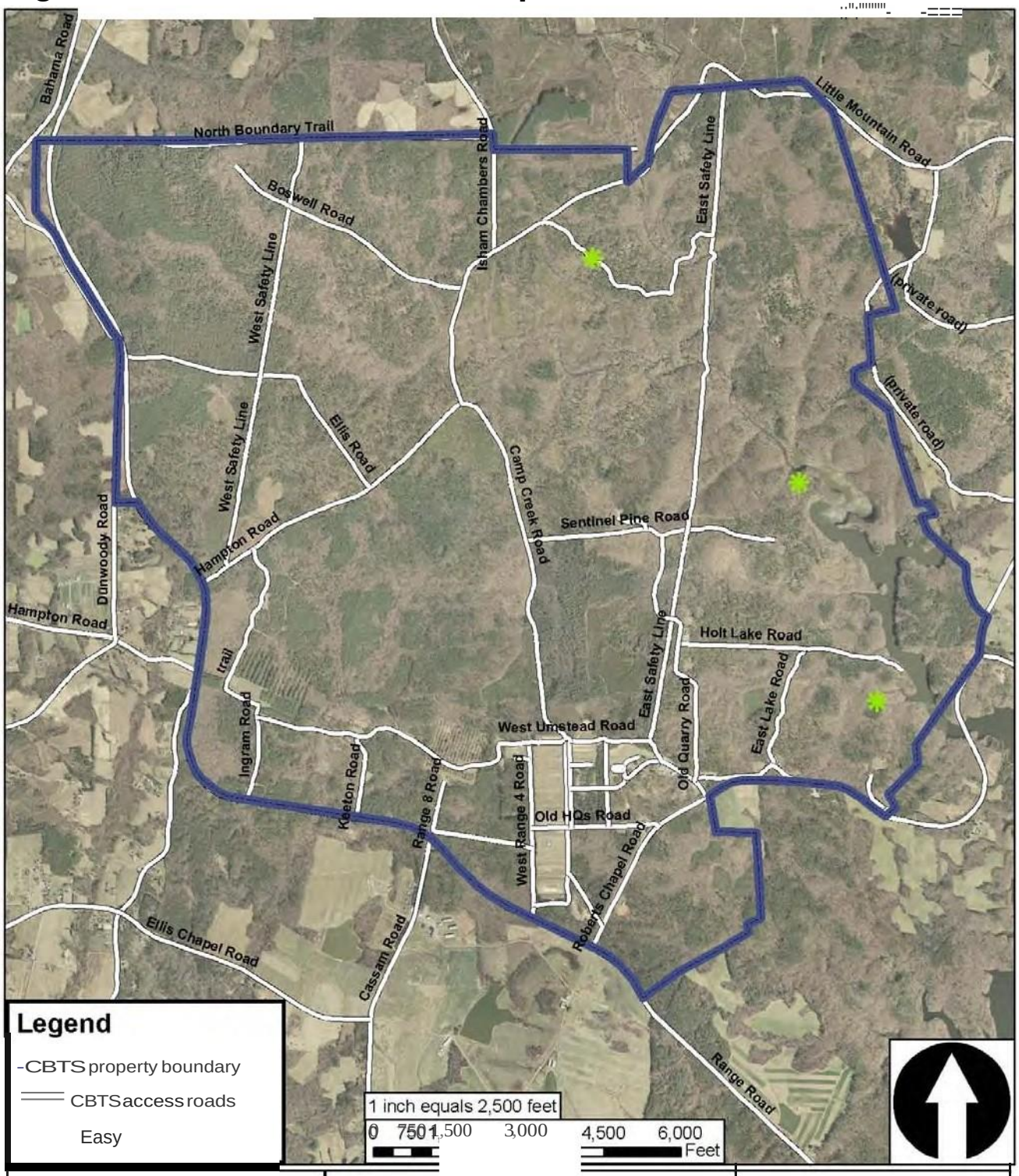
7.0 CONCLUSIONS

Managing and controlling invasive exotic plants is difficult, expensive and requires a long-term commitment. Managers have limited resources and so prioritizing efforts is critical. High priority should be given to those species that have substantial impacts on natural resources or are believed to be easy to manage. High priority should also be given to those species that are not yet established or causing major impacts but have the potential to do so. Low priority should be given to species that cause little impact, are virtually impossible to control, or both.

High priority populations at CBTS are the following (given in order of importance): all populations of kudzu, English ivy, Chinese wisteria, silk tree, princess tree, and tree-of-heaven. Populations of Japanese honeysuckle that can be easily eradicated (green populations), and similar populations of Chinese lespedeza should also be considered high priority.

Low priority populations would include: easily eradicated populations of Microstegium, difficult eradication level populations of Chinese lespedeza, medium and difficult eradication level populations of Japanese honeysuckle, medium and difficult eradication level populations of Microstegium.

Figure 12. Common Mullien Populations on CBTS



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APPENDIX A

AGENCY COORDINATION AND NATIVE AMERICAN CONSULTATION

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CONTENTS

Native American Consultation

INRMP Agency Review and Concurrence Letters

STATE OF NORTH CAROLINA
DEPARTMENT OF PUBLIC SAFETY
JOINT FORCE HEADQUARTERS
NORTH CAROLINA NATIONAL GUARD

August 31, 2015

PAT MCCRORY
GOVERNOR

FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Governor Edwina Butler-Wolfe
Absentee-Shawnee Tribe of Indians of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, OK 74801

Dear Governor Butler-Wolfe,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

If you have interest, we invite you to join us as a consulting party as we update the Integrated Natural Resources Management Plan in accordance with 36 CFR Part 800.2, EO 13175 and DoD Native American and Alaska Native Policy. With your advice and assistance, we hope to maintain an ongoing cooperative relationship between your Nation and the North Carolina National Guard.

You may contact our natural/cultural resources manager, Mr. Michael Glisson, at (984) 664-6268 or michael.h.glisson.nfg@mail.mil. Mr. Glisson, in coordination with his counterpart in your tribe, can outline areas of concern and provide you with further information.

If you would like to confer with the senior leadership of the North Carolina National Guard, please contact COL Clifford Wilkins, my liaison and technical point of contact for this endeavor, at the address above, by telephone at (984) 664-6178 or by email, at Clifford.w.wilkins.mil@mail.mil.

Sincerely,

Gregory A. Lusk
Major General, NCARNG
Adjutant General

1636 Gold Star Drive, Raleigh, NC 27607-3371, Telephone: (919) 664-6000, DSN 582-9210

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SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Chief Bill Harris
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730

Dear Chief Harris,

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1636 Gold Star Drive, Raleigh, NC 27607-3371, Telephone: (919) 664-6000, DSN 582-9210

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SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Principal Chief George Tiger
Muscogee (Creek) Nation of Oklahoma
PO Box 580
Okmulgee, OK 74447

Dear Principal Chief Tiger,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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Gregory A. Lusk
Major General, NCARNG
Adjutant General

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SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Principal Chief Bill John Baker
Cherokee Nation
PO Box 298
Tahlequah, OK 74465

Dear Principal Baker,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Principal Chief Michell Hicks
Eastern Band of Cherokee Indians of North Carolina
PO Box 455
Cherokee, NC 28719

Dear Principal Chief Hicks,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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You may contact our natural/cultural resources manager, Mr. Michael Glisson, at (984) 664-6268 or michael.h.glisson.nfg@mail.mil. Mr. Glisson, in coordination with his counterpart in your tribe, can outline areas of concern and provide you with further information.

If you would like to confer with the senior leadership of the North Carolina National Guard, please contact COL Clifford Wilkins, my liaison and technical point of contact for this endeavor, at the address above, by telephone at (984) 664-6178 or by email, at Clifford.w.wilkins.mil@mail.mil.

Sincerely,

Gregory A. Lusk
Major General, NCARNG
Adjutant General

1636 Gold Star Drive, Raleigh, NC 27607-3371, Telephone: (919) 664-6000, DSN 582-9210

STATE OF NORTH CAROLINA
DEPARTMENT OF PUBLIC SAFETY
JOINT FORCE HEADQUARTERS
NORTH CAROLINA NATIONAL GUARD

August 31, 2015

PAT MCCRORY
GOVERNOR

FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Chief George Wickliffe
United Keetoowah Band of Cherokee Indians of Oklahoma
PO Box 746
Tahlequah, OK 74465

Dear Chief Wickliffe,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Tribal Administrator Jodi Hayes
Shawnee Tribe
29 South Highway 69A
Miami, OK 74354

Dear Tribal Administrator Hayes,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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Gregory A. Lusk
Major General, NCARNG
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GOVERNOR

FRANK L. PERRY
SECRETARY

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

Chief Leo Henry
Tuscarora Nation
2006 Mt. Hope Road
Lewiston, NY 14092

Dear Chief Henry,

The North Carolina National Guard (NCNG) intends to update its Integrated Natural Resources Management Plan for the Camp Butner Training Center (CBTC). The CBTC is a military training site managed by the NCNG that encompasses approximately 4,880 acres in Durham and Granville Counties, North Carolina (see attached figure). Prior to implementing this action, we wish to consult with federally recognized Indian Nations that may have ancestral ties to the area.

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Sincerely,

Gregory A. Lusk
Major General, NCARNG
Adjutant General

Glisson, Michael H NFG NG NCARNG (US)

From: Caitlin Haire <caitlinh@ccppcrafts.com>
Sent: Friday, October 16, 2015 10:45 AM
To: Glisson, Michael H NFG NG NCARNG (US)
Subject: Camp Butner Training Center

Mr. Glisson,

The Catawba wish to be a consulting party. Thanks

Caitlin

--

Caitlin Totherow
Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, SC 29730

803-328-2427 ext. 226
Caitlinh@ccppcrafts.com < Caution-mailto:Caitlinh@ccppcrafts.com >

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NORTH CAROLINA NATIONAL GUARD

PAT MCCRORY
GOVERNOR

GREGORY A. LUSK
MAJOR GENERAL, NCNG
ADJUTANT GENERAL

NGNC-FMO-DEM

MEMORANDUM FOR RECORD

FROM: Michael Glisson, Natural/Cultural Resources Manager

DATE: 19 Oct 2015

SUBJECT: 2016 INRMP Update Tribal Consultation

Tribal consultation for the above named project was initiated on 1 September 2015, when registered letters were sent to the eight federally recognized Indian tribes with ancestral ties to North Carolina, inviting them to consult on the preparation of the INRMP update.

One response was received from the Catawba Nation. When the Draft INRMP update is completed, the Catawba Nation will be provided with an electronic copy for their review and comment.

Michael Glisson
Natural/Cultural Resources Manager

1636 Gold Star Drive, Raleigh, NC 27607-3371, Telephone: (919) 664-6000, DSN 582-9210
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APPENDIX B

CBTS FOREST MANAGEMENT PLAN (UPDATED)

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CAMP BUTNER FOREST MANAGEMENT PLAN (2006)

Introduction and Background Information

This report is an update of the previous plan dated March 2001, for the timber resources of the Camp Butner Training Facility at Butner, North Carolina. The initial field data collection began during the months of May and June 1994 by Staff Foresters Jim Smith and Larry Such with assistance from Division of Forest Resources Technicians from Durham, Granville, and Wake Counties. Since then all the stand data with regards to timber type has been updated but more field data is needed in order to make better management decisions.

Management Objectives

The NC Division or Forest Resources recommends managing this property to maximize forest health, production, and enhance wildlife habitat while providing for protection of the water resources. It is felt that these objectives can be met on a sustainable basis while maintaining an allowable cut. Managing these resources can be accomplished along with the coordination of the NCNG troop training and activities, which take priority. Management activities such as in-stand burning, reforestation, harvesting, timber stand improvement, buffer establishment and maintenance, and proper trail, road, and culvert maintenance, must be considered to address the objectives above.

Management Concerns

Update Timber Stand Data

In order to meet the objectives above, there is a need for more detailed timber stand data such as specific stand ages, basal areas, site indexes, and current growth data. Such information is important in determining the current growth and volumes and estimating the future growth and volumes of each stand. This information can then be used to make better current/future harvesting decisions based on growth data, while maintaining a sustainable condition. Time and manpower available from the NC Division of Forest Resources to gather this needed field data is generally limited and can pose some challenges. This can be resolved by hiring summer students or a private consultant to collect the data. If the funds are not available to do this, then the NC Division of Forest Resources can gather the data however it may take 2-3 years to complete the survey.

Marketing Timber Resources

Being able to market Camp Butner's timber resources for the maximum amount has always been an issue. Many local buyers and processors have concerns over metal fragments or bullets in the timber, that could shut down their mill operations. Some local mills will not consider Camp Buter's timber because of this. This has affected they way in which timber is marketed on the property. Generally, there should be few if any metal fragments in the non-impact areas of the forest. However there is a better chance of running into metal fragments in the impact areas, which occupies most of the forest area. Earth berms at the end of the ranges will help protect the resource, but is not a guaranteed method.

It is best to market the timber resource through a competitive lump sum bid process. This usually brings the highest price and the least amount of supervision and effort on the Camp staff. Ideally this is the method that

should be used for all sales on the camp however this method can result in early termination of the contract when the buyer is shut down by the mill due to metal fragments. This could result in law suits and lengthy processes to reimburse the bidder the difference in what he cut and what he could not sell. It is felt that the competitive bid lump sum process is best used in areas where there are no metal fragments.

For timber sales that fall within impact areas, it is felt that the only way to successfully market the timber resource is to sell it by the unit or "pay as you cut". This allows the buyer to pay for each load he removes and not for timber left on the stump. In case the mill shuts the buyer down, the buyer has not lost his investment in standing timber he cannot cut. On such sales, it is extremely important to have National Guard personnel present at or near the deck to count each load that is removed from the forest. This tally should be filed and compared to the tickets submitted to be sure all loads are accounted for.

Topographic Limitations

Approximately the eastern one-third of the property contains slopes ranging from 20% to as much as 50% especially in the vicinity of Lake Butner and the major watercourses that feed the Lake. Harvesting and fireline construction within this area should be done with extreme caution to protect the integrity of the water quality as well as the aesthetics of the watershed.

Forest Practice Guidelines Related to Water Quality

All forestland disturbing activities must adhere to the Performance Standards of the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J .0101-.0209) or be subject to the requirements of the N. C. Sedimentation Pollution Control Act of 1973. Also forest best management practices can be followed to help prevent violations of the established Forest Practice Guidelines. These guidelines and best management practices can be viewed through the North Carolina Division of Forest Resources web page (address is in the appedix). Also because of the proximity of the camp to the Neuse River, the Neuse Basin rules must be followed and are very important for any land disturbing activities at Camp Butner. These general guidelines are attached.

The Allowable Cut or Harvest

There are approximately 4575 of woodland acres recognized in this report that can be managed to a greater or lesser degree for timber and wildlife production. Of these acres, there is approximately 1167 acres of hardwoods consisting of either upland or bottomland species. The remaining 3372 acres consists of pine (loblolly or Virginia) or pine/hardwood mixtures.

Since March 2001, there have been 209 acres clear-cut and 143 acres replanted or naturally regenerated at Camp Butner. Approximately 193 acres have been thinned. Those data are shown in Tables 3 and 2, respectively. Much of the timber that has been harvested and thinned has been done in an effort to reduce the incidence of pine bark beetle infestations, to remove decadent and low value stands of Virginia Pine and to replace them with Loblolly Pine. Virginia Pine is purchased by local markets only for pulpwood, a low value product. It is rare that any of it can be sold for ChipNSaw production. Loblolly, however, offers an increase in value since it is extensively used for plywood and solid wood products.

All harvests for timber and wildlife management must be made with respect to the average annual increment for Camp Butner. Timber harvests that routinely exceed the average annual increment will lead to a depletion of the timber resource. It is, therefore, important to quantify the removals of all timber to ensure that overharvesting is avoided, at least, for the long-term. Only the necessity to salvage damaged timber or to replace an inferior species should be used as a reason to overharvest.

Based on the expected yields for natural stands of loblolly pine of varying site indices and similarly

for pine plantations, and the expected yields reported for natural hardwood stands, the 4575 woodland acres at Camp Butner, if well stocked, should reasonably produce, on average, approximately 2.5 tons of wood per acre per year. These figures are based on 40-year rotations for the pine and 50 to 60 year rotations for the bottomland hardwoods. Although hardwoods appear to remain productive with longer rotations, longer rotations, will generally result in reduction of the average annual production for pine. How long pine rotations might be extended without sacrificing too much growth is a point of much contention. If pine rotations are extended substantially, then the average annual increment must be adjusted downward. Also, it is important to note that 15 % of the producing acreage is in bottomland hardwoods that produce over 17% of the average annual production. Completely excluding these bottomlands from any type of harvesting or silvicultural practice will also significantly reduce the allowable harvest at Camp Butner. These sites are the most productive at Camp Butner.

In general, sustainability of the timber resource can be achieved by limiting total harvests to the following guidelines:
All pine stands of a 40 year rotation: 48 acres / year or 240 acres for the 5 year management period.
All pine stands of a 60 year rotation: 25 acres / year or 125 acres for the 5 year management period.
All hardwoods of a 40 year rotation: 3 acres / year or 15 acres for the 5 year management period.
All hardwoods of a 60 year rotation: 5acres / year or 25 acres for the 5 year management period.
All hardwoods of a 100 year rotation: 3 acres / year or 15 acres for the 5 year management period.
All hardwood of a 120 year rotation: 3 acres / year or 15 acres for the 5 year management period.

These rotation lengths are indicated in the attached stand tables and are based on rotation ages and corresponding acres.

Use of Herbicides in Silviculture

Periodically it is important to revisit the young pine plantations that are 2-3 years of age to evaluate their need to be released from competition of primarily sweetgum and red maple. If the stocking of these plantations is low then they will need to be released or the stands will become predominantly sweetgum. It is generally accepted that the use of Arsenal AC will control sweetgum and red maple at a relatively low rate of herbicide per acre. Usually only one application is necessary for the entire rotation. The use of Arsenal AC is also touted by many game biologists to result in improved forage for turkeys and quail, since legumes tolerate the active ingredient (imazapyr)of Arsenal AC very well. Many of the younger stands that were planted in the past 4 years are positioned to be evaluated for this practice.

Additionally, there are several small areas of wisteria and kudzu that should be treated with herbicides to eliminate it from the stands. In addition to replacing the native plant species, the wisteria vines cause trees to be crooked and deformed, resulting in lower product values. One area, in Block A-2, which had a bad wisteria problem, has already been harvested. This area must be watched closely to see that any resprouting is controlled. Garlon 4 or Accord may be used to control this pest.

Prescribe Burning

Prescribe burning is desirable to reduce the losses from wildfire, to improve wildlife habitat, and possibly to restore some rare and threatened plant species. Placing the older pine stands on a 5 year burn cycle would offer a practical and low cost insurance against wildfire. While winter burning may have to be used initially on many stands that have a buildup of fuels, summer burning should be used whenever possible (generally in older pine stands) to combat the proliferation of sweetgum and other woody underbrush, including wisteria, that become unwanted components of most pine stands. Those areas that

have invasions of wisteria vines are prime areas for burning. A summer silvicultural burn will control many of the vines and provide herbaceous plants a greater opportunity to exist in the understory. Several blocks were burned this winter but there are others that need the same treatment. A list of understory burning accomplished since March 2001 has been attached.

The NC Division of Forest Resources wishes to continue the burn program and provide this fee service as the weather and manpower allows.

The Timber Resource

This report divides the Camp Butner Training property into ten blocks that coincide with the ten "sub-areas" identified on the Camp Butner (Special) map. Included is a separate stand type map for each block that illustrates the approximate shape and size of the various stands within each block. A table of data, with generic recommendations for each stand, accompanies each of the block maps. The digital version for these blocks is also available and will generally offer a greater capacity for data analyses than can be reasonably included in this report. A description of the stand types is outlined below and Figures 1, 2, and 3 offer an overview of the forest conditions at Camp Butner.

Stand Types + NCNG Butner

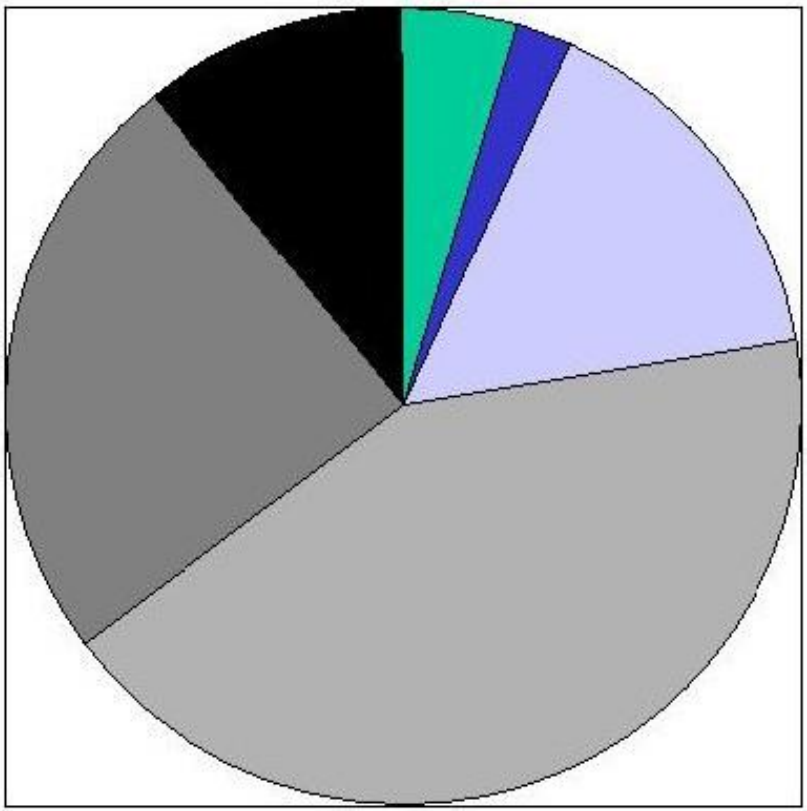
Type 1-5	These are natural pine stands of loblolly (L), shortleaf (S), or Virginia pine (V) or mixtures of these species for the various age classes indicated.
Type 6-9	These are bottomland hardwoods of various species (chiefly yellow poplar, sweetgum, willow oak, water oak and red maple) for the age classes indicated.
Type 10-13	These are upland hardwoods of various species (chiefly red oaks, chestnut oaks, white oaks, hickory, beech, yellow poplar) for the age classes indicated.
Type 14-17	These are mixed stands of pines and hardwoods (chiefly oaks) for the various age classes indicated.
Type 18-22	These are loblolly pine plantations for the various age classes indicated.
Type 23	These are old fields or pastures that have been abandoned. They are currently occupied with grasses, briers, shrubs and/or a variety of trees both pines and hardwoods of varying ages and densities
Type 24	These are open areas, such as ranges and parking lots that will not be useful for timber production.

TYPE #	**TYPE DESCRIPTION**
1	Pine (L<S<V) 10 years or less
2	Pine (L<S<V) 11-20 years
3	Pine (L<S<V) 21-30 years
4	Pine (L<S<V) 32-40 years
5	Pine (L<S<V) 41 Years +
6	Bottomland Hardwoods 10 years or less
7	Bottomland Hardwoods 11-30 years

8	Bottomland Hardwoods 31-50 years
9	Bottomland Hardwoods 51 Years +
10	Upland Hardwoods 10 years or less
11	Upland Hardwoods 11-30 years
12	Upland Hardwoods 31-50 years
13	Upland Hardwoods 51 Years +
14	Pine-Hardwood 10 years or less
15	Pine-Hardwood 11-30 years
16	Pine-Hardwood 31-50 years

TYPE #	**TYPE DESCRIPTION**
17	Pine-Hardwood 51 Years +
18	Pine Plantation 10 years or less
19	Pine Plantation 11-20 years
20	Pine Plantation 21-30 years
21	Pine Plantation 31-40 years
22	Pine Plantation 41 Years +
23	Old Fields/Pastures
24	Open Areas

Acres by Type- Figure 1



O Open Areas 225 Acres (5%)

•Old Fields 118 _4.cres (2%)

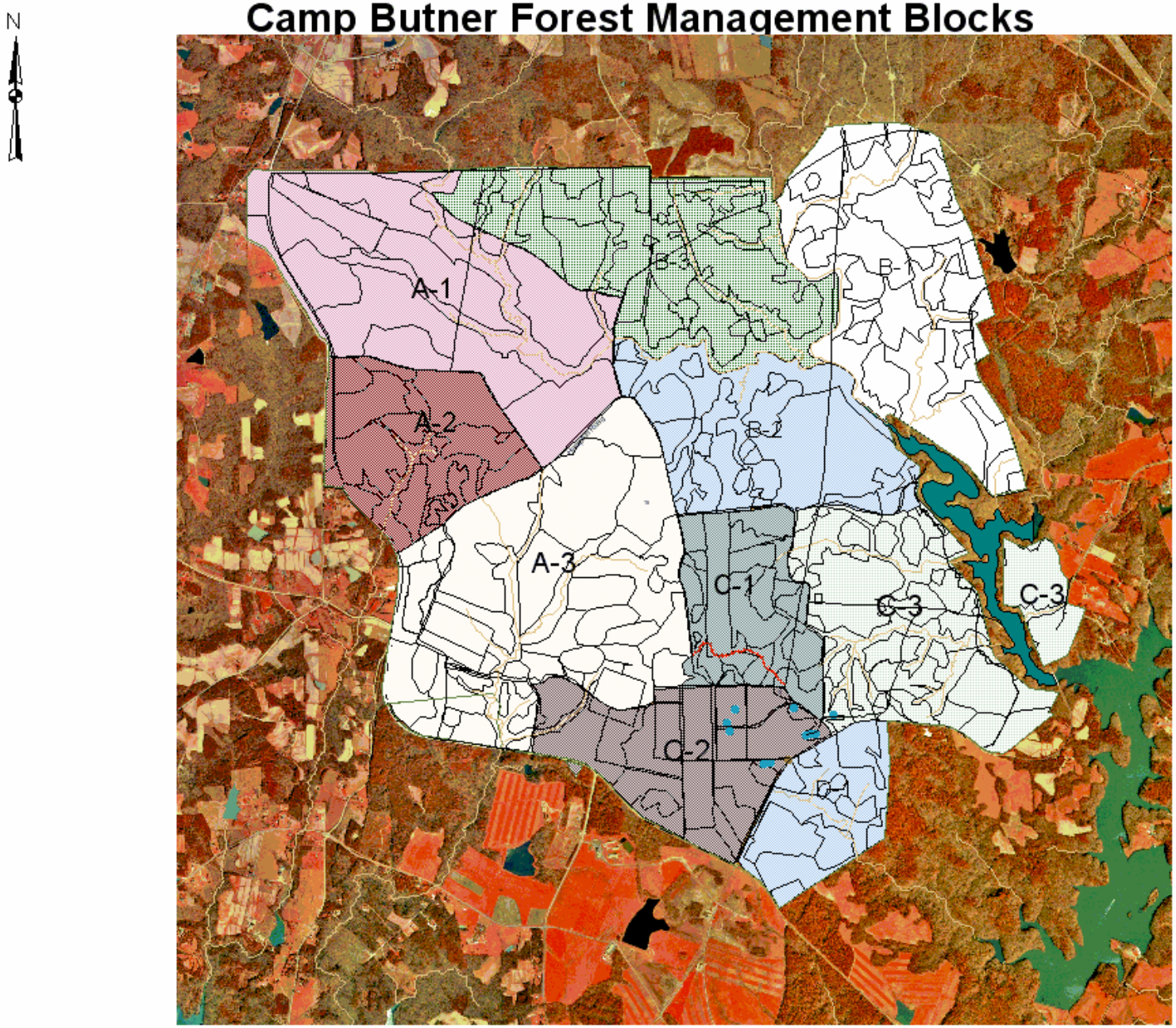
D Pine Plantation 758 Acres (16%)

D Natural Pine 2047 _4.cres (42%)

!Cl Hardwood 1188 Acres (24%)

•Mixed Hd,vd/Pine 533 _4.cres (11%)

Camp Butner Forest Management Blocks

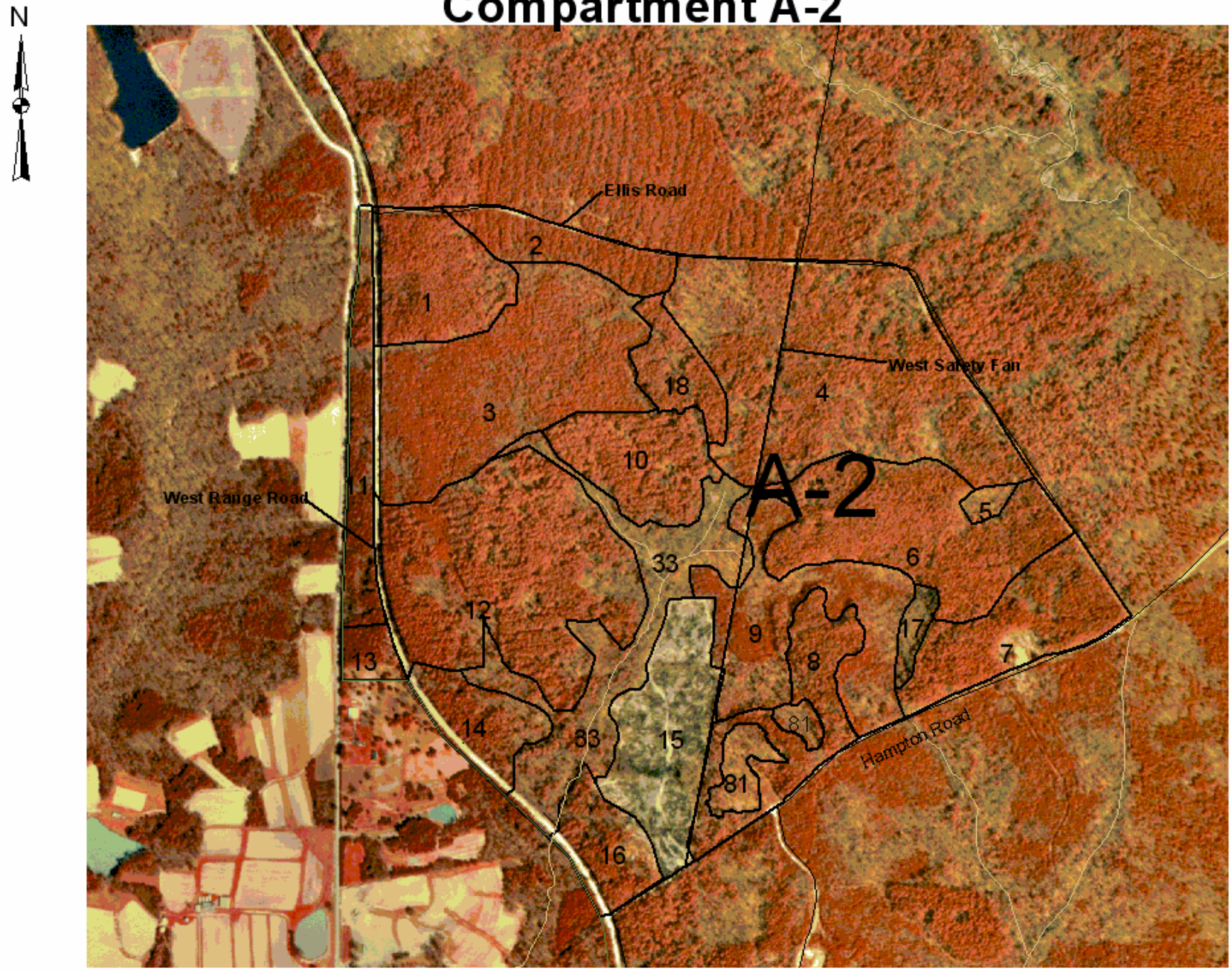



North Boundary Road
Boswell Road
West Safety Fan
West Range Road
Hampton Road
A-1
11
0
12
13
14
4
10
33
7
8
9
N

Block A-1

Stand # / Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendations next 5 years
1 / 40	5	Pine (Loblolly) < 10 years	2006	80-85 Loblolly Pine	67	Check for Release/Growth
2 / 60	6	Bottomland Hardwoods < 10 years	2003	85 Loblolly Pine	16.5	Let grow
4 / 40	2	Pine (L,S,V) 11-20 Years	1979	80-85 Loblolly Pine	32.6	Let grow / Prescribe Burn
7 / 40	4	Pine (L,S,V) 31-40 Years	1950	80-85 Loblolly Pine	74.5	Let grow / Prescribe Burn
8 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	6.7	Let grow / Prescribe Burn
9 / 40	4	Pine (L<SV) 31-40 years	?	80-85 Loblolly Pine	76.1	Let grow / Prescribe Burn
10 / 40	5	Pine(L,S,V)>41 years	1956	80-85 Loblolly Pine	122.6	Check for Harvest / or Prescribe Burn
11 / 40	5	Pine(L,S,V)> 41 years	?	80-85 Loblolly Pine	61	Check for Harvest / or Prescribe Burn
12 / 40	3	Pine (L,S,V) 11-20 Years	?	80-85 Loblolly Pine	58	Check for Thinning/ Prescribe Burn
13 / 40	5	Pine (L,S,V) >41 Years	?	80-85 Loblolly Pine	10.4	Check for Harvest / or Prescribe Burn
14 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	40.5	Check for Thinning/ Prescribe Burn
33 / 60	9	Bottomland Hardwoods 51 Years +	?	90-100 Yellow Poplar	109	Selection Harvest and Watershed Buffer
Total					**674.5**	

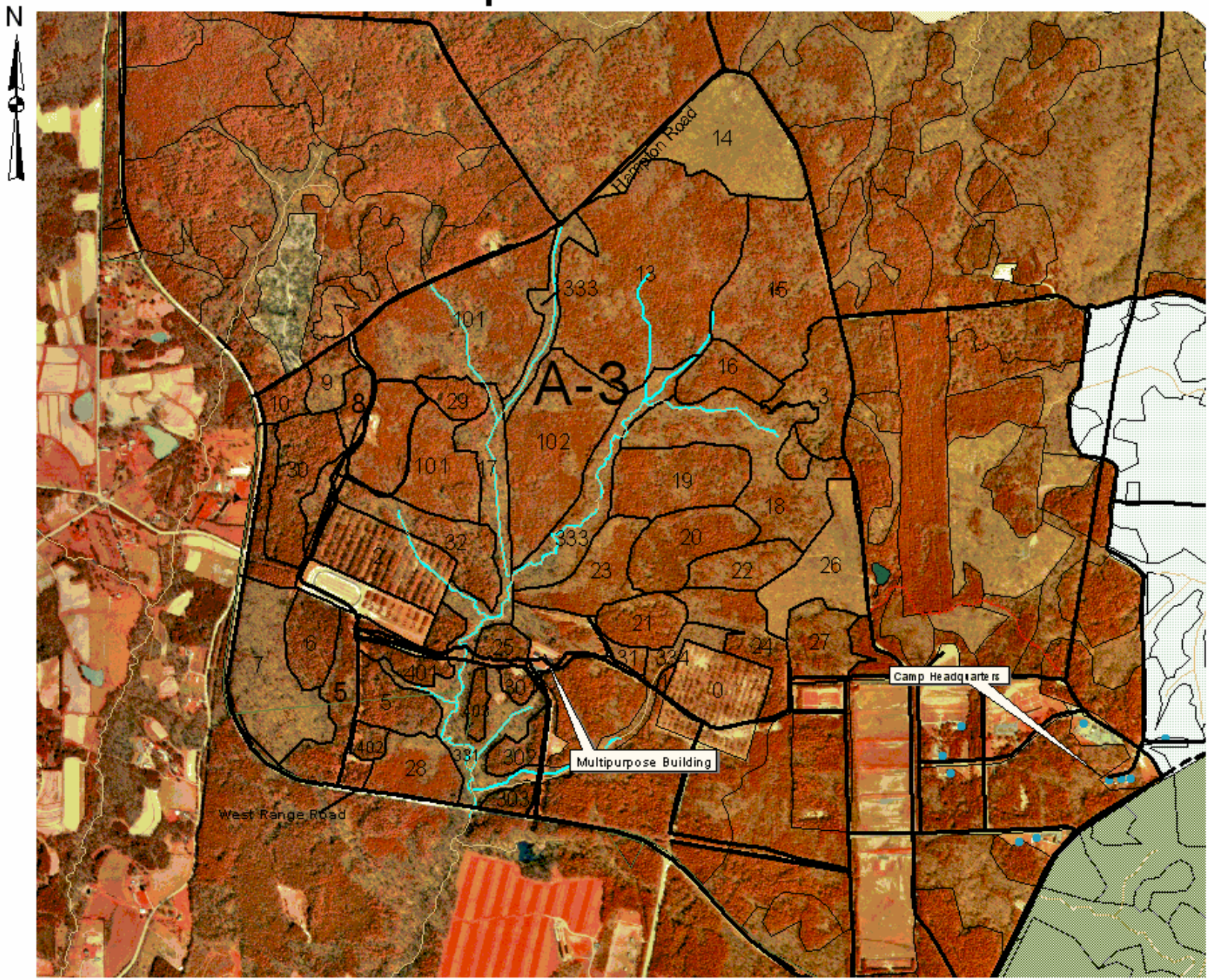
Compartment A-2



Block A-2

Stand#/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	14.5	Check for Harvest
2 / 40	19	Pine Plantation 11-20 Years	1979	80-85 Loblolly Pine	8.3	Prescribe Burn (Winter)
3 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	35.7	Check Growth for Harvest
4 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	50.5	Check Growth for Harvest
5 / 100	13	Upland Hdwds >51years	?	80-85 Loblolly Pine	1.2	Wildlife Habitat--PROTECT
6 / 40	5	Pine(L,S)>41 years	?	80-85 Loblolly Pine	27.1	Prescribe Burn
7 / 40	4	Pine(L,S,V) 31-40 years	?	80-85 Loblolly Pine	16.0	Check Growth / Prescribe Burn
8 / 40	18	Pine Plantation 10years or less	2001	80-85 Loblolly Pine	13.4	Let Grow
9 / 40	2	Pine(L,S,V) 11-20 years	1984	80-85 Loblolly Pine	22.2	Check for Thinning/ Prescribe Burn
10 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	12.7	Check for Harvest
11 / 60	6	Bottomland Hardwood	2003	80-85 Loblolly Pine	9.4	Let Grow
12 / 40	4	Pine(L,S,V) 31-40 years	?	80-85 Loblolly Pine	42	Check Growth / Prescribe Burn
13 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	2.7	Check Growth, Let Grow
14 / 60	5	Pine (L,S,V)> 41 Years	?	70-75 Loblolly Pine	8.7	Check for Harvest
15 / 40	18	Pine Plantation < 10 years	1998	80-85 Loblolly Pine	17.9	Let Grow
16 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	8.0	Check for Thinning
17 / 100	8	Bottomland Hardwoods 31-50 years	?	80-85 Loblolly Pine	2.1	Wildlife Habitat
18 / 40	18	Pine Plantation < 10 years	2000	80-85 Loblolly Pine	6.5	Let Grow
33 / 100	9	Bottomland Hardwoods 51 years +	?	85-90 Loblolly Pine	23.5	Watershed Buffer & Wildlife Habitat
81 / 100	12	Upland Hdwds 31-50 years	?	80 Loblolly Pine	4.8	Wildlife Habitat
Totals					**327.7**	

Compartment A3



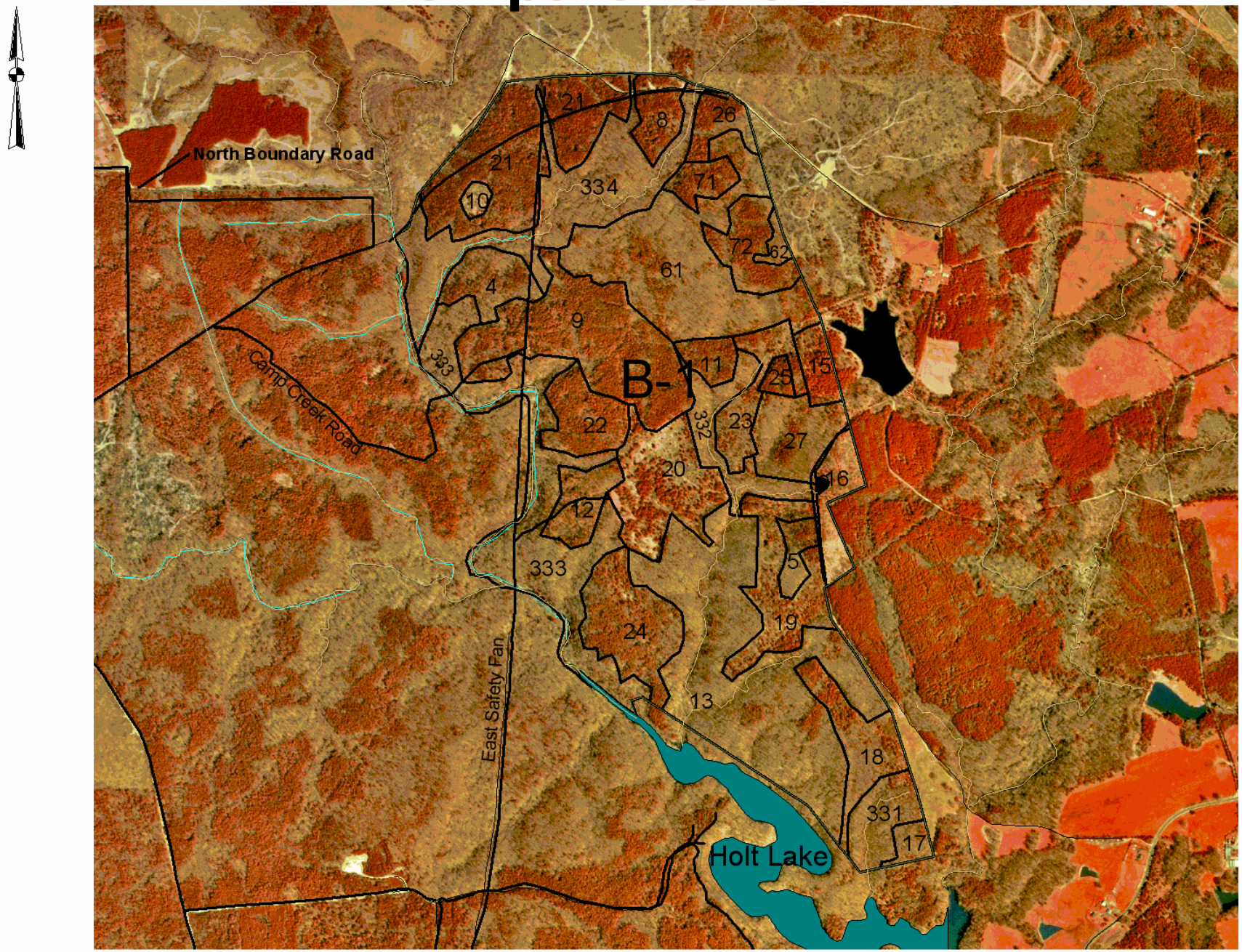
Block A-3

Stand #/ Rotation	Stand Type	Description	Estab.Date	Site Index	ACRES	General Recommendation
1 / 40	5	Pine (L,S,V) >41 Years	?	80-85 Loblolly Pine	0.8	Check growth for Harvest
2 / 40	5	Pine(L,S,V)>41 Years	?	85-90 LoblollyPine	24.4	Clearcut Mature Timber/Regenerate Naturally
3 / 40	1	Pine (Loblolly) <10 years	2003	80-85 LoblollyPine	17.7	Let Grow / Check for Release
5 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	28.8	Check for Thinning/ Prescribe Burn
6 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	11.2	Check Growth for Harvest
7 / 120	13	Upland Hdwds 51 Years +	?	70-75 Red Oak	32.6	Check Growth for Harvest
8 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	20.0	Check Growth for Harvest
9 / 120	13	Upland Hdwds 51 Years +	?	70-75 Red Oak	6.8	Check Growth for Harvest
10 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	6.2	Check Growth for Thinning
13 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	84.1	Check for Thinning/ Prescribe Burn
14 / 40	18	Pine Plantation (L)<10 years	1995	80-85 LoblollyPine	35.7	Let Grow / Check for Release
15 / 60	16	Pine-Hdwd 31-50 Years	?	70-80 LoblollyPine	40.7	Check for Thinning/ Prescribe Burn
16 / 60	5	Pine (L,S,V) >41 Years	?	70-75 LoblollyPine	14	Check Growth for Harvest
17 / 100	9/13	Bottomland & Upland Hdwds 51 +	?	85-90YellowPoplar	21.5	Watershed Buffer & Wildlife Habitat/ Selection Harvest
18 / 80	8/12	Bottom/Upland Hdwds 31-50 Yrs	?	85-90YellowPoplar	39.3	Check Growth for Thinning
19 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	23.5	Check for Thinning/ Prescribe Burn
20 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	18.9	Check Growth for Harvest
21 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	10.9	Check Growth for Harvest
22 / 100	12/4	Upland Hdwds 31-50 Yrs. / Pine (L,S,V) 31-50 Yrs.	?	80-85 LoblollyPine	11.0	Check Growth for Harvest

Block A-3

Stand #/ Rotation	Stand Type	Desription	Estab.Date	Site Index	Acres	General Recommendation
23 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	16.2	Check Growth for Harvest
24 / 40	4	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	16.8	Check Growth for Harvest
25 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	5.3	Check Natural stocking, Let Grow
26 / 40	19	Pine Plantation (L)<10 years	1995	80-85 LoblollyPine	23.0	Let Grow / Check for Release
27 / 40	16	Pine-Hdwd 31-50 Years	?	85-90 YellowPoplar	13.5	Check Growth/ No Treatment Needed Next 10 Years
28 / 40	15	Pine-Hdwd(11-30 Years)	?	80-85 LoblollyPine	13.7	Check Growth
29 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 LoblollyPine	6	Check for Thinning/ Prescribe Burn
30 / 40	1	Pine(l)<10 years	2001	80-85 LoblollyPine	18.6	Let Grow / Check for Release
31 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	2.4	Check Growth for Harvest
32 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	23.6	Check Growth for Harvest
101 / 40	19	Pine Plantation 11-21 years	?	80-85 LoblollyPine	87.9	Check for Thinning/ Prescribe Burn
102 / 40	19	Pine Plantation 11-21 years	?	80-85 LoblollyPine	38.6	Check for Thinning/ Prescribe Burn
301 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	2.9	Check Growth / Prescribe Burn
302 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	6.1	Check Growth / Prescribe Burn
303 / 40	5	Pine (L,S,V) >41 Years	?	80-85 LoblollyPine	3.7	Check Growth / Prescribe Burn
331 / 60	8	Bottomland Hdwds 31-50 Yrs.	?	100+ YellowPoplar	23.3	Watershed Buffer and Wildlife Habitat /Selection Harvest
332 / 60	8	Bottomland Hdwds 31-50 yrs.	?	100 Yellow Poplar	8.9	Let Grow/ Watershed Buffer and Wildlife Habitat
333 / 60	8	Bottomland Hdwds 31-50 Yrs.	?	100+ YellowPoplar	22.5	Watershed Buffer and Wildlife Habitat /Selection Harvest
334 / 100	9	Bottomland Hdwds 51 years +	?	80-85 LoblollyPine	5.4	Watershed Buffer and Wildlife Habitat /Selection Harvest
401 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 LoblollyPine	5.5	Check Growth for Harvest
402 / 40	5	Pine(L,S,V) >41 years	?	80-85 LoblollyPine	3.0	Check Growth for Harvest
403 / 40	18	Pine (L,S,V) <10 Years	2003	80-85 LoblollyPine	3.2	Let Grow / Check for Release
Totals					**798**	

Compartment B-1



Block B-1

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
4 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	12.0	Check Growth for Harvest
5 / 120	11	Upland Hdwds 11-30 Years	?	70-75 Red Oak	5.4	Check Growth/ No Treatment Needed Next 10 Years
8 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	9.2	Check Growth for Thinning/ Prescribe Burn
9 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	49.3	Check Growth for Thinning/ Prescribe Burn
10 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	2.1	Check Stocking and Reforest Where Needed
11 / 40	16	Pine-Hdwd 31-50 Years	?	80-85 Loblolly Pine	5.5	Check Growth for Harvest
12 / 40	5	Pine (L,S,V)> 41 Years	?	80-85 Loblolly Pine	10.2	Check Growth for Harvest
13 / 120	12	Upland Hdwds 31-50 Years	?	70-75 Red Oak	90.0	Check Grwoth for TSI / Wildlife Habitat
15 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	6.4	Check Growth for Harvest
16 / 60	23	Old Fields/Pastures	?	N/A	10.1	Check Stocking and Reforest Where Needed
17 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	3.7	Check Stocking and Reforest Where Needed
18 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	16.2	Check Stocking and Reforest Where Needed
19 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	22.9	Check Stocking and Reforest Where Needed
20 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	27.6	Check Stocking and Reforest Where Needed
21 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	47.2	Check Stocking and Reforest Where Needed
22 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	13.7	Check Growth for Thinning/ Prescribe Burn

Block B-1

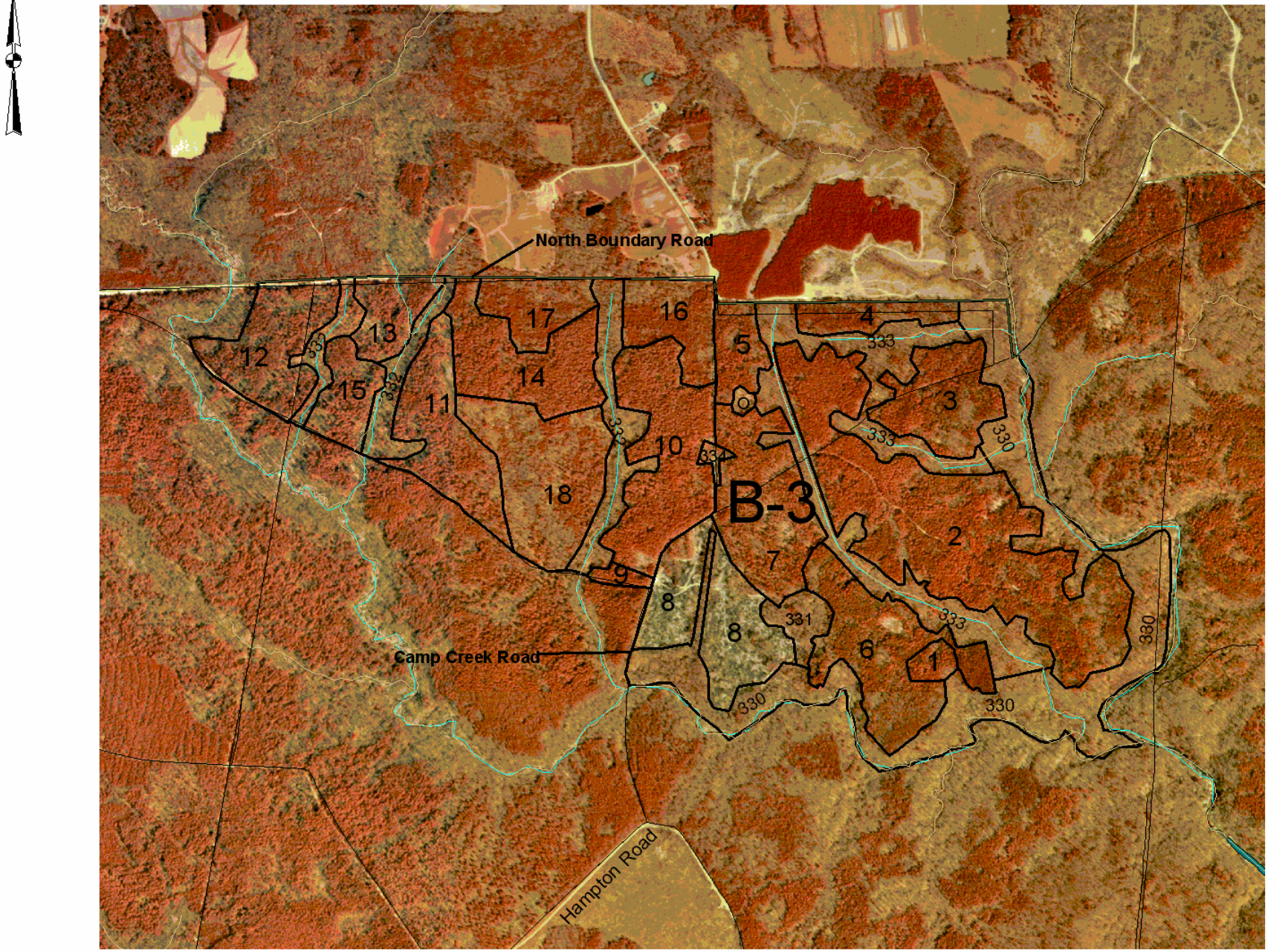
Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
23 / 60	23	Old Fields/Pastures	?	80-85 Loblolly Pine	12.9	Check Stocking and Reforest Where Needed
24 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	23.6	Check Growth for Harvest
25 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	2.5	Check Growth for Thinning/ Prescribe Burn
26 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	7.4	Check Growth for Thinning/ Prescribe Burn
27 / 120	12	Upland Hdwds 31-50 Years	?	75-75 Red Oak	16.4	Check Grwoth for TSI / Wildlife Habitat
61 / 120	12	Upland Hdwds 31-50 Years	?	70-75 Red Oak	57.1	Check Grwoth for TSI / Wildlife Habitat
62 / 120	12	Upland Hdwds 31-50 Years	?	70-75 Red Oak	2.3	Check Grwoth for TSI / Wildlife Habitat
71 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	6.1	Check Growth for Harvest
72 / 40	17	Pine-Hdwd 51 Years +	?	80-85 Loblolly Pine	13.3	Check Growth for Harvest
331 / 100	8	Bottomland Hardwoods 31-50 Years	?	85-90 Yellow Poplar	12.5	Check Growth, Thin if Possible
332 / 100	8	Bottomland Hardwoods 31-50 Years	?	85-90 Yellow Poplar	15.3	Check Growth, Thin, if Possible
333 / 100	9	Bottomland Hardwoods 51 years +	?	85-90 Loblolly Pine	58.8	Watershed Buffer / Wildlife Habitat, Check Growth Selection Harvest
334 / 100	8	Bottomland Hardwoods 31-50 Years	?	85-90 Yellow Poplar	48.1	Watershed Buffer / Wildlife Habitat, Check Growth Selection Harvest
Totals					**512.4**	

Holt Lake
39
41
18
N

Block B-2

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 60	3	Pine (L,S,V) 21-30 Years	?	75-80 Loblolly Pine	18.9	Check Growth for Thinning/ Prescribe Burn
2 / 60	3	Pine(L,S,V) 21-30 years	?	75-80 Loblolly Pine	2.4	Check Growth for Thinning/ Prescribe Burn
3 / 60	4/5	Pine (L,S,V) 31-40 Years / Pine (L,S,V) >41 Years	?	75-85 Loblolly Pine	37.3	Check Growth for Thinning/ Prescribe Burn
4 / 40	4/5	Pine(L,S,V) 31-49 Years/Pine (L,S,V) >41 Years	?	85-90 Loblolly Pine	6.2	Check Growth for Thinning/ Prescribe Burn
5 / 60	16	Pine-Hdwd 31-50 Years	?	75-80 Loblolly Pine	23.9	Check Growth for Harvest
6 / 60	21	Loblolly Pine Plantation	?	75-85 Loblolly Pine	11.5	Check Growth for Thinning/ Prescribe Burn
7 / 40	18	Pine Plantation(L)<10 years	2000	85 Loblolly	5.7	Let grow
8 / 60	21	Pine Plantation 31-40 years	?	75-85 Loblolly Pine	8.5	Check Growth for Thinning/ Prescribe Burn
9 / 60	5	Pine(L,S) >41 Years	?	75-85 Loblolly Pine	4.6	Harvest (Virginia Pine)
10 / 60	16/17	Pine-Hdwd(31-50 years)/(51 Years +	?	75 Loblolly Pine	133	Selection Harvest, Wildlife Habitat/Watershed Buffer
11 / 60	15	Pine-Hdwd 11-30 years	?	80 Loblolly Pine	10.9	Let grow
12 / 60	5	Pine(L,S,V)> 41 years	?	75-85 Loblolly Pine	20.2	Check Growth for Harvest
13 / 60	4	Pine(L,S,) 31-40 years	?	80 Loblolly Pine	15.2	Check Growth for Thinning/ Prescribe Burn
14 / 120	12	Upland Hdwds 31-50 years	?	70-75 Loblolly Pine	3.6	Watershed Buffer/Wildlife Habitat
15 / 60	18	Pine Plantation <10 years	2003	75-80 Loblolly Pine	1.7	TSI release Longleaf, Let Grow
16 / 60	18	Pine Plantation <10 years	1999	75-80 Loblolly Pine	9.5	Let Grow
17 / 60	18	Loblolly Pine Plantation<10 Yrs	2001	80 Loblolly Pine	3.9	Check growth, Let Grow
18 / 60	18	Loblolly Pine Plantation<10 Yrs	2001	80 Loblolly Pine	3.2	Check growth, Let Grow
19 / 60	18	Loblolly Pine Plantation	2001	75-85 Loblolly Pine	3.7	Check growth, Let Grow
20 / 40	18	Pine Plantation(L)<10 Yrs.	1998	80-85 Loblolly Pine	1.5	Check growth, Let Grow
331 / 100	9	Bottomland Hardwoods 51 yrs+	?	85-90 YellowPoplar	12.5	Selection Harvest , Watershed Buffer/Wildlife Habitat
332 / 60	9	Bottomland Hardwoods 51 yrs+	?	90-100Yellow Poplar	91.7	Selection Harvest , Watershed Buffer/Wildlife Habitat
Totals					**418.2**	

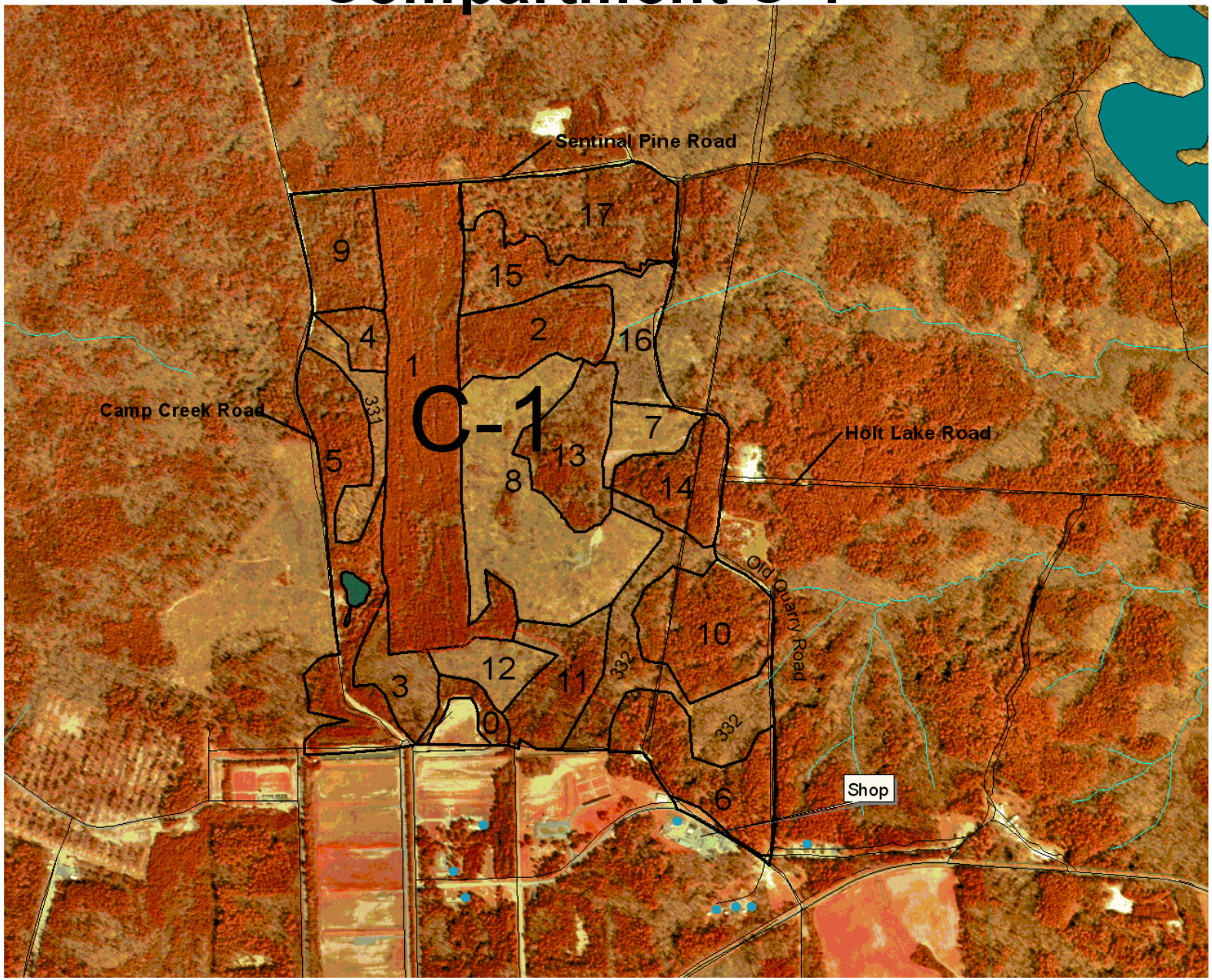
Compartment B-3



Block B-3

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
0	23	Fields/Pastures/ArchSite	?	80 Loblolly Pine	1.0	Protect
1 / 60	5	Pine (L<S<V) >41 Years	1960	80 Loblolly Pine	3.2	Check Growth for Harvest
2 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	85.3	Check Growth / Prescribe Burn
3 / 60	5	Pine (L,S,V) 21-30 Years	?	75-80 Loblolly Pine	20.2	Check Growth for Harvest
4 / 60	5	Pine (L,S,V) >41 Years	?	75-80 Loblolly Pine	8.9	Check Growth for Harvest
5 / 60	5	Pine (L,S,V) >41 Years	?	75-80 Loblolly Pine	8.8	Check Growth for Harvest
6 / 60	18	Loblolly Pine Plantation<10	2000	75-80 Loblolly Pine	33.1	Check Growth for release
7 / 60	4	Pine(L,S,V) 31-40 years	?	75-85 Loblolly Pine	30.2	Check Growth / Prescribe Burn
8 / 40	18	Loblolly Pine Plantation<10	1998	80-85 Loblolly Pine	30.2	Check Growth for release
9 / 40	4	Pine (L,S,V) 31-40 Years	?	80-85 Loblolly Pine	2.1	Check Growth for Thinning
10 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	34.1	Check Growth for Thinning/ Prescribe Burn
11 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	24.7	Check Growth for Thinning/ Prescribe Burn
12 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	23.2	Check Growth for Thinning/ Prescribe Burn
13 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	10.8	Check Growth for Thinning/ Prescribe Burn
14 / 60	4	Pine (L,S,V) 31-40 Years	?	75-85 Loblolly Pine	25.4	Check Growth for Thinning/ Prescribe Burn
15 / 60	16	Pine-Hdwd(31-50 years)	?	75-85 Loblolly Pine	10.9	Check Growth for Harvest
16 / 60	15	Pine-Hdwd 11-30 Years	?	75-85 Loblolly Pine	15.1	Check Growth, Let Grow/Prescribe Burn
17 / 60	15	Pine-Hdwd 11-30 Years	?	75-85 Loblolly Pine	12.4	Check Growth, Let Grow/Prescribe Burn
18 / 60	15	Pine-Hdwd 11-30 Years	?	75-85 Loblolly Pine	34.0	Check Growth, Let Grow/Prescribe Burn
330 / 100	9	Bottomland Hardwoods 51 years +	?	90-100 Yellow Poplar	82.1	Selection Harvest , Watershed Buffer/Wildlife Habitat
331 / 100	9	Bottomland Hardwoods 51 years+	?	90-100 Yellow Poplar	6.1	Selection Harvest , Watershed Buffer/Wildlife Habitat
332 / 100	9	Bottomland Hardwoods 51 years+	?	90-100 Yellow Poplar	31.0	Selection Harvest , Watershed Buffer/Wildlife Habitat
333 / 60	9	Bottomland Hardwoods 51 years+	?	90-95 Yellow Poplar	46.4	Selection Harvest , Watershed Buffer/Wildlife Habitat
334 / 60	9	Bottomland Hardwoods 51 Years +	?	90-95 Yellow Poplar	1.4	Selection Harvest , Watershed Buffer/Wildlife Habitat
Totals					**580**	

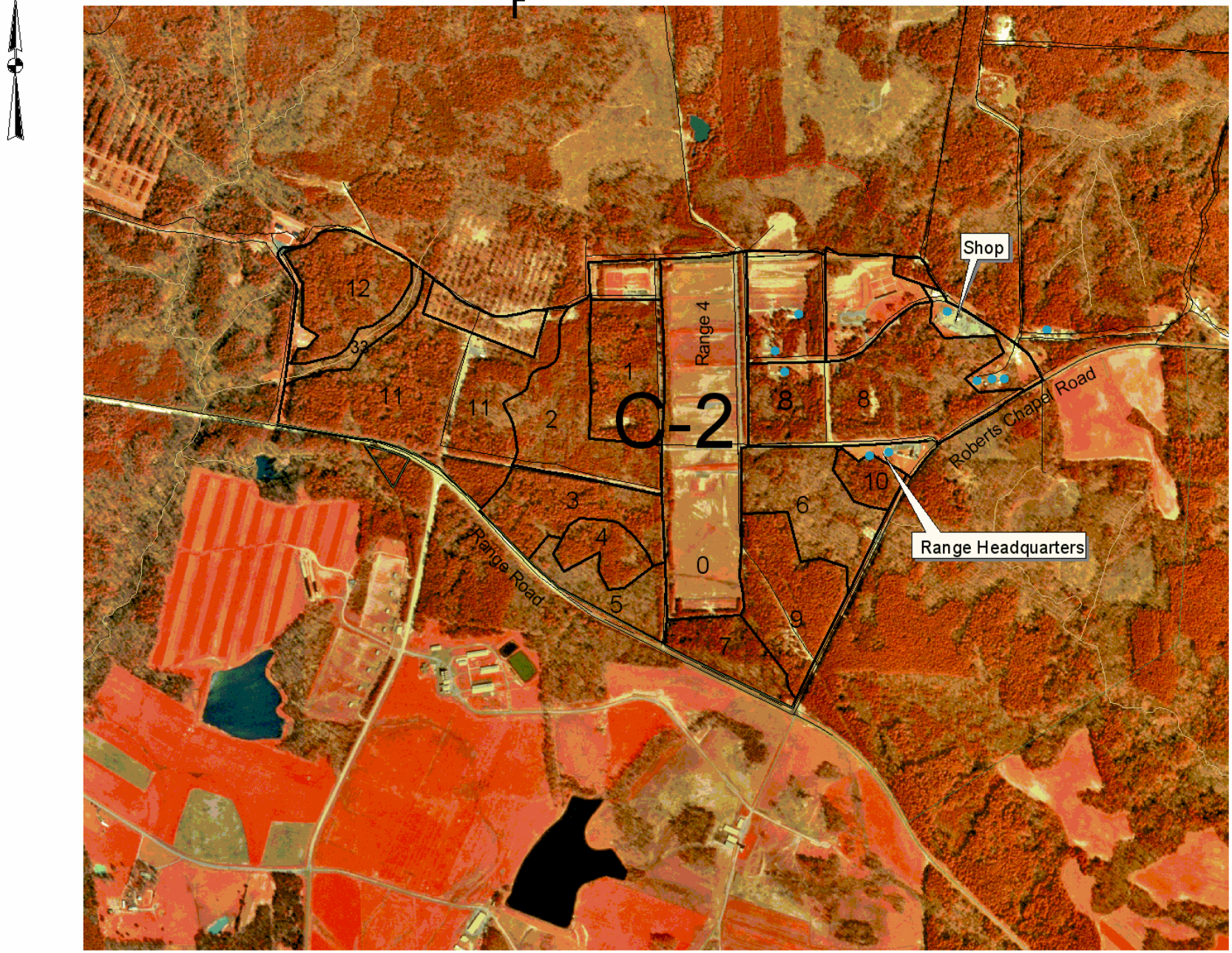
Compartment C-1



Block C-1

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
0	5	Pine(L,S,V)> 41 Years	?	75-80 Loblolly Pine	2.7	Leave as Berm for Pistol Range
1 / 60	20	Pine Plantation(L) 21-30 Years	?	75-80 Loblolly Pine	42.6	Check Growth, Prescribe Burn
2 / 60	19	Pine Plantation (L)11-20 Years	?	75-80 Loblolly Pine	11.8	Check Growth for Thinning, Prescribe Burn
3 / 100	9	Upland Hdwds 51 Years +	?	85-90 Yellow Poplar	6.5	Check Growth for Harvest
4 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	3.3	Check Growth for Harvest
5 / 60	4	Pine(L,S,V) 31-40 years	?	75-80 Loblolly Pine	21.7	Check Growth for Thinning, Prescribe Burn
6 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	14.1	Check Growth for Thinning, Prescribe Burn
7 / 60	19	Pine Plantation(L)10-20 years	1996	75-80 Loblolly Pine	4.9	Check Growth, Let Grow
8 / 60	19	Pine Plantation(L)10-20 years	1996	75-80 Loblolly Pine	30.9	Check Growth, Let Grow
9 / 60	1	Pine (L,S,V) <10 Years	2001	75-85 Loblolly Pine	10.1	Check Growth, Let Grow
10 / 40	16	Pine-Hdwd 31-50 Years	?	80-85 Loblolly Pine	15.6	Check Growth, Let Grow, Prescribe Burn
11 / 60	5	Pine(L,S,V) >41 Years	?	75-80 Loblolly Pine	10.0	Check Growth, Let Grow, Prescribe Burn
12 / 60	19	Pine Plantation(L)10-20 years	1996	75-80 Loblolly Pine	5.4	Check Growth, Let Grow
13 / 60	15	Pine-Hdwd(11-30 years)	?	75-80 Loblolly Pine	11.4	Check Growth for Thinning, Prescribe Burn
14 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	9.4	Check Growth for Thinning, Prescribe Burn
15 / 40	17	Pine-Hdwd 51 years +	?	80-85 Loblolly Pine	9.3	Check Growth for Harvest
16 / 60	17	Pine-Hdwd 51 years+	?	75-85 Loblolly Pine	8.1	Check Growth for Harvest
17 / 40	18	Pine Plantation(L)<10 years	2003	75-85 Loblolly Pine	17.9	Check Growth for Release
331 / 100	9	Bottomland Hardwoods 51 Years +	?	85-90 Yellow Poplar	6.2	Selective Harvests and Wildlife Habitat
332 / 100	8	Bottomland Hardwoods 31-50 years	?	80-90 Yellow Poplar	17.8	Watershed Buffer & Wildlife Habitat, Select Harvest
Totals					**310**	

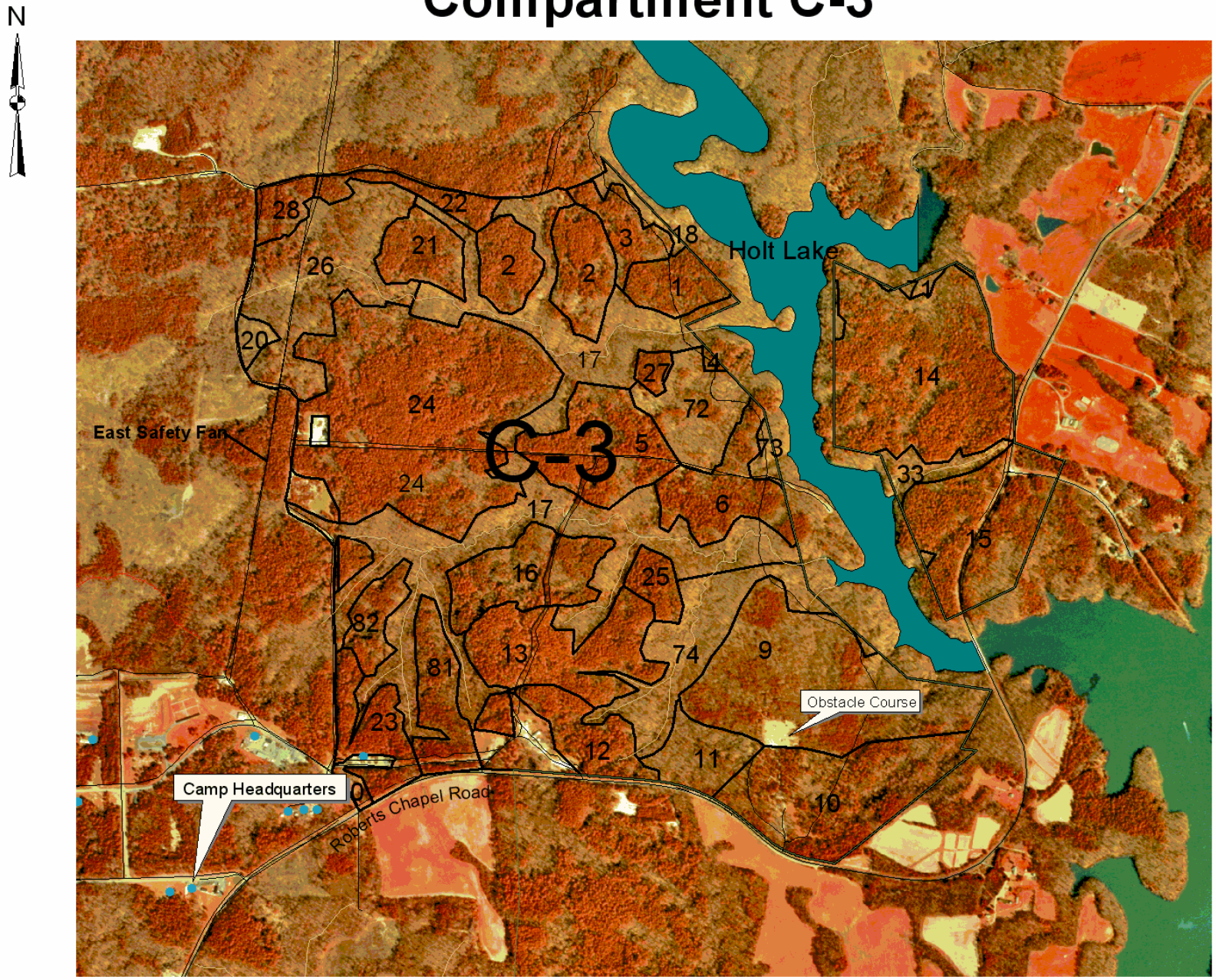
Compartment C-2



Block C-2

Stand #/ Rotation	Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 606	5	Pine (L,S,V) >41 Years	?	75-80 Loblolly Pine	18.8	Check Growth for Harvest
2 / 40	2	Pine (L,S,V) 11-20 Years	?	80-85 Loblolly Pine	23.3	Check Growth for Thinning, Prescribe Burn
3 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	17.9	Check Growth, Prescribe Burn
4 / 40	4	Pine(L,S,V) 31-40 Years	?	80-85 Loblolly Pine	7.6	Check Growth, Prescribe Burn
5 / 120	13	Upland Hdwds 51 Years +	?	70-75 Loblolly Pine	10.3	Wildlife Habitat
6 / 40	9/13	Upland &Bottomland Hardwoods 51 years+	?	85-90 Loblolly Pine	20.5	Wildlife Habitat/ Watershed Buffer, Select Harvest
7 / 60	5	Pine(L,S,V) 41 Years +	?	75-80 Loblolly Pine	10.9	Check Growth for Thinning and Prescribe Burn
8 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	43.4	Check Growth for Selection Harvest
9 / 40	4	Pine(L,S,V) 41 Year +	?	80-85 Loblolly Pine	21.8	Check Growth, Prescribe Burn
10 / 60	5	Pine(L,S,V) 41 years +	?	75-80 Loblolly Pine	5.0	Thin for Aesthetics near Office
11 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	52.3	Check Growth , Prescribe Burn
12 / 40	5	Pine(L,S,V) 41 years +	?	80-85 Loblolly Pine	19.2	Check Growth for Thinning, Prescribe Burn
13 / 60	4	Pine (L,S,V) 31-40 Years	?	75-80 Loblolly Pine	1.5	Check Growth, Let Grow
33 / 100	9	Bottomland Hardwoods 51 years +	?	80-85 Loblolly Pine	5.0	Watershed Buffer and Wildlife Habitat
Totals					**260.4**	

Compartment C-3

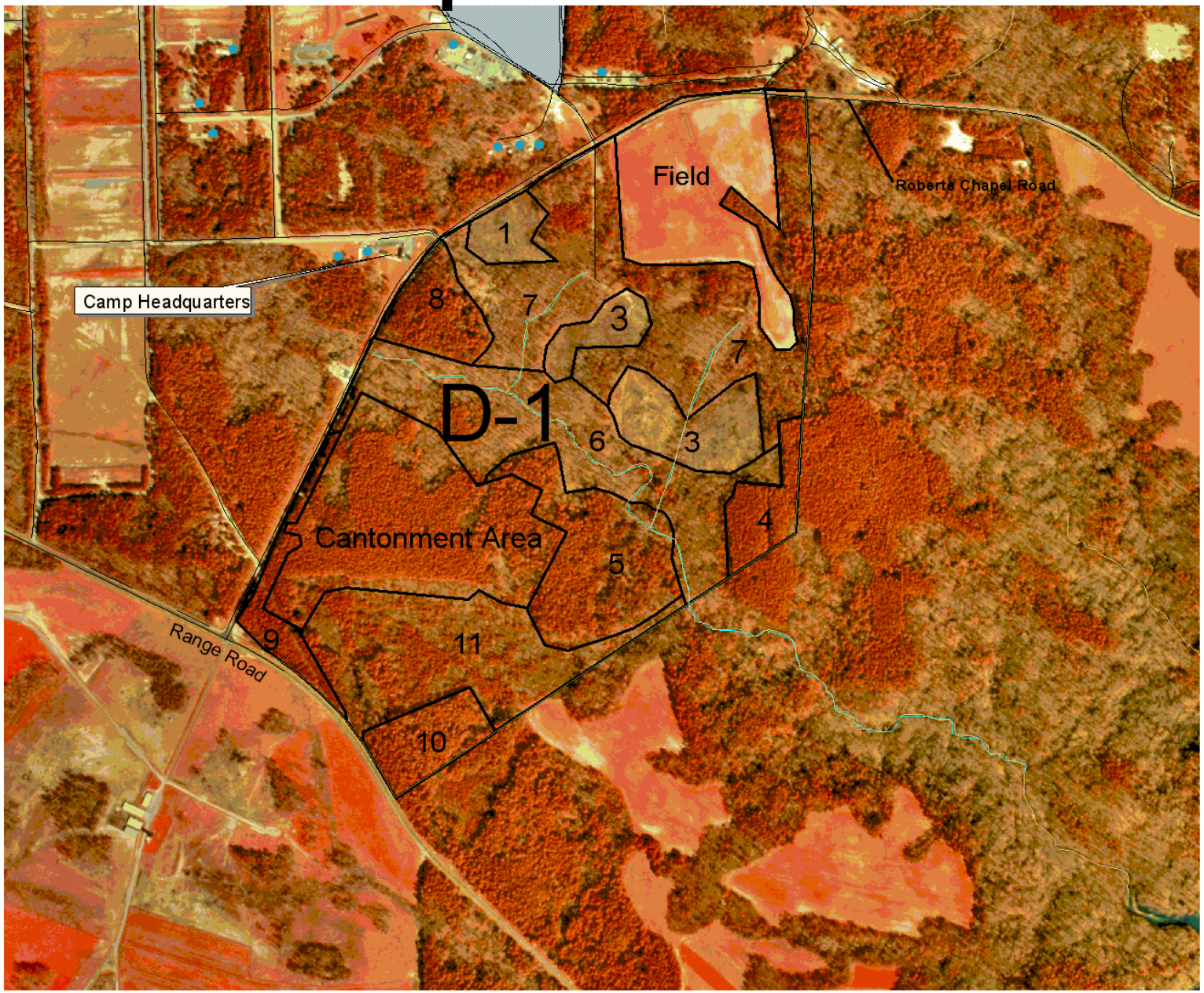


Block C-3

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 60	18	Pine Plantation(L)<10 years	1999	75-85 Loblolly Pine	7.2	Check Growth, Let Grow
2 / 60	21	Pine Plantation 31-40 Years		75-80 Loblolly Pine	17.4	Check Growth, Let Grow
3 / 60	4	Pine (L,S,V) 31-40 Years		75-85 Loblolly Pine	6.8	Check Growth, Prescribe Burn
4 / 60	5	Pine (L,S,V) 41 Years +		75-85 Loblolly Pine	0.5	Check Growth for Harvest
5 / 60	5	Pine(L) 41 Years +		80 Loblolly	17.9	Check Growth, Prescribe Burn
6 / 60	16	Pine-Hdwd 31-50 years		75-80 Loblolly	14.1	Check Growth for Selection Harvest of Pine
9 / 60	15	Pine-Hdwd 11-30 years		75-80 Loblolly Pine	44.5	Harvest Virginia Pine, Crop Tree Release
10 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	29.4	Check Growth for Harvest
11 / 120	13	Upland Hdwds 51 years +		70-75 Loblolly Pine	8.7	Wildlife Habitat
12 / 60	5	Pine(L,S,V) 41 years +		75-80 Loblolly Pine	11.5	Check Growth, Prescribe Burn
13 / 60	21	Pine Plantation 31-40 years		75-80 Loblolly Pine	21.5	Check Growth, Prescribe Burn
14 / 60	5	Pine (L,S,V) 41 Years +		75-85 Loblolly Pine	44.0	Check Growth for Harvest
15 / 60	1	Pine (L,S,V) <10 Years	2003	75-85 Loblolly Pine	25.5	Check Natural Estab, Harvest Seedtrees
16 / 40	18	Loblolly Pine Plantation< 10 Yrs.	2000	80-85 Loblolly Pine	15.8	Check Growth,Let Grow
17 / 40	9/13	Upland & Bottomland Hdwds 51+		90100YellowPoplar	81.0	Wildlife Habitat/ Watershed Buffer, Select Harvest
18 / 40	9/13	Upland & Bottomland Hdwds 51 +		90-100 Yellow Poplar	2.1	Watershed Buffer-Protect
20 / 60	18	Pine Plantation < 10 Years	1996	75-80 Loblolly Pine	2.0	Check Growth, Let Grow
21 / 60	18	Pine Plantation(L)<10 years	1999	75-80 Loblolly Pine	8.4	Check Growth, Let Grow
22 / 60	5	Pine(L,S) 41 years+		80 Loblolly Pine	5.7	Check Growth for Harvest
23 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	10.7	Check Growth for Harvest
24 / 60	21	Pine(L,S,V) 41 Years +		75-80 Loblolly Pine	67.2	Check Growth, Prescribe Burn
25 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	4.3	Check Growth for Harvest
26 / 60	17	Pine-Hdwd 51 Years +		75-85 Loblolly Pine	30.0	Check Growth for Harvest
27 / 60	5	Pine (L,S,V) 41 Years +		75-80 Loblolly Pine	1.9	Check Growth for Harvest
28 / 60	18	Pine Plantation < 10 years	1999	75-80 Loblolly Pine	4.5	Let Grow
33 / 100	9	Bottomland Hardwoods 51 Yrs.+		90-100 Yellow Poplar	4.4	Wildlife Habitat/Watershed Buffer, Selection Harvest
71 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	1.7	Wildlife Habitat/Watershed Buffer
72 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	13.0	Check for Harvest and Watershed Buffer
73 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	1.7	Wildlife Habitat/Watershed Buffer
74 / 100	12	Upland Hdwds 31-50 Years		85-90 Yellow Poplar	20.1	Wildlife Habitat/Watershed Buffer, Selection Harvest

81 / 60	18	Pine Plantation(L)<10 years	1999	75-80 Loblolly Pine	11.0	Check Growth, Let Grow
82 / 60	18	Pine Plantation(L)<10 years	1999	75-80 Loblolly Pine	7.9	Check Growth for Release, Let Grow
Totals					**542.6**	

Compartment D-1



Block D-1

Stand #/ Rotation	Stand Type	Description	Estab. Date	Site Index	ACRES	General Recommendation
1 / 60	18	Pine Plantation(L) <10 years	1998	75-80 loblolly Pine	3.4	Check Growth, Let Grow
3 / 40	18	Pine Plantation (L)<10 years	1998	80-85 Loblolly Pine	12.5	Check Growth, Let Grow
4 / 40	22	Pine Plantation(L)>40 years	?	85 Loblolly Pine	5.3	Check Growth for Thinning
5 / 60	5	Pine(L,S,V)41 Years +	?	75-80 Loblolly Pine	16.8	Check Growth for Thinning or Seed Tree Harvest
6 / 60	9/13	Upland & Bottomland Hardwoods 51 Years +	?	85-90 Yellow Poplar	27.8	Wildlife Habitat/ Watershed Buffer, Selection Harvest
7 / 120	13	Upland Hdwds 51 years +	?	75-80 Loblolly Pine	43.7	Check for Harvest
8 / 40	5	Pine (L,S,V) 41 Years +	?	80-85 Loblolly Pine	6.7	Check for Harvest
9 / 60	4	Pine(L.,S,V) 31-40 years	?	75-80 Loblolly Pine	5	Aesthetic Buffer, Let Grow
10 / 40	5	Pine(L,S,V) 41 Years +	?	80-85 Loblolly Pine	6.4	Check Growth for Thinning, Prescribe Burn
11 / 40	16	Pine-Hdwd(31-50 Years)	?	85-90 Loblolly Pine	24.2	Wildlife Habitat, Selection Harvest
Totals					**151.7**	

Table 1 Areas Prescribed Burned (understory) since March 2001

Block	Stand #	Action	Acres
A3	102	Understory Burn Winter 2002	38.6
A3	29	Understory Burn Winter 2002	6
A3	101	Understory Burn Winter 2002	88
A1	10	Understory Burn Winter 2002	42
A1	9	Understory Burn Winter 2002	76
A1	7	Understory Burn Winter 2002	75
A1	8	Understory Burn Winter 2002	7
A1	13	Understory Burn Winter 2002	10.4
A1	4	Understory Burn Winter 2004	32.6
A1	10	Understory Burn Winter 2004	80
A1	14	Understory Burn Winter 2004	41
A1	12	Understory Burn Winter 2004	46
A1	N.Range	Understory Burn Winter 2004	34
A1	1	Understory Burn Winter 2004	50
A1	11	Understory Burn Winter 2004	61
A1	13	Understory Burn Winter 2004	5
B3	12	Understory Burn Winter 2004	20
C1	4	Understory Burn Winter 2004	3.3
C1	331	Understory Burn Winter 2004	6

C1	5	Understory Burn Winter 2004	18
C1	3	Understory Burn Winter 2004	6.5
C1	12	Understory Burn Winter 2004	5.4
Block	**Stand#**	**Action**	**Acres**
C1	11	Understory Burn Winter 2004	10
C1	332	Understory Burn Winter 2004	8
C1	6	Understory Burn Winter 2004	4
C1	10	Understory Burn Winter 2004	5
C1	8	Understory Burn Winter 2004	30
C1	14	Understory Burn Winter 2004	6
C1	7	Understory Burn Winter 2004	5
C1	13	Understory Burn Winter 2004	11.4
C1	1	Understory Burn Winter 2004	43
C1	2	Understory Burn Winter 2004	11.8
C1	16	Understory Burn Winter 2004	8
C1	15	Understory Burn Winter 2004	9.3
Total			**903.3**

Table 2. Areas Thinned Since March 2001

Block	Stand #	Action	Acres
C1	1	First Row Thinning 2001	42.6
C1	5	First Row Thinning 2001	21.7
C3	12	Shelterwood Thinning 2001	11.8
A3	15	Selection Thinning 2002	40.7
A3	301	Shelterwood Thinning 2002	2.8
A3	302	Shelterwood Thinning 2002	6.1
A3	303	Shelterwood Thinning 2002	3.6
A2	13	Shelterwood Thinning 2003	2.7
A2	1	Shelterwood Thinning 2003	14.5
C2	9	Shelterwood Thinning 2003	21.7
C3	15	Seedtree Thinning 2003	25.5
Totals			**193.7**

Table 3. Stands Final Harvest and Planted or Cleared Since March 2001

Block	Stand#	Description	Action	Acres	Date
A-1	1	80-85 Loblolly Pine	Planted Loblolly Pine Elite Family Mix	67	2005
A-1	11/12	Clear	Final harvest and cleared for camp use	34	2005
A-1	2	85 Loblolly Pine/Hardwood	Natural Regeneration Loblolly/Hardwoods	16.5	2003
A-2	11	85 Loblolly Pine/Hardwood	Natural Regeneration Loblolly/Hardwoods	9.4	2003
A-3	3	80-85 Loblolly Pine	Planted Loblolly Pine 2nd Gen	17.7	2003
A-3	403	80-85 Loblolly Pine	Planted Loblolly Pine 2nd Gen	3.1	2003
B-2	15	Longleaf Pine	Planted to Longleaf Pine Cont.	1.7	2003
C-1	9	Loblolly Pine	Final Harvest and Regenerated Naturally	10.1	2001
C-1	17	80-85 Loblolly Pine	Planted to Loblolly Pine 2nd Gen	17.9	2003
D-1	9/11	Clear	Final harvest and cleared for camp use	32	2005

Total Acres: Planted 107.4
Natural Regeneration 36
Cleared for camp use 66

Appendix

FORESTRY *Leaflets*

North Carolina Division of Forest Resources

FM-34 **APRIL 2004**

A Guide to Implementing Neuse River Basin and Tar-Pamlico River Basin Riparian Buffer Rules for Forest Management Activities

Additional rule information is available on the 'Water Quality' portion of the N.C. Division of Forest Resources Web site www.dfr.state.nc.us and the Non-Point Source (NPS) Planning Unit portion of the N.C. Division of Water Quality Web site http://h2o.enr.state.nc.us/nps/ or by contacting staff from either agency, or DENR Regional offices.

WHERE TO APPLY THESE RIVER BASIN RIPARIAN BUFFER RULES

✓ **The Neuse River Basin and Tar-Pamlico River Basin "Riparian Buffer Rules" apply to perennial and intermittent streams, ponds, lakes, and estuaries located in either river basin, and which are approximately shown on the most recent version of either an NRCS soil survey map or a USGS 1:24000 (7½ minute) quad topographic map.**

✘ **The Neuse River or Tar-Pamlico River Riparian Buffer Rules do not apply to the following waterbodies:**

- ✘ Any "surface waters" that do not appear on either of the above named soils or topographic maps
- ✘ Any ephemeral streams (sometimes referred to as saddles, swales, gullies, or stormwater channels)
- ✘ Man-made ditches or canals that are not intended for water navigation or boat access
- ✘ Man-made ponds and lakes that are located outside natural drainage ways

Seek advice from a professional trained in stream identification when determining 'buffer rule' applicability. Modified streams may look like ditches, but still require implementing these river basin riparian buffer rules. This Leaflet is not intended to provide legal advice or final interpretation of the Neuse River or Tar-Pamlico River riparian buffer rules.
On waterbodies where the river basin riparian buffer rules do not apply, ***an SMZ is still required*** to comply with the Forest Practices Guidelines Related to Water Quality (FPGs).

REQUIRED RIVER BASIN RIPARIAN BUFFER WIDTH and ZONES

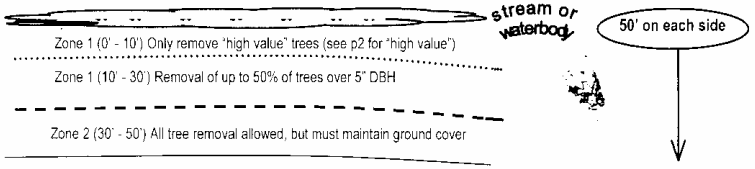
The buffer is made up of two "zones" that together equal a 50-foot wide strip of land:

Zone 1 - For streams: Zone 1 begins at the most landward limit of the top of bank, or the rooted vegetation, and extends towards the land for 30 feet on all sides.

Zone 1 - For ponds, lakes, reservoirs: Zone 1 begins at the most landward limit of the normal water level, or the rooted vegetation, and extends towards the land for 30 feet.

Zone 1 - For the 20 Coastal NC counties: Zone 1 begins at the most landward limit of the following options, whichever is more restrictive *(see a,b,c below)* and extends toward the land for 30 feet:
(a) the normal high water level, or **(b)** the normal water level, or
(c) the landward limit of coastal wetlands as defined by NC Div. of Coastal Management

Zone 2 - For all sites: Zone 2 begins at the outer edge of Zone 1 and extends outward 20 feet and shall consist of a stable, vegetated area. Ground cover must allow water infiltration and diffusion.



TIMBER HARVESTING IN THE RIPARIAN BUFFER

Selective timber harvesting is only allowed to occur in the 50 foot buffer if:

1) A forest management plan for the property is written or approved by a Registered Forester, **or**
2) The property is enrolled in that county's present-use valuation program for forestry use.

All of Zone 1 (total of 30 feet with 'Inner' & 'Outer' areas defined below)

Allowed Tree removal, provided that disturbance to soil and residual vegetation is minimized.

Allowed with Restrictions **Tracked or wheeled vehicles are not permitted except at stream crossings designed, constructed, and maintained in accordance with FPG .0203**

Not Allowed Soil disturbing site preparation activities

Zone 1 - Inner 10 feet (land immediately adjacent to the stream or waterbody)

Allowed Removal of individual "High Value" trees

Allowed with Restrictions
- "High Value" Pine trees are defined as any tree with a DBH of 14" and greater **or** a stump diameter of 18" and greater
- "High Value" Hardwood and Wetland trees are defined as any tree with a DBH of 16" and greater, **or** a stump diameter 24" and greater

Not Allowed **Removal of any tree with exposed primary roots visible in the streambank.**
- It is recommended to mark/flag residual "leave" trees to make sure they are protected

Zone 1 - Outer 20 feet (land adjoining the inner 10 feet area)

Allowed
- Limited amount of timber removal
- Remaining trees left standing should be as evenly spaced as possible.

Allowed with Restrictions Harvest of no more than 50% of the trees over 5" DBH
- Re-entry for natural forest is allowed every 15 years.
- Re-entry for plantation forest is allowed every 5 years.

Not Allowed Removal of trees 5" DBH and smaller

All of Zone 2 (outermost 20 feet of the entire riparian buffer)

There are no tree harvesting or site prep restrictions in Zone 2, so long as there is sufficient ground cover maintained to provide for diffusion and infiltration of water runoff. ***All activities must still comply with the N.C. FPGs.***

OTHER FORESTRY ACTIVITIES IN THE RIPARIAN BUFFER

Forestry Activities Allowed in the Entire 50-foot Riparian Buffer

- \ Individual trees may be treated to maintain or improve their health, form, or vigor.
- \ Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation. These practices must be approved by the Division of Forest Resources for a specific site. The Division of Forest Resources must notify the Division of Water Quality of all approvals.
- \ Removal of individual trees that are in danger of causing damage to structures or human life.

Forestry Activities Allowed with Restrictions, in the Entire 50-foot Riparian Buffer

- ✓ Access roads and skid trails only allowed for temporary and permanent stream crossings, which are established in accordance with FPG .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.
- ✓ Timber felling shall be directed away from the stream or waterbody.
- ✓ Skidding shall be directed away from the stream or waterbody and shall be done in a manner that minimizes soil disturbance and prevents rutting or the creation of channels.
- ✓ Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the buffer shall be allowed provided that soil disturbance is minimized. Planting shall consist primarily of native species.
- ✓ Application of fertilizer only allowed as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stands shall be conducted so that the chemicals are not applied directly to or allowed to drift into buffer.

Forestry Activities Not Allowed in the 50-foot Riparian Buffer

- ✘ NO logging decks or sawmill sites placed in the buffer.
- ✘ NO high intensity prescribed burns.

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APPENDIX C

RECORD OF ENVIRONMENTAL CONSIDERATION

(REC)

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Enviro Tracking #:	**ARNG ENVIRONMENTAL CHECKLIST**	State ARNG
INRMP17	Enter information in the yellow shaded areas.	NC

1. PROJECT NAME:

NC Integrated Natural Resource Management Plan

2. PROJECT NUMBER: (MILCON if applicable)	3. DATE PREPARED:
NIA	4-May-16

4. DESCRIPTION AND LOCATION OF THE PROJECT/PROPOSED ACTION:

a. Location (Include a detailed map, if applicable):

Camp Butner Training Site

b. Description:

Implementation of the NC Natural Resource Management Plan for Camp Butner Training Site

c. The proposed action will involve (check all that apply):

D **Training activities/areas** D **Construction** 0 **Natural resource management**
D **Maintenance/repair/rehabilitation** D Real estate action D **Environmental plans/surveys**
0 **fnnovative readiness training project**
D Other (Explain):

d. Project size (acres): N/A (if annlicablel Acres of new surface disturbance (proposed): (if annlicablel

5. START DATE of PROPOSED ACTION (dd-mmm-yy): Note: This must be a future date.

6. PROGRAMMED FISCAL YEAR (if applicable): 2017/18

7. END DATE (if applicable):

I?Afffii;I PEIJ1$IG/tiic'ANAIIY5JS)GVIDJ;

To use a categorical exclusion, the project must satisfy the following three screening criteria: no segmentation, no exceptional circumstances and a qualifying categorical exclusion that covers the project. The following decision tree will guide the application and documentation of these three screening criteria. The criteria were extracted from 32 CFR Section 651.29 and represent the most common screening conditions experienced in the ARNG. NOTE: Each question in Part B must have an applicable block checked for concurrence with REC.

1. Is this action segmented (the scope of the action must include the consideration of connected, cumulative, and similar actions)? D YES (go to #30) O NO (go to #2)

2. Is there reasonable likelihood of significant environmental effects (direct, indirect,and cumulative)? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) ☐ NO (go to #3)

3. Is there a reasonable likelihood of significant effects on public health, safety or the environment? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) O NO (go to #4)

4. Is there an imposition of uncertain or unique environmental risks? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) ☐ NO (go to #5)

5. Is the pro1ect of greater scope or size than is normal for the category of action? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) O NO (go to #6)

6. Does the project introduce or employ unproven technology? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) O NO (go to #7)

.•) •• <)>/ •..·<·-·....•....·.• F?AJ".B,..QEPl51QNANA,LY'S)S(c9iitjm.1¢d)X " .:.•.•-•·.·/;). .:•...•..·..:.<

7. Will there be reportable releases of hazardous or toxic substances as specified in 40 CFR Part 302? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

O YES (go to #30) O NO (go to #8)

8. If proposed action is in a non-attainment or maintenance area, will air emissions exceed de minimus levels or otherwise require a formal Clean Air Act (CAA) conformity determination? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. D YES (go to #30) O NO (go to #g) D N/A (go to #9)

9. Will the project have effects on the quality of the environment that are likely to be highly controversial? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

D YES (go to #30) O NO (go to #10)

10. Will the project establish a precedent (or make decisions in principle) for future or subsequent actions that are reasonably likely to have future significant effects? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. D YES (go to #30) O NO (go to #11)

11. Has federal funding been secured for the Innovative Readiness Training (IRT) project?

O N/A (go to #13) D YES (go to #13) D NO (go to #12)

12. NOTE: IRT projects not currently funded can secure approved NEPA documentation. However, once funding is secured State ARNG is required to coordinate with ARNG-ILE-T to complete natural and cultural surveys via proponent funding.

D CONFIRMED (go to #27)

13. Do you have a species list from the U.S. Fish and Wildlife Service that is less than 90 days old?

[2] YES (go to #14) Granville: 3/25/15; Durham: 12/26/12 O **NO (update species list return to #13)**

14. In reviewing the species list, what determination was made by the State ARNG?

O **No species present (go to #16)**
O No affect (go to #16)
D **May affect but not likely to adversely affect (go to #16i_.Q§,t,e_ 9f US_FW!?:_Q., IJQl,;lf,nce_:** 1
O May affect likely to adversely affect (go to #15)

15. Does an existing Biological Opinion cover the action?

O YES (go to #16) **Date of BO:** D NO (go to #30)

16. Have the Endangered Species Act, Section 7 requirements completed?

[2] YES (go to #17) Granville: 3/25/15; Durham: 12/26/12 D **NO (complete documentation, return to #16)**

17. Does the project involve an undertaking to a building or structure that is 50 years of age or older?

D YES (go to #18) O NO (go to #20)

18. Has the building or structure been surveyed for the National Register of Historic Places?

O YES (go to #19) O NO (complete inventory, return to #18)

19. Is the building or structure eligible for or listed on the National Register of Historic Places?

O YES (go to #20) O NO (go to #20)

20. Does the action involve ground disturbing activities?

D YES (go to #21) O NO (go to #22)

21. Has an archaeological inventory or research been completed to determine if there are any archeological resources present?

D YES (go to #22) D **NO (complete inventory or conduct research, return to #21)**

22. In reviewing the undertaking, under the National Historic Preservation Act (NHPA) (for both above and below ground resources), what determination was made by the State ARNG?

O **No 106 undertaking; no additional consultation required under NHPA (go to question #27)**
O No properties affected (go to #24) Date of SHPO Concurrence:
O No adverse effect (go to #24) Date of SHPO Concurrence:
O Adverse effect (go to #23)

23. Has the State ARNG addressed the adverse effect?

DYES (place date of MOA or existing PA and explanation of mitigation in box below, go to #24) O NO (go to #30)

23a.

24. Per DoDI 4710.02 did the state ARNG determine that tribal consultation was necessary for this project?

D YES {go to #25)

0 NO (Provide reason Inthis block 24a, go to #27)

See **INRMP** Appendix A for contact documentation

25. Did the Tribes express an interest or respond with concerns about the project?

D YES (go to #26) 0 NO (go to #27) Date of Documentation:

26. Has the State ARNG addressed the Tribal concerns?

DYES (place date of MOU or explanation of how State ARNG addressed tribal concerns in box below, go to #27)

D NO (address concerns, return to #26)

Comolete onlv if additional documentation is reauired in auestion #26

26a.

27. Does the project involve an unresolved effect on areas having special designation or recognition such as those listed below? For any yes responses go to #30 otherwise go to #28. If any No response is a result of negotiated and/or previously resolved effects please describe resolution in box 27a below.

TYPE	Unresolved Effects?	TYPE	Unresolved Effects?
a. Prime/Unique Farmland	No	e. Wild/Scenic River	No
b. Wilderness Area/National Park	No	f. Coastal Zones	No
c. Sole-Source Aquifer	No	g. 100-year Floodplains	No
d. Wetlands	No	h. National Wildlife Refuges	No

27a.

28. Is this project addressed in a separate EA or EIS review?

(2]YES (complete table below; go to Part C, Determination) DNO (go to #29)

Document Title:	**Environmental Assessment with FNSI**
Lead Aaencv:	NCARNG
Date of Decision Document:	9/28/2001

29. Does the project meet at least one of the categorical exclusions listed in 32 CFR 651 App B?

DYES (complete table below; go to Part C, Determination) DNO (go to #30)

List primary CAT EX code	
Descibe why CAT EX applies	

30. At this time your project has not met all the qualifications for using a categorical exclusion under 32 CFR 651. Unless the scope of the project is changed, it will require an Environmental Assessment or possibly an Environmental Impact Statement. If you feel this is in error, please call your NEPA Regional Manager to discuss. If needed, go to Part C Determination.

Additional Information (if needed):

PART C - DETERMINATION

On the basis of this initial evaluation, the following is appropriate:

D IAW 32 CFR 651 Appendix B, the proposed action qualifies for a Categorical Exclusion (CX) that does not require a Record of Environmental Consideration.

☑ A Record of Environmental Consideration (REC).

☐ An Environmental Assessment (EA).

☐ A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS).

Signature of Proponent (Requester)

Braden Ramage
Printed Name of Proponent (Requester)

May 05, 2016
Date Signed

Vickie A. Dudick
Environmental Program Manager

VICKIE A. DUDICK
Printed Name of Env. Program Manager
Director of Environmental Management

Date Signed
HI04'18

Other concurrence (as **needed):**

Signature	Signature
Rodney D. Newton Printed Name	Printed Name
/r9 rYl QGj1 2ofG Date Signed	Date Signed
Signature	Signature
Printed Name	Printed Name
Date Signed	Date Signed
Signature	Signature
Printed Name	Printed Name
Date Signed	Date Signed

ARNG Record of Environmental Consideration State ARNG

Enviro Tracking #:

INRMP17 **Enter information in the yellow shaded areas.** NC

1. PROJECT NAME:	
NC Integrated Natural Resource Management Plan	
2. PROJECT NUMBER: (MILCON **if** applicable)	3. DATE PREPARED:
N/A	4-May-16

4. START DATE of PROPOSED ACTION (dd-mmm-yy): Note: This must be a future date

5. PROGRAMMED FISCAL YEAR: 2017/18

6. END DATE if a licable :

7. DESCRIPTION AND LOCATION OF THE PROPOSED ACTION:

a. Location (Include a detailed map, if applicable):
Camp Butner Training Site

b. Description:
Implementation of the NC Natural Resource Management Plan for Camp Butner Training Site

8. CHOOSE **ONE** OF THE FOLLOWING:

[/] An existing environmental assessment" adequately covers the scope of this project. Attach FNSI if EA was completed by another federal agency (non-ARNG).
EA Date (dd-mmm-yy): 28-09-01 Lead Agency: NCARNG

O An existing environmental impact statement" adequately covers the scope of this project.
EIS Date (dd-mmm-yy): Lead Agency:

O After reviewing the screening criteria and completing the ARNG environmental checklist, this project qualifies for a **Categorical Exclusion** (select below).
Categorical Exclusion Code:
See 32 CFR 651 App. B
Categorical Exclusion Code:
See 32 CFR 651 App. B
Categorical Exclusion Code:
See 32 CFR 651 App. B

D This project is exempt from NEPA requirements under the provisions of:
Cite superseding law:

– !

***Copies of the referenced EA or EIS can be found in the ARNG Environmental Office within each state.**

9. REMARKS:

Environmental Program Manager

VICKIE DUDICK
Printed Name of Env. Program Manager

0 Date Signed Date Signed

Proponent Information:
10. Proponent:
11. Address:
12. POC:
13. Comm. Voice:

14. Proponent POC e-mail:

Signature of Proponent (Requester)

Braden Ramage

Printed Name of Proponent (Requester)

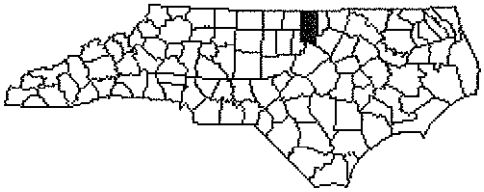
May 17, 2016

17 MAY 2016

U.S. Fish & Wildlife Service

Endangered Species, Threatened Species,Federal Species of Concern, and Candidate Species,

Granville County, North Carolina



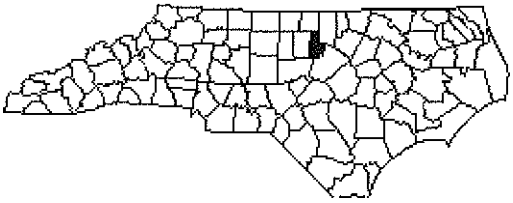
Updated: 03-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American eel	*Anguilla rostrata*	FSC	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Carolina darter	*Etheostoma collis lepidinion*	FSC	Current
Carolina madtom	*Noturus jiiriosus*	FSC	Current
Pinewoods shiner	*Lythrurus matutinus*	FSC	Obscure
Roanoke bass	*Ambloplites cavifrons*	FSC	Current
Invertebrate:			
Atlantic pigtoe	***Fusconaia n7asoni***	FSC	Current
Brook floater	*Alasmidonta varicosa*	FSC	Current
Chowanoke crayfish	*Orconectes virginiensis*	FSC	Obscure
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Green floater	*Lasmigona subviridis*	FSC	Current
Yellow lampmussel	*Lampsilis cariosa*	FSC	Current
Yellow lance	*Elliptio lanceolata*	FSC	Current
Vascular Plant:			
Butner's barbara's-buttons	*Marshallia* sp.	FSC	Current
HarpereIla	*Ptilimnium nodosum*	E	Current
Prairie birdsfoot-trefoil	*Lotus unifoliolatus* var. *helleri*	FSC	Current
Smooth coneflower	*Echinacea laevigata*	E	Current
Smooth-seeded hairy nutrush	*Scleria* sp. *1*	FSC	Historic
Tall larkspur	*Delphinium exaltatum*	FSC	Current
Torrey's Mountain-mint	*Pycnanthemum torrei*	FSC	Historic
Nonvascnlar Plant:			
Lichen:			

U.S. Fish & Wildlife Serviue

Endangered Species, Threatened Species, Federal Species of Concern, and Candidate Species,

Durham County, North Carolina



Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American eel	*Anguilla rostrata*	FSC	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
CaroJina darter	*Etheostoma collis lepidinion*	FSC	Current
Carolina madtom	*Noturus furiosus*	FSC	Current
Pinewoods shiner	*Lythrurus matutinus*	FSC	Obscure
Roanoke bass	*Ambloplites cavifrons*	FSC	Current
Invertebrate:			
Atlantic pigtoe	*Fusconaia masoni*	FSC	Current
Green floater	*Lasmigona subviridis*	FSC	Current
Panhandle pebblesnail	*Somatogyrus virginicus*	FSC	Current
Septima's clubtail	*Gomphus septima*	FSC	Historic
Yellow lampmussel	*Lampsilis cariosa*	FSC	Current
Vascular Plant:			
Butternut	*Jug/ans cinerea*	FSC	Historic
Michaux's sumac	*Rhus michauxii*	E	Current
Smooth coneflower	*Echinacea laevigata*	E	CulTent
Sweet pinesap	*Monotropsis odorata*	FSC	Current
Tall larkspur	*Delphinium exaltatum*	FSC	Current
Nonvascular Plant:			
Lichen:			

Definitions of Federal Status Codes:

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APPENDIX D

RTLA MONITORING PROTOCOLS

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PROTOCOLS FOR MONITORING BENTHIC MACROINVERTEBRATE COMMUNITIES

Macroinvertebrate diversity provides a reliable index of stream health and quality. The aquatic insects of three orders (Ephemeroptera - mayflies, Plecoptera- stoneflies, and Trichoptera - caddisflies) are used in what is called an EPT index. The species of these orders are characteristic of high-quality streams. Healthy streams support a more diverse fauna than polluted or disturbed ones. Therefore, the number of different species found at a given site is indicative of stream quality.

The two main stream systems on CBTS are Knap of Reeds Creek (a portion of which was dammed to create Holt Lake) and Camp Creek. Benthic macroinvertebrates are collected annually on a segment of each stream. The time of year when collecting takes place is not critical, but should be consistent from year to year. It is probably most convenient to inventory these plots in the summer, when LCTA core plot monitoring is being conducted.

Sampling locations must include riffle areas with a rocky or gravelly substrate. Riffles harbor the highest diversity of species. Because they are well-oxygenated, the species found there tend to be those most sensitive to environmental conditions. If possible, the sampling area should include a variety of other microhabitats, such as leaf packs[1], sediments at the bottom of pools, aquatic vegetation, and root mats beneath overhanging banks. These will contain different types of macroinvertebrates, and can be sampled based on their availability.

Because the same stream section will be sampled each year, it is important that the sampling procedures at each site are consistent from year to year. Care should be taken to make a detailed record of the microhabitats sampled and the specific collection methods used. For instance: "1 m^2 kick sample from riffle with 3' x 3' kick net, 2 handfuls of leaf pack, and one 1-m sweep of a net under the root mat at the west bank." The same habitats (assuming they still exist at the site) and methods should be used at that location in the following years. To ensure that the same sampling location is used in sequential years, a GPS reading should be taken, and any useful landmarks should be noted on the Macroinvertebrate Survey Datasheet (Figure 1). It may be helpful to place a permanent marker at the site to aid in relocation.

Equipment Needed:

- 3' x 3' kick net or D-frame dip net, with a $^1/_{16}$-inch mesh
- long-handled net (if sampling habitats other than riffles) - if you are using D-frame dip for the riffle sampling, it can be used for this also
- sieve bucket (optional)
- waterproof wading boots
- shallow white dissecting trays
- tweezers and clear plastic pipets

If identifying in the lab:

- plastic or glass containers with tight-fitting lids
- 70% isopropyl alcohol, or full-strength denatured ethanol

[1] clumps of leaves and other organic material that become trapped behind large rocks or logs, or under streambanks

Site Information

Begin by filling out the information concerning the stream's physical attributes on page one of the Macroinvertebrate Survey Datasheet (Figure 1). For the stream description, include the type of substrate, whether the stream section is straight or winding, a description of the banks, forest type and approximate percent canopy cover, and the kinds of aquatic vegetation present, if any.

Sampling Methods:

These methods have been adapted from the Adopt-a-Stream Foundation's *Streamkeeper's Field Guide* (available at www.streamkeeper.org).

Riffles. Collect the sample near the head of the riffle (the upstream end, just below the preceding pool). Place the net beneath the area you wish to sample. Angle the top of the net downstream, and anchor the bottom of the net in the stream bottom to prevent any organisms from escaping. Disturb a 1 m^2 area by kicking up the substrate for about one minute.[2] Remove the net and gently scrape its contents into a white tray with a shallow layer of stream water. (If using a D-frame dip net, you will have to composite several samples in different areas until approximately 1 m^2 has been sampled.)

Leaf Packs. Select older material that has begun to decompose. Pick a handful or two and place into a white tray with stream water. If you have a sieve bucket, the material may be placed in it and washed to separate the organisms from the substrate. Otherwise, each leaf will need to be examined individually to detect the organisms.

Aquatic Plants, Root Mats, and Bottom Sediments. Use a long-handled net to sample these habitats. Make a sweep through vegetation growing in or hanging into the water, and under root mats overhanging the stream bank. Empty the net into a white tray, using care to scrape out all the contents. When collecting muck from the bottom of a pool, a sieve bucket is useful for sifting silt from the sample. The organisms can be picked out of the muck by hand in a white tray, although this is more tedious work.

Visual Inspection. Macroinvertebrates can also be hand-picked with tweezers from the surfaces of rocks and woody debris. You may want to finish by performing a 2-minute search to detect any species that were not found using the other methods. Make sure to record the time taken for a visual search and the kinds of substrate examined.

Sorting and Identification

There are many keys available for identifying macroinvertebrates. The *Streamkeeper's Field Guide* and the *Save Our Streams Monitor's Guide to Aquatic Macroinvertebrates* (available from the Isaac Walton League at ww.iwla.org) both include a dichotomous key**.**

[2] You may decide to first rub the larger rocks clean in the running water directly in front of the net. Place these rocks outside the sampling area before beginning to kick up the stream bottom.

Identifying in the lab. Bringing the macroinvertebrates back to a lab allows you to take more time examining them, use a microscope for magnification, or perhaps have someone more experienced identify them. If desired, the organisms can often be keyed out to genus or species if sufficient time is taken. However, they must be preserved until they are examined. Even if you will be doing the identification in the lab, it is generally best to sort your samples in the field. The macroinvertebrates are much easier to separate from the silt and debris when they are alive and moving. Place them in containers with either 70% isopropyl alcohol or full-strength denatured ethanol, and secure the lids tightly. Store the containers in a cool, dark place until you are ready to work with them.

Identifying in the field. Identifying the macroinvertebrates at the field site allows you to release them back into the stream when you are through. It is less likely that you will be able to identify to the level of genus or species, but you should be able to discern between different taxa within the same general group. Using tweezers and a pipet, pick out organisms from the white trays and place them into separate stream water-filled containers based on type. An ice-cube tray works well for this purpose. The objective is to separate the invertebrates into major groups and determine the number of distinct taxa within each group. Page two of the Macroinvertebrate Survey Datasheet lists the major taxonomic groups. If you are unable to place any of the organisms into a group, you can preserve the specimen as described above and bring it to a lab for further study. Record the number of individuals and number of different taxa for each group on page two of the Macroinvertebrate Survey Datasheet. Several blank spaces are provided at the bottom of the sheet for any organisms not listed.

Interpretation of Results

On page one of the Macroinvertebrate Survey datasheet, select the EPT value category which applies. Calculate the EPT richness (total number of mayfly, stonefly, and caddisfly taxa) and taxa richness (total number of all taxa). In general, streams with a higher taxa richness are healthier than those with less diversity, and an EPT richness between 8 to 12 is considered favorable. Unfortunately, it is difficult to make any definite conclusions about stream health from the results of this type of survey. The macroinvertebrate community is affected by many variables that are unrelated to pollutants, such as velocity, depth, temperature, and the types of organic material available as food sources. Therefore, species diversity will vary somewhat from stream to stream, regardless of water quality. Still, examining survey data over a period of several years may provide invaluable insights. Each year, the macroinvertebrate data for each sampling location should be compared to those from previous years. This will indicate whether the condition of the stream has improved, declined, or remained stable. If any significant declines in diversity are detected, the sample site should be further investigated with more comprehensive water quality tests.

Camp Butner LCTA Special Use Plots

Macroinvertebrate Survey Datasheet

Page 1

Stream: _____

UTMs: _____ N, _____ E

Directions to Location: _____

_____

_____

Date: _____ Water Temp: ___

Time: _____ Avg. Depth: _____

Field Technicians: _____ Avg. Velocity: _____

Site Description: _____

_____

_____

EPT value:

Check which applies	Stoneflies	Mayflies	Caddisflies	Stream Quality
	present	present	present	excellent
	absent	present	present	good
	absent	absent	present	fair
	absent	absent	absent	poor

Richness:

EPT richness (total number of mayfly, stonefly, and caddisfliy taxa) _____

Taxa Richness (total number af all macroinvertebrate taxa) _____

Notes: _____

_____

_____

_____

_____

_____

Camp Butner LCTA Special Use Plots

Macroinvertebrate Survey Datasheet - page 2

Page 2

Stream: _____ Date: _____

Order or Class	Family or Suborder	Common Name	# of indivs.	# of Taxa
Ephemeroptera		Mayflies		
Plecoptera		Stoneflies		
Trichoptera		Caddisflies		
Diptera	Chironomidae	Midges		
	Tipulidae	Craneflies		
	Simuliidae	Blackflies		
	Athericidae	Watersnipe Flies		
		Other True Flies		
Megaloptera	Corydalidae	Dobsonflies		
	Corydalidae	Fishflies		
	Sialidae	Alderflies		
Coleoptera	Psephenidae	Water Pennies		
	Elmidae	Riffle Beetles		
		Other Beetles		
Odonata	Zygoptera	Damselflies		
	Anisoptera	Dragonflies		
Isopoda		Sowbugs		
Amphipoda		Scuds		
Decapoda		Crayfish		
Gastropoda		Snails		
Bivalvia		Clams and Mussels		
Hirudinea		Leeches		
Oligochaeta		Aquatic Worms		
Turbellaria		Planarians		
		Total		

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APPENDIX E

NEUSE RIVER BASIN RULES

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CONTENTS

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North Carolina
Department of Environment and Natural Resources
Division of Water Quality
Nonpoint Source Management Program

Riparian Buffer Protection Rules for the Neuse and Tar-Pamlico River Basins

On Dec. 9, 1999, the North Carolina Environmental Management Commission adopted rules to protect 50-foot wide riparian, or waterside, buffers along waterways in the Neuse and Tar-Pamlico River Basins. These buffers remove nitrogen, phosphorus, and other pollutants from rainwater that flows into the basins' waterways, protecting the waterways from surrounding land uses. The rules are part of larger nutrient reduction strategies for each basin. In the **Neuse River basin,** the rules have been effective as temporary rules since **July 22, 1997**. In the **Tar-Pamlico basin**, temporary rules took effect on **Jan. 1, 2000**.

In both basins, the rules will be effective as permanent rules on Aug. 1, 2000, pending review by the General Assembly during the summer.

The main rule, referred to as the buffer *protection* rule, requires that up to 50 feet of riparian area be protected and maintained on the banks of waterways in the basin. **This rule does not require establishment of new buffers unless the existing use of the buffer changes.** Diffuse flow of stormwater that runs into the buffer must be maintained.

Here are some frequently asked questions followed by answers that further explain the rules.

Q: What waters in the basins require buffers?

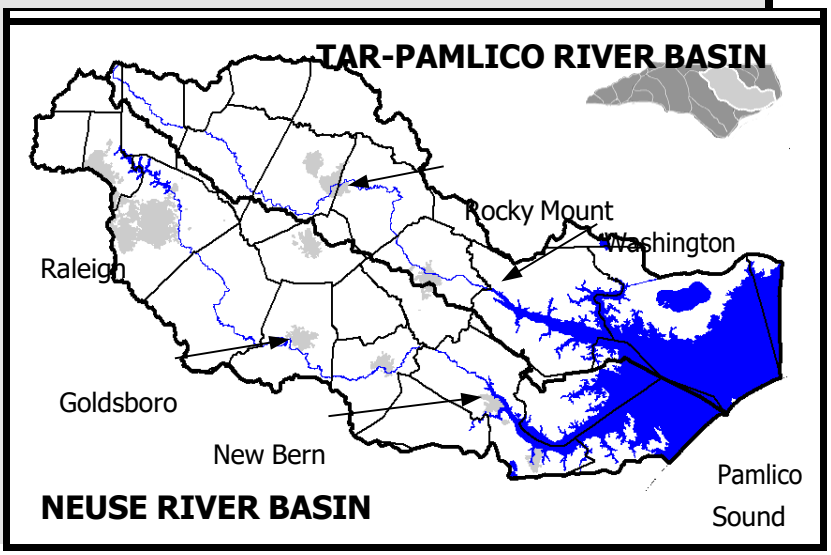
A: Intermittent and perennial streams, lakes, ponds and estuarine waters that are shown on the most recent version of either a county soil survey map prepared by the Natural Resources Conservation Service or a 1:24,000 scale topographic map prepared by the U.S. Geologic Survey, and that exist on the ground.

Q: Are there any waters that don't have to be buffered?

A: Yes. The rule does not apply to the following waters: ditches and manmade conveyances other than modified natural streams unless they are constructed for navigation and/or boat access; manmade ponds and lakes located outside natural drainageways; and ephemeral (stormwater) streams.

Q: What does it mean to protect the buffer?

A: The first 30 feet (zone 1) of the buffer is to remain essentially undisturbed. The



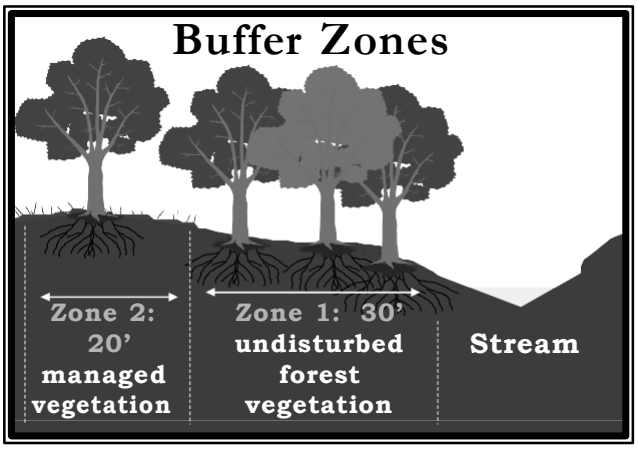
landward 20 feet (zone 2) is to be vegetated, but certain uses would be allowed in this zone.

Q: Are existing activities within 50 feet of waterways exempt from the rules?

A: Yes. The footprint of existing, ongoing uses is exempt. These uses include, but are not limited to: agriculture; buildings; industrial, commercial, and transportation facilities; maintained lawns; utility lines; and on-site wastewater systems.

Q: What activities are allowed in the buffer?

A: The rule includes a table of uses. In it, specific activities are listed as *exempt*, *allowable*, *allowable with mitigation*, or *prohibited*. *Exempt* activities require no prior approval. *Allowable* and *allowable with mitigation* mean that approval must be obtained from the Division of Water Quality beforehand. The approval process will require a showing of no practical alternatives to the impact, and that the impact will be minimized. If it is *allowable with mitigation*, a greater amount of buffer must be established elsewhere to offset impacts. A separate buffer **mitigation rule** establishes requirements for activities that are *allowable with mitigation*. *Prohibited* activities are not allowed, however, a variance may be sought if one thinks that complying with the rule will cause practical difficulties or unnecessary hardships. If an activity is not listed in the table, then it is prohibited.



Q: What are some common activities listed in the table of uses?

A: The following are brief explanations of only some activities listed in the table - you will want to read and understand the rule before you begin any activity in a buffer:

- Driveway crossings on single-family residential lots that disturb less than 25 feet along the buffer are *exempt*.
- Maintenance of existing ditches through the buffer is *exempt* provided that water quality impacts are minimized.
- Grading and revegetation in zone 2 only is *exempt* if disturbed areas are stabilized, the health of vegetation in zone 1 is not compromised, and diffuse flow is reestablished.
- Road intrusions into the buffer are *allowable with mitigation*.
- Road crossings of a waterbody that impact less than 40 feet of the buffer are *exempt*. Wider crossings that are less than 150 feet wide are *allowable*, and those over 150 feet wide are *allowable with mitigation*.
- New ponds in drainageways are *allowable* if a 50-foot buffer is established around the new ponds, or *allowable with mitigation* if a new buffer is not established.
- Fertilizer application is *prohibited*, except for one-time application to establish replanted vegetation.
- Some management of vegetation is *exempt*, such as periodic mowing and harvesting of plant products in zone 2 only, planting to enhance the buffer, pruning provided that the health and function of the vegetation is not compromised, removal of understory nuisance vegetation as defined in the rule, and removal of individual trees that endanger structures or human life.
- Water dependent structures as defined in the rules are *allowable*.
- Utilities vary from *exempt* to *allowable with mitigation*, depending on type, size, and location.

The public is encouraged to read and understand the buffer rules before beginning any activities within buffers in the Basin. For more information or to obtain a copy of the rules, please contact Division of Water Quality staff at a Regional Office (see below). The rules can also be viewed or downloaded from the DWQ web site at http://h2o.enr.state.nc.us/nps/tarp.htm.

DENR Washington Regional Office (252) 946-6481
Location and mail address: 943 Washington Square Mall, Washington, NC 27889

DENR Raleigh Regional Office (919) 571-4700
Location: 3800 Barrett Drive, Suite 101, Raleigh, NC
Mail address: 1628 Mail Service Center, Raleigh, NC 27699-1628

FORESTRY Leaflets
North Carolina Forest Service

November 2015 *WQ-11*

A Guide to Implementing Neuse River Basin and Tar-Pamlico River Basin Riparian Buffer Rules for Forest Management Activities

Additional rule information is available on the N.C. Forest Service Web site www.ncforestservice.gov.

Where to Apply These Buffer Rules

The Neuse River Basin and Tar-Pamlico River Basin 'Riparian Buffer Rules' apply to perennial streams, intermittent streams, ponds, lakes, and estuaries located in either river basin, and which are approximately shown on the most recently published versions of either a NRCS soil survey map or USGS 1:24000 (7.5 minute) quad topographic map.

The Neuse River and Tar-Pamlico River Riparian Buffer Rules do not apply to the following waterbodies:

- ***x*** Any "surface waters" that do not appear on either of the above-named soils or topographic maps.
- ***x*** Any ephemeral streams (sometimes referred to as sloughs, swales, gullies or stormwater channels).
- ***x*** Man-made ditches or canals that are not intended for water navigation or boat access.
- ***x*** Man-made ponds and lakes that are located outside natural drainage ways.

Seek advice from a professional trained in stream identification and determination when assessing 'buffer rule' applicability. Modified streams may look like ditches but still require these riparian buffer rules. This Leaflet is not intended to provide legal advice or final interpretation of these buffer rules.
A SMZ is still required in all cases along intermittent streams, perennial streams and perennial waterbodies as mandated by the statewide rules known as the "Forest Practices Guidelines Related to Water Quality" (FPGs).

Required Buffer Zones and Widths

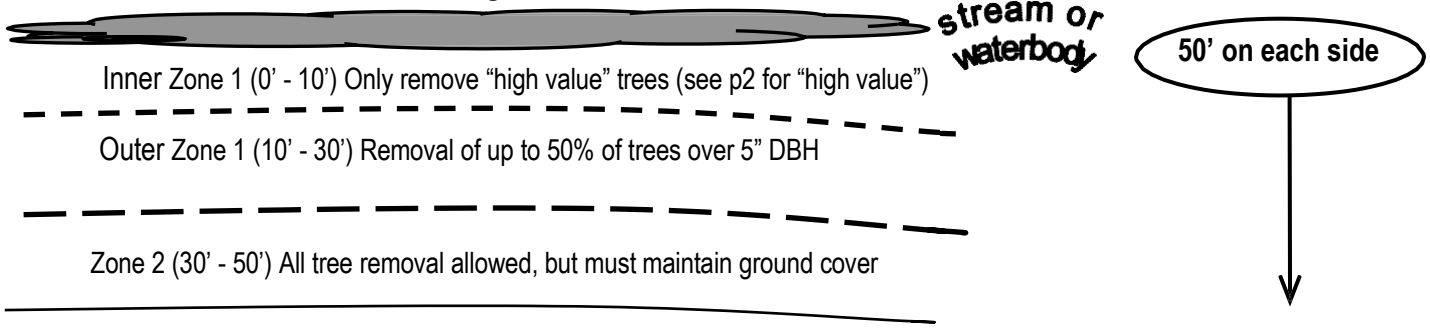
The buffer area is made up of two zones that together equal a 50-foot wide buffer that must be "measured horizontally on a line perpendicular to the surface water."

Zone 1 - For streams: Zone 1 begins at the most landward limit of the top of bank, or the rooted vegetation, and extends towards the land for 30 feet on all sides.

Zone 1 - For ponds, lakes, reservoirs: Zone 1 begins at the most landward limit of the normal water level, or the rooted vegetation, and extends towards the land for 30 feet.

Zone 1 - For the 20 Coastal NC counties: Zone 1 begins at the most landward limit of the normal high water level or the normal water level, as appropriate; and extends towards the land for 30 feet.

Zone 2 - For all sites: Zone 2 begins at the outer edge of Zone 1 and extends outward 20 feet and shall consist of a stable, vegetated area. Ground cover must allow water infiltration and diffusion.



Timber Harvesting In The Riparian Buffer

Selective timber harvesting is only allowed to occur in the 50 foot buffer if:

1) A forest management plan for the property is prepared or approved by a Registered Forester, **or**
2) The property is enrolled in that county's Present-Use Tax Valuation Program for forestry use.

All of Zone 1: 0 ft. to 30 ft. (Includes 'Inner' & 'Outer' areas defined below)

Allowed Tree removal, provided that disturbance to soil and residual vegetation is minimized.

Allowed with Restrictions **Tracked or wheeled vehicles are not permitted except at stream crossings designed, constructed, and maintained in accordance with FPG .0203**

Not Allowed No soil-disturbing site preparation activities.

Zone 1 - Inner 10 feet: 0' to 10' (land immediately adjacent to the stream or waterbody)

Allowed Removal of individual "High Value" trees.

Allowed with Restrictions
- "High Value" Pine trees are defined as any tree with a DBH of 14" and greater **or** a stump diameter of 18" and greater.
- "High Value" Hardwood and Wetland trees are defined as any tree with a DBH of 16" and greater, **or** a stump diameter 24" and greater.

Not Allowed **No removal of any tree with exposed primary roots visible in the streambank**
- It is recommended to mark/flag residual "leave" trees to make sure they are protected.

Zone 1 - Outer 20 feet: 10' to 30' (land adjoining the inner 10 feet area)

Allowed
- Limited amount of timber removal.
- Remaining trees left standing should be as evenly spaced as possible.

Allowed with Restrictions Harvest of no more than 50% of the trees over 5" DBH:
- Re-entry for natural forest is allowed every 15 years.
- Re-entry for plantation forest is allowed every 5 years.

Not Allowed No removal of trees 5" DBH and smaller.

All of Zone 2: 30 ft. to 50 ft. (The outermost 20 feet of the entire riparian buffer)

There are no tree harvesting or site-prep restrictions in Zone 2, so long as there is sufficient ground cover maintained to provide for diffusion and infiltration of water runoff. **All activities must still comply with the North Carolina FPGs.**

Other Forestry Activities In The Riparian Buffer

Forestry Activities Allowed in the Entire 50-foot Riparian Buffer

- ✓ Individual trees may be treated to maintain or improve their health, form, or vigor.
- ✓ Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation. These practices must be approved by the N.C. Forest Service for a specific site. The N.C. Forest Service must notify the Division of Water Resources of all approvals.
- ✓ Removal of individual trees that are in danger of causing damage to structures or human life.

Forestry Activities Allowed with Restrictions in the Entire 50-foot Riparian Buffer

- ▪ Access roads and skid trails only allowed for temporary and permanent stream crossings, which are established in accordance with FPG .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.
- ▪ Timber felling shall be directed away from the stream or waterbody.
- ▪ Skidding shall be directed away from the stream or waterbody and shall be done in a manner that minimizes soil disturbance and prevents rutting or the creation of channels.
- ▪ Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the buffer shall be allowed provided that soil disturbance is minimized. Plantings shall consist primarily of native species.
- ▪ Application of fertilizer only allowed as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stands shall be conducted so that the chemicals are not applied directly to or allowed to drift into buffer.

Forestry Activities Not Allowed in the 50-foot Riparian Buffer

- ✗ NO logging decks or sawmill sites placed in the buffer.
- ✗ NO high intensity prescribed burns.

15A NCAC 02B .0202 DEFINITIONS

The definition of any word or phrase used in this Section shall be the same as given in G.S. 143, Article 21. The following words and phrases, which are not defined in this article, shall be interpreted as follows:

(1) Acute toxicity to aquatic life means lethality or other harmful effects sustained by either resident aquatic populations or indicator species used as test organisms in a controlled toxicity test due to a short-term exposure (relative to the life cycle of the organism) to a specific chemical or mixture of chemicals (as in an effluent). Short-term exposure for acute tests is generally 96 hours or less. Acute toxicity shall be determined using the following procedures:
   (a) for specific chemical constituents or compounds, acceptable levels shall be equivalent to a concentration of one-half or less of the Final Acute Value (FAV) as determined according to "Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Life and its Uses" published by the Environmental Protection Agency and referenced in the Federal Register (50 FR 30784, July 29, 1985) which is hereby incorporated by reference including any subsequent amendments.
   (b) for specific chemical constituents or compounds for which values described under Subparagraph (1)(a) of this Rule can not be determined, acceptable levels shall be equivalent to a concentration of one-third or less of the lowest available LC50 value.
   (c) for effluents, acceptable levels are defined as no statistically measurable lethality (99 percent confidence level using Students t test) during a specified exposure period. Concentrations of exposure shall be determined on a case-by-case basis.
   (d) in instances where detailed dose response data indicate that levels of acute toxicity are significantly different from those defined in this Rule, the Director may determine on a case-by-case basis an alternate acceptable level through statistical analyses of the dose response curve.

(2) Acute to Chronic Ratio (ACR) means the ratio of acute toxicity expressed as an LC50 for a specific toxicant or an effluent to the chronic value for the same toxicant or effluent.

(3) Agricultural uses include the use of waters for stock watering, irrigation, and other farm purposes.

(4) Applicator means any person, firm, corporation, wholesaler, retailer, distributor, any local, state, or federal governmental agency, or any other person who applies fertilizer to the land of a consumer or client or to land they own or to land which they lease or otherwise hold rights.

(5) Approved treatment, as applied to water supplies, means treatment accepted as satisfactory by the Division of Environmental Health or Division of Water Quality.

(6) Average (except bacterial) means arithmetical average and includes the analytical results of all samples taken during the specified period; all sampling shall be done as to obtain the most representative sample under prevailing conditions:
   (a) Daily Average for dissolved oxygen, shall be of at least four samples;
   (b) Weekly Average means the average of all daily composite samples obtained during the calendar week. If only one grab sample is taken each day, the weekly average is the average of all daily grab samples. A minimum of three daily grab samples is needed to calculate a weekly average.
   (c) Monthly Average means the average of all daily composites (or grab samples if only one per day) obtained during the calendar month.

   The definitions in this Paragraph do not affect the monitoring requirements for NPDES permits but rather shall be used by the Division along with other methodologies in determining violations of water quality standards. Arithmetical averages as defined by this Section, and not confidence limits nor other statistical descriptions, shall be used in all calculations of limitations which require the use of averages pursuant to this Section and 40 CFR 122.41(l)(4)(iii).

(7) Best Management Practice (BMP) means a structural or nonstructural management-based practice used singularly or in combination to reduce nonpoint source inputs to receiving waters in order to achieve water quality protection goals.

(8) Best usage of waters as specified for each class means those uses as determined by the Environmental Management Commission in accordance with the provisions of G.S. 143-214.1.

(9) Bioaccumulation factor (BAF) is a unitless value that describes the degree to which substances are taken up or accumulated into tissues of aquatic organisms from water directly and from food or other ingested materials containing the accumulated substances, and is usually measured as a ratio of a substance's

concentration in tissue versus its concentration in water in situations where exposure to the substance is occurring from both water and the food chain.

(10) Bioconcentration factor (BCF) is a unitless value that describes the degree to which substances are absorbed or concentrated into tissues of aquatic organisms from water directly and is usually measured as a ratio of substance's concentration in tissue versus its concentration in water in situations where exposure to the substance is occurring from water only.

(11) Biological integrity means the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions.

(12) Buffer means a natural or vegetated area through which stormwater runoff flows in a diffuse manner so that the runoff does not become channelized and which provides for infiltration of the runoff and filtering of pollutants. The buffer shall be measured landward from the normal pool elevation of impounded structures and from the bank of each side of streams or rivers.

(13) Built-upon area means that portion of a development project that is covered by impervious or partially impervious cover including buildings, pavement, gravel areas (e.g. roads, parking lots, paths), recreation facilities (e.g. tennis courts), etc. (Note: Wooden slatted decks and the water area of a swimming pool are considered pervious.)

(14) Chronic toxicity to aquatic life means any harmful effect sustained by either resident aquatic populations or indicator species used as test organisms in a controlled toxicity test due to long-term exposure (relative to the life cycle of the organism) or exposure during a substantial portion of the duration of a sensitive period of the life cycle to a specific chemical substance or mixture of chemicals (as in an effluent). In absence of extended periods of exposure, early life stage or reproductive toxicity tests may be used to define chronic impacts.

(15) Chronic value for aquatic life means the geometric mean of two concentrations identified in a controlled toxicity test as the No Observable Effect Concentration (NOEC) and the Lowest Observable Effect Concentration (LOEC).

(16) Cluster development means the grouping of buildings in order to conserve land resources and provide for innovation in the design of the project including minimizing stormwater runoff impacts. This term includes nonresidential development as well as single-family residential and multi-family developments. For the purpose of Sections .0100, .0200 and .0300 of this Subchapter, planned unit developments and mixed use development shall be considered as cluster development.

(17) Commercial applicator means any person, firm, corporation, wholesaler, retailer, distributor or any other person who for hire or compensation applies fertilizer to the land of a consumer or client.

(18) Concentrations are the mass of a substance per volume of water and for the purposes of this Section shall be expressed as milligrams per liter (mg/l), micrograms per liter (ug/l), or nanograms per liter (ng/l).

(19) Contiguous refers to those wetlands landward of the mean high water line or normal water level and within 575 feet of classified surface waters which appear as solid blue lines on the most recently published versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps.

(20) Critical area means the area adjacent to a water supply intake or reservoir where risk associated with pollution is greater than from the remaining portions of the watershed. The critical area is defined as extending either 1/2 mile from the normal pool elevation of the reservoir in which the intake is located or to the ridge line of the watershed (whichever comes first); or 1/2 mile upstream from and draining to the intake (or other appropriate downstream location associated with the water supply) located directly in the stream or river (run-of-the-river), or to the ridge line of the watershed (whichever comes first). Since WS-I watersheds are essentially undeveloped, establishment of a critical area is not required. Local governments may extend the critical area as needed. Major landmarks such as highways or property lines may be used to delineate the outer boundary of the critical area if these landmarks are immediately adjacent to the appropriate outer boundary of 1/2 mile. The Commission may adopt a different critical area size during the reclassification process.

(21) Cropland means agricultural land that is not covered by a certified animal waste management plan and is used for growing corn, grains, oilseed crops, cotton, forages, tobacco, beans, or other vegetables or fruits.

(22) Designated Nonpoint Source Agency means those agencies specified by the Governor in the North Carolina Nonpoint Source Management Program, as approved by the Environmental Protection Agency.

(23) Development means any land disturbing activity which adds to or changes the amount of impervious or partially impervious cover on a land area or which otherwise decreases the infiltration of precipitation into the soil.

(24) Director means the Director of the Division of Water Quality.

(25) Discharge is the addition of any man-induced waste effluent either directly or indirectly to state surface waters.

(26) Division means the Division of Water Quality or its successors.

(27) Domestic wastewater discharge means the discharge of sewage, non-process industrial wastewater, other domestic wastewater or any combination of these items. Domestic wastewater includes, but is not limited to, liquid waste generated by domestic water using fixtures and appliances, from any residence, place of business, or place of public assembly even if it contains no sewage. Examples of domestic wastewater include once-through non-contact cooling water, seafood packing facility discharges and wastewater from restaurants.

(28) Effluent channel means a discernable confined and discrete conveyance which is used for transporting treated wastewater to a receiving stream or other body of water as provided in Rule .0215 of this Section.

(29) Existing development, for projects that do not require a state permit, shall be defined as those projects that are built or those projects that at a minimum have established a vested right under North Carolina zoning law as of the effective date of the local government water supply ordinance, or such earlier time that an affected local government's ordinances shall specify, based on at least one of the following criteria:

(a) substantial expenditures of resources (time, labor, money) based on a good faith reliance upon having received a valid local government approval to proceed with the project, or

(b) having an outstanding valid building permit in compliance with G.S. 153A-344.1 or G.S. 160A-385.1, or

(c) having an approved site specific or phased development plan in compliance with G.S. 153A-344.1 or G.S. 160A-385.1.

For projects that require a state permit, such as landfills, NPDES wastewater discharges, land application of residuals and road construction activities, existing development shall be defined as those projects that are built or those projects for which a state permit was issued prior to August 3, 1992.

(30) Existing uses mean uses actually attained in the water body, in a significant and not incidental manner, on or after November 28, 1975, whether or not they are included in the water quality standards, which either have been actually available to the public or are uses deemed attainable by the Environmental Management Commission. At a minimum, uses shall be deemed attainable if they can be achieved by the imposition of effluent limits and cost-effective and reasonable best management practices (BMPs) for nonpoint source control.

(31) Family subdivision means a division of a tract of land:

(a) to convey the resulting parcels, with the exception of parcels retained by the grantor, to a relative or relatives as a gift or for nominal consideration, but only if no more than one parcel is conveyed by the grantor from the tract to any one relative; or

(b) to divide land from a common ancestor among tenants in common, all of whom inherited by intestacy or by will.

(32) Fertilizer means any substance containing nitrogen or phosphorus which is used primarily for its plant food content.

(33) Fishing means the taking of fish by sport or commercial methods as well as the consumption of fish or shellfish or the propagation of fish and such other aquatic life as is necessary to provide a suitable environment for fish.

(34) Forest vegetation means the plants of an area which grow together in disturbed or undisturbed conditions in various wooded plant communities in any combination of trees, saplings, shrubs, vines and herbaceous plants. This includes mature and successional forests as well as cutover stands.

(35) Freshwater means all waters that under natural conditions would have a chloride ion content of 500 mg/l or less.

(36) Industrial discharge means the discharge of industrial process treated wastewater or wastewater other than sewage. Stormwater shall not be considered to be an industrial wastewater unless it is contaminated with industrial wastewater. Industrial discharge includes:

(a) wastewater resulting from any process of industry or manufacture, or from the development of any natural resource;

(b) wastewater resulting from processes of trade or business, including wastewater from laundromats and car washes, but not wastewater from restaurants; or

(c) wastewater discharged from a municipal wastewater treatment plant requiring a pretreatment program.

(37) Land-disturbing activity means any use of the land that results in a change in the natural cover or topography that may cause or contribute to sedimentation.

(38) LC50 means that concentration of a toxic substance which is lethal (or immobilizing, if appropriate) to 50 percent of the organisms tested during a specified exposure period. The LC50 concentration for toxic materials shall be determined for sensitive species as defined by Subparagraph (43) of this Rule under aquatic conditions characteristic of the receiving waters.

(39) Local government means a city or county in singular or plural as defined in G.S. 160A-1(2) and G.S. 158A-10.

(40) Lower piedmont and coastal plain waters mean those waters of the Catawba River Basin below Lookout Shoals Dam; the Yadkin River Basin below the junction of the Forsyth, Yadkin, and Davie County lines; and all of the waters of Cape Fear, Lumber, Roanoke, Neuse, Tar-Pamlico, Chowan, Pasquotank, and White Oak River Basins; except tidal salt waters which are assigned S classifications.

(41) MF is an abbreviation for the membrane filter procedure for bacteriological analysis.

(42) Major variance means a variance from the minimum statewide watershed protection rules that results in the relaxation, by a factor greater than five percent of any buffer, density or built-upon area requirement under the high density option; any variation in the design, maintenance or operation requirements of a wet detention pond or other approved stormwater management system; or relaxation by a factor greater than 10 percent, of any management requirement under the low density option.

(43) Minor variance means a variance from the minimum statewide watershed protection rules that results in a relaxation, by a factor of up to five percent of any buffer, density or built-upon area requirement under the high density option; or that results in a relaxation by a factor up to 10 percent, of any management requirement under the low density option.

(44) Mixing zone means a region of the receiving water in the vicinity of a discharge within which dispersion and dilution of constituents in the discharge occurs and such zones shall be subject to conditions established in accordance with 15A NCAC 2B .0204(b).

(45) Mountain and upper piedmont waters mean all of the waters of the Hiwassee; Little Tennessee, including the Savannah River drainage area; French Broad; Broad; New; and Watauga River Basins; and those portions of the Catawba River Basin above Lookout Shoals Dam and the Yadkin River Basin above the junction of the Forsyth, Yadkin, and Davie County lines.

(46) Nonconforming lot of record means a lot described by a plat or a deed that was recorded prior to the effective date of local watershed regulations (or their amendments) that does not meet the minimum lot-size or other development requirements of Rule .0211 of this Subchapter.

(47) Nonpoint source pollution means pollution which enters waters mainly as a result of precipitation and subsequent runoff from lands which have been disturbed by man's activities and includes all sources of water pollution which are not required to have a permit in accordance with G.S. 143-215.1(c).

(48) Non-process discharge means industrial effluent not directly resulting from the manufacturing process. An example would be non-contact cooling water from a compressor.

(49) Nutrient sensitive waters mean those waters which are so designated in the classification schedule in order to limit the discharge of nutrients (usually nitrogen and phosphorus). They are designated by "NSW" following the water classification.

(50) Offensive condition means any condition or conditions resulting from the presence of sewage, industrial wastes or other wastes within the waters of the state or along the shorelines thereof which shall either directly or indirectly cause foul or noxious odors, unsightly conditions, or breeding of abnormally large quantities of mosquitoes or other insect pests, or shall damage private or public water supplies or other structures, result in the development of gases which destroy or damage surrounding property, herbage or grasses, or which may cause the impairment of taste, such as from fish flesh tainting, or affect the health of any person residing or working in the area.

(51) Primary Nursery Areas (PNAs) are tidal saltwaters which provide essential habitat for the early development of commercially important fish and shellfish and are so designated by the Marine Fisheries Commission.

(52) Primary recreation includes swimming, skin diving, skiing, and similar uses involving human body contact with water where such activities take place in an organized or on a frequent basis.

(53) Protected area means the area adjoining and upstream of the critical area in a WS-IV water supply in which protection measures are required. The boundaries of the protected areas are defined as within five miles of the normal pool elevation of the reservoir and draining to water supply reservoirs (measured from the normal pool elevation) or to the ridge line of the watershed (whichever comes first); or 10 miles upstream and draining to the intake located directly in the stream or river (run-of-the-river), or to the ridge line of the watershed (whichever comes first). Local governments may extend the protected area. Major landmarks such as highways or property lines may be used to delineate the outer boundary of the protected area if these landmarks are immediately adjacent to the appropriate outer boundary of five or 10 miles. In some cases the protected area shall encompass the entire watershed. The Commission may adopt a different protected area size during the reclassification process.

(54) Residential development means buildings for residence such as attached and detached single family dwellings, apartment complexes, condominiums, townhouses, cottages, and their associated outbuildings such as garages, storage buildings, and gazebos.

(55) Residuals means any solid or demisolid waste generated from a wastewater treatment plant, water treatment plant or air pollution control facility permitted under the authority of the Environmental Management Commission.

(56) Riparian area means an area that is adjacent to a body of water.

(57) Secondary recreation includes wading, boating, other uses not involving human body contact with water, and activities involving human body contact with water where such activities take place on an infrequent, unorganized, or incidental basis.

(58) Sensitive species for aquatic toxicity testing is any species utilized in procedures accepted by the Commission or its designee in accordance with Rule .0103 of this Subchapter, or the following genera:

(a) Daphnia;
(b) Ceriodaphnia;
(c) Salmo;
(d) Pimephales;
(e) Mysidopsis;
(f) Champia;
(g) Cyprinodon;
(h) Arbacia;
(i) Penaeus;
(j) Menidia;
(k) Notropis;
(l) Salvelinus;
(m) Oncorhynchus;
(n) Selenastrum;
(o) Chironomus;
(p) Hyalella;
(q) Lumbriculus.

(59) Shellfish culture includes the use of waters for the propagation, storage and gathering of oysters, clams, and other shellfish for market purposes.

(60) Stormwater collection system means any conduit, pipe, channel, curb or gutter for the primary purpose of transporting (not treating) runoff. A stormwater collection system does not include vegetated swales, swales stabilized with armoring or alternative methods where natural topography prevents the use of vegetated swales (subject to case-by-case review), curb outlet systems or pipes used to carry drainage underneath built-upon surfaces that are associated with development controlled by the provisions of 15A NCAC 2H .1003(c)(1).

(61) Source of water supply for drinking, culinary or food-processing purposes means any source, either public or private, the waters from which are used for human consumption, or used in connection with the processing of milk, beverages, food, or other purpose which requires water suitable for human consumption.

(62) Swamp waters mean those waters which are classified by the Environmental Management Commission and which are topographically located so as to generally have very low velocities and other characteristics

which are different from adjacent streams draining steeper topography. They are designated by "Sw" following the water classification.

(63) Tidal salt waters mean all tidal waters which are classified by the Environmental Management Commission which generally have a natural chloride ion content in excess of 500 parts per million and include all waters assigned S classifications.

(64) Toxic substance or toxicant means any substance or combination of substances (including disease-causing agents), which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, has the potential to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions or suppression in reproduction or growth) or physical deformities in such organisms or their offspring.

(65) Trout waters are those waters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis. These waters shall be classified by the Commission after considering the requirements of Rule .0101(b) and (c) of this Subchapter and include all waters designated by "Tr" in the water classification.

(66) Waste disposal includes the use of waters for disposal of sewage, industrial waste or other waste after approved treatment.

(67) Water dependent structures are those structures for which the use requires access or proximity to or siting within surface waters to fulfill its basic purpose, such as boat ramps, boat houses, docks and bulkheads. Ancillary facilities such as restaurants, outlets for boat supplies, parking lots and commercial boat storage areas are not water dependent structures.

(68) Water quality based effluent limits and best management practices are limitations or best management practices developed by the Division for the purpose of protecting water quality standards and best usage of surface waters consistent with the requirements of G.S. 143-214.1 and the Federal Water Pollution Control Act as amended.

(69) Waters with quality higher than the standards means all waters for which the determination of waste load allocations (pursuant to Rule .0206 of this Section) indicates that water quality is sufficiently greater than that defined by the standards such that significant pollutant loading capacity still exists in those waters.

(70) Watershed means the entire land area contributing surface drainage to a specific point. For the purpose of the water supply protection rules in 15A NCAC 2B .0104 and .0211 local governments may use major landmarks such as highways or property lines to delineate the outer boundary of the drainage area if these landmarks are immediately adjacent to the ridgeline.

(71) Wetlands are "waters" as defined by G.S. 143-212(6) and are areas that are inundated or saturated by an accumulation of surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands classified as waters of the state are restricted to waters of the United States as defined by 33 CFR 328.3 and 40 CFR 230.3.

History Note: *Authority G.S. 143-214.1; 143-215.3(a)(1);*
Eff. February 1, 1976;
Amended Eff. August 1, 1995; February 1, 1993; August 3, 1992; August 1, 1990;
RRC Objection Eff. July 18, 1996 due to lack of authority and ambiguity;
Amended Eff. August 1, 1998; October 1, 1996.

15A NCAC 02B .0232 NEUSE RIVER BASIN- NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: BASIN NUTRIENT REDUCTION GOAL

(a) Pursuant to 1995 (Reg. Sess., 1996) N.C. Session Laws, c. 572, the Environmental Management Commission hereby establishes the goal of reducing the average annual load of nitrogen delivered to the Neuse River Estuary from point and nonpoint sources by a minimum of 30 percent of the average annual load for the period 1991 through 1995 by the year 2001. All waters of the Neuse River Basin have been supplementally classified as Nutrient Sensitive Waters (NSW) pursuant to 15A NCAC 2B .0223. The following rules shall be implemented in accordance with 15A NCAC 2B .0223 in all waters of the Neuse River Basin:

(1) Rule .0233 for protection and maintenance of riparian areas,
(2) Rule .0234 for wastewater discharges,
(3) Rule .0235 for urban stormwater management,
(4) Rules .0236 and .0238 for agricultural nitrogen reduction,
(5) Rule .0239 for nutrient management, and
(6) Rule .0240 for nitrogen offset fees.

(b) Failure to meet requirements of Rules .0233, .0234, .0235, .0236, .0238, .0239, and .0240 of this Section may result in imposition of enforcement measures as authorized by G.S. 143-215.6A (civil penalties), G.S. 143-215.6B (criminal penalties), and G.S. 143-215.6C (injunctive relief).

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.1; 143-215.3(a)(1); 143-215.6A; 143-215.6B; 143-215.6C;*
Eff. August 1, 1998.

15A NCAC 02B .0233 NEUSE RIVER BASIN: NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: PROTECTION AND MAINTENANCE OF EXISTING RIPARIAN BUFFERS

The following is the management strategy for maintaining and protecting existing riparian buffers in the Neuse River Basin.

(1) PURPOSE. The purpose of this Rule shall be to protect and preserve existing riparian buffers in the Neuse River Basin to maintain their nutrient removal functions.

(2) DEFINITIONS. For the purpose of this Rule, these terms shall be defined as follows:

(a) 'Channel' means a natural water-carrying trough cut vertically into low areas of the land surface by erosive action of concentrated flowing water or a ditch or canal excavated for the flow of water. (current definition in Forest Practice Guidelines Related to Water Quality, 15A NCAC 01I .0102)

(b) 'DBH' means Diameter at Breast Height of a tree, which is measured at 4.5 feet above ground surface level.

(c) 'Ditch or canal' means a man-made channel other than a modified natural stream constructed for drainage purposes that is typically dug through inter-stream divide areas. A ditch or canal may have flows that are perennial, intermittent, or ephemeral and may exhibit hydrological and biological characteristics similar to perennial or intermittent streams.

(d) 'Ephemeral (stormwater) stream' means a feature that carries only stormwater in direct response to precipitation with water flowing only during and shortly after large precipitation events. An ephemeral stream may or may not have a well-defined channel, the aquatic bed is always above the water table, and stormwater runoff is the primary source of water. An ephemeral stream typically lacks the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.

(e) 'Forest plantation' means an area of planted trees that may be conifers (pines) or hardwoods. On a plantation, the intended crop trees are planted rather than naturally regenerated from seed on the site, coppice (sprouting), or seed that is blown or carried into the site.

(f) 'High Value Tree' means a tree that meets or exceeds the following standards: for pine species, 14-inch DBH or greater or 18-inch or greater stump diameter; and, for hardwoods and wetland species, 16-inch DBH or greater or 24-inch or greater stump diameter.

(g) 'Intermittent stream' means a well-defined channel that contains water for only part of the year, typically during winter and spring when the aquatic bed is below the water table. The flow may be heavily supplemented by stormwater runoff. An intermittent stream often lacks the biological and hydrological characteristics commonly associated with the conveyance of water.

(h) 'Modified natural stream' means an on-site channelization or relocation of a stream channel and subsequent relocation of the intermittent or perennial flow as evidenced by topographic alterations in the immediate watershed. A modified natural stream must have the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.

(i) 'Perennial stream' means a well-defined channel that contains water year round during a year of normal rainfall with the aquatic bed located below the water table for most of the year. Groundwater is the primary source of water for a perennial stream, but it also carries stormwater runoff. A perennial stream exhibits the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.

(j) 'Perennial waterbody' means a natural or man-made basin that stores surface water permanently at depths sufficient to preclude growth of rooted plants, including lakes, ponds, sounds, non-stream estuaries and ocean. For the purpose of the State=s riparian buffer protection program, the waterbody must be part of a natural drainageway (i.e., connected by surface flow to a stream).

(k) 'Stream' means a body of concentrated flowing water in a natural low area or natural channel on the land surface.

(l) 'Surface water' means all waters of the state as defined in G.S. 143-212 except underground waters.

(m) 'Tree' means a woody plant with a DBH equal to or exceeding five inches.

(3) APPLICABILITY. This Rule shall apply to 50-foot wide riparian buffers directly adjacent to surface waters in the Neuse River Basin (intermittent streams, perennial streams, lakes, ponds, and estuaries), excluding wetlands. Except as described in Sub-Item (4)(a)(iii) of this Rule, wetlands adjacent to surface waters or within 50 feet of surface waters shall be considered as part of the riparian buffer but are regulated pursuant to 15A NCAC 02H .0506. The riparian buffers protected by this Rule shall be measured pursuant to Item (4) of this Rule. For the purpose of this Rule, a surface water shall be present if the feature is approximately shown on either the most recent version of the soil survey map prepared by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). Riparian buffers adjacent to surface waters that do not appear on either of the maps shall not be subject to this Rule. Riparian buffers adjacent to surface waters that appear on the maps shall be subject to this Rule unless one of the following applies.

(a) EXEMPTION WHEN AN ON-SITE DETERMINATION SHOWS THAT SURFACE WATERS ARE NOT PRESENT. When a landowner or other affected party believes that the maps have inaccurately depicted surface waters, he or she shall consult the Division or the appropriate delegated local authority. Upon request, the Division or delegated local authority shall make on-site determinations. Any disputes over on-site determinations shall be referred to the Director in writing. A determination of the Director as to the accuracy or application of the maps is subject to review as provided in Articles 3 and 4 of G.S. 150B. Surface waters that appear on the maps shall not be subject to this Rule if an on-site determination shows that they fall into one of the following categories.

(i) Ditches and manmade conveyances other than modified natural streams unless constructed for navigation or boat access.

(ii) Manmade ponds and lakes that are located outside natural drainage ways.

(iii) Ephemeral (stormwater) streams.

(b) EXEMPTION WHEN EXISTING USES ARE PRESENT AND ONGOING. This Rule shall not apply to portions of the riparian buffer where a use is existing and ongoing according to the following:

(i) A use shall be considered existing if it was present within the riparian buffer as of July 22, 1997. Existing uses shall include, but not be limited to, agriculture, buildings, industrial facilities, commercial areas, transportation facilities, maintained lawns, utility lines and on-site sanitary sewage systems. Only the portion of the riparian buffer that contains the footprint of the existing use is exempt from this Rule. Activities necessary to maintain uses are allowed provided that no additional vegetation is removed from Zone 1 except that grazed or trampled by livestock and existing diffuse flow is maintained. Grading and revegetating Zone 2 is allowed provided that the health of the vegetation in Zone 1 is not compromised, the ground is stabilized and existing diffuse flow is maintained.

(ii) At the time an existing use is proposed to be converted to another use, this Rule shall apply. An existing use shall be considered to be converted to another use if any of the following applies:

(A) Impervious surface is added to the riparian buffer in locations where it did not exist previously.

(B) An agricultural operation within the riparian buffer is converted to a non-agricultural use.

(C) A lawn within the riparian buffer ceases to be maintained.

(4) ZONES OF THE RIPARIAN BUFFER. The protected riparian buffer shall have two zones as follows:

(a) Zone 1 shall consist of a vegetated area that is undisturbed except for uses provided for in Item (6) of this Rule. The location of Zone 1 shall be as follows:

(i) For intermittent and perennial streams, Zone 1 shall begin at the most landward limit of the top of bank or the rooted herbaceous vegetation and extend landward a distance of 30 feet on all sides of the surface water, measured horizontally on a line perpendicular to the surface water.

(ii) For ponds, lakes and reservoirs located within a natural drainage way, Zone 1 shall begin at the most landward limit of the normal water level or the rooted herbaceous vegetation and extend landward a distance of 30 feet, measured horizontally on a line perpendicular to the surface water.

(iii) For surface waters within the 20 Coastal Counties (defined in 15A NCAC 02B .0202) within the jurisdiction of the Division of Coastal Management, Zone 1 shall begin at the most landward limit of:

(A) the normal high water level;

(B) the normal water level; or

(C) the landward limit of coastal wetlands as defined by the Division of Coastal Management;

and extend landward a distance of 30 feet, measured horizontally on a line perpendicular to the surface water, whichever is more restrictive.

(b) Zone 2 shall consist of a stable, vegetated area that is undisturbed except for activities and uses provided for in Item (6) of this Rule. Grading and revegetating Zone 2 is allowed provided that the health of the vegetation in Zone 1 is not compromised. Zone 2 shall begin at the outer edge of Zone 1 and extend landward 20 feet as measured horizontally on a line perpendicular to the surface water. The combined width of Zones 1 and 2 shall be 50 feet on all sides of the surface water.

(5) DIFFUSE FLOW REQUIREMENT. Diffuse flow of runoff shall be maintained in the riparian buffer by dispersing concentrated flow and reestablishing vegetation.

(a) Concentrated runoff from new ditches or manmade conveyances shall be converted to diffuse flow before the runoff enters the Zone 2 of the riparian buffer.

(b) Periodic corrective action to restore diffuse flow shall be taken if necessary to impede the formation of erosion gullies.

(6) TABLE OF USES. The following chart sets out the uses and their designation under this Rule as exempt, allowable, allowable with mitigation, or prohibited. The requirements for each category are given in Item (7) of this Rule.

	Exempt	Allowable	Allowable with Mitigation	Prohibited
Airport facilities: • Airport facilities that impact equal to or less than 150 linear feet or one-third of an acre of riparian buffer • Airport facilities that impact greater than 150 linear feet or one-third of an acre of riparian buffer		X	X	
Archaeological activities	X			
Bridges		X		
Dam maintenance activities	X			
Drainage ditches, roadside ditches and stormwater outfalls through riparian buffers: • Existing drainage ditches, roadside ditches, and stormwater outfalls provided that they are managed to minimize the sediment, nutrients and other pollution that convey to waterbodies • New drainage ditches, roadside ditches and stormwater outfalls provided that a stormwater management facility	X	X		

is installed to control nitrogen and attenuate flow before the conveyance discharges through the riparian buffer • New drainage ditches, roadside ditches and stormwater outfalls that do not provide control for nitrogen before discharging through the riparian buffer • Excavation of the streambed in order to bring it to the same elevation as the invert of a ditch				X X
Drainage of a pond in a natural drainage way provided that a new riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the new channel	X			
Driveway crossings of streams and other surface waters subject to this Rule: • Driveway crossings on single family residential lots that disturb equal to or less than 25 linear feet or 2, 500 square feet of riparian buffer • Driveway crossings on single family residential lots that disturb greater than 25 linear feet or 2,500 square feet of riparian buffer • In a subdivision that cumulatively disturb equal to or less than 150 linear feet or one-third of an acre of riparian buffer • In a subdivision that cumulatively disturb greater than 150 linear feet or one-third of an acre of riparian buffer	X	X X	X	
Fences provided that disturbance is minimized and installation does not result in removal of forest vegetation	X			
Forest harvesting - see Item (11) of this Rule				
Fertilizer application: • One-time fertilizer application to establish replanted vegetation • Ongoing fertilizer application	X			X
Grading and revegetation in Zone 2 only provided that diffuse flow and the health of existing vegetation in Zone 1 is not compromised and disturbed areas are stabilized	X			
Greenway/hiking trails		X		
Historic preservation	X			
Landfills as defined by G.S. 130A-290				X
Mining activities: • Mining activities that are covered by the Mining Act provided that new riparian buffers that meet the requirements of Items (4) and (5) of this Rule are established adjacent to the relocated channels • Mining activities that are not covered by the Mining Act OR where new riparian buffers that meet the requirements or Items (4) and (5) of this Rule are not established adjacent to the relocated channels • Wastewater or mining dewatering wells with approved NPDES permit	X	X	X	
Non-electric utility lines: • Impacts other than perpendicular crossings in Zone 2 only[3]		X		

• Impacts other than perpendicular crossings in Zone 1[3]			X	
Non-electric utility line perpendicular crossing of streams and other surface waters subject to this Rule[3]: • Perpendicular crossings that disturb equal to or less than 40 linear feet of riparian buffer with a maintenance corridor equal to or less than 10 feet in width • Perpendicular crossings that disturb greater than 40 linear feet of riparian buffer with a maintenance corridor greater than 10 feet in width • Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer with a maintenance corridor equal to or less than 10 feet in width • Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of riparian buffer with a maintenance corridor greater than 10 feet in width • Perpendicular crossings that disturb greater than 150 linear feet of riparian buffer	X	X X	X X	
On-site sanitary sewage systems - new ones that use ground absorption				X
Overhead electric utility lines: • Impacts other than perpendicular crossings in Zone 2 only[3] • Impacts other than perpendicular crossings in Zone 1 [1,2,3]	X X			
Overhead electric utility line perpendicular crossings of streams and other surface waters subject to this Rule[3] • Perpendicular crossings that disturb equal to or less than 150 linear feet of riparian buffer [1] • Perpendicular crossings that disturb greater than 150 linear feet of riparian buffer [1, 2]	X	X		
Periodic maintenance of modified natural streams such as canals and a grassed travelway on one side of the surface water when alternative forms of maintenance access are not practical		X		

[1] Provided that, in Zone 1, all of the following BMPs for overhead utility lines are used. If all of these BMPs are not used, then the overhead utility lines shall require a no practical alternatives evaluation by the Division.

- A minimum zone of 10 feet wide immediately adjacent to the water body shall be managed such that only vegetation that poses a hazard or has the potential to grow tall enough to interfere with the line is removed.
- Woody vegetation shall be cleared by hand. No land grubbing or grading is allowed.
- Vegetative root systems shall be left intact to maintain the integrity of the soil. Stumps shall remain where trees are cut.
- Rip rap shall not be used unless it is necessary to stabilize a tower.
- No fertilizer shall be used other than a one-time application to re-establish vegetation.
- Construction activities shall minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
- Active measures shall be taken after construction and during routine maintenance to ensure diffuse flow of stormwater through the buffer.
- In wetlands, mats shall be utilized to minimize soil disturbance.

[2] Provided that poles or towers shall not be installed within 10 feet of a water body unless the Division completes a no practical alternatives evaluation.

[3] Perpendicular crossings are those that intersect the surface water at an angle between 75 degrees and 105 degrees.

	Exempt	Allowable	Allowable with Mitigation	Prohibited
Playground equipment: • Playground equipment on single family lots provided that installation and use does not result in removal of vegetation • Playground equipment installed on lands other than single-family lots or that requires removal of vegetation	X	X		
Ponds in natural drainage ways, excluding dry ponds: • New ponds provided that a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the pond • New ponds where a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is NOT established adjacent to the pond		X	X	
Protection of existing structures, facilities and streambanks when this requires additional disturbance of the riparian buffer or the stream channel		X		
Railroad impacts other than crossings of streams and other surface waters subject to this Rule			X	
Railroad crossings of streams and other surface waters subject to this Rule: • Railroad crossings that impact equal to or less than 40 linear feet of riparian buffer • Railroad crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet or one-third of an acre of riparian buffer • Railroad crossings that impact greater than 150 linear feet or one-third of an acre of riparian buffer	X	X	X	
Removal of previous fill or debris provided that diffuse flow is maintained and any vegetation removed is restored	X			
Road impacts other than crossings of streams and other surface waters subject to this Rule			X	
Road crossings of streams and other surface waters subject to this Rule: • Road crossings that impact equal to or less than 40 linear feet of riparian buffer • Road crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet or one-third of an acre of riparian buffer • Road crossings that impact greater than 150 linear feet or one-third of an acre of riparian buffer	X	X	X	
Scientific studies and stream gauging	X			
Stormwater management ponds excluding dry ponds: • New stormwater management ponds provided that a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the pond • New stormwater management ponds where a riparian		X	X	

buffer that meets the requirements of Items (4) and (5) of this Rule is NOT established adjacent to the pond				
Stream restoration	X			
Streambank stabilization		X		
Temporary roads: • Temporary roads that disturb less than or equal to 2,500 square feet provided that vegetation is restored within six months of initial disturbance • Temporary roads that disturb greater than 2,500 square feet provided that vegetation is restored within six months of initial disturbance • Temporary roads used for bridge construction or replacement provided that restoration activities, such as soil stabilization and revegetation, are conducted immediately after construction	X	X X		
Temporary sediment and erosion control devices: • In Zone 2 only provided that the vegetation in Zone 1 is not compromised and that discharge is released as diffuse flow in accordance with Item (5) of this Rule • In Zones 1 and 2 to control impacts associated with uses approved by the Division or that have received a variance provided that sediment and erosion control for upland areas is addressed to the maximum extent practical outside the buffer • In-stream temporary erosion and sediment control measures for work within a stream channel	X X	X		
Underground electric utility lines: • Impacts other than perpendicular crossings in Zone 2 only[3] • Impacts other than perpendicular crossings in Zone 1[3,4]	X X			
Underground electric utility line perpendicular crossings of streams and other surface waters subject to this Rule:[3] • Perpendicular crossings that disturb less than or equal to 40 linear feet of riparian buffer[3,4] • Perpendicular crossings that disturb greater than 40 linear feet of riparian buffer[3,4]	X	X		

[4] Provided that, in Zone 1, all of the following BMPs for underground utility lines are used. If all of these BMPs are not used, then the underground utility line shall require a no practical alternatives evaluation by the Division.

- Woody vegetation shall be cleared by hand. No land grubbing or grading is allowed.
- Vegetative root systems shall be left intact to maintain the integrity of the soil. Stumps shall remain, except in the trench, where trees are cut.
- Underground cables shall be installed by vibratory plow or trenching.
- The trench shall be backfilled with the excavated soil material immediately following cable installation.
- No fertilizer shall be used other than a one-time application to re-establish vegetation.
- Construction activities shall minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
- Active measures shall be taken after construction and during routine maintenance to ensure diffuse flow of stormwater through the buffer.
- In wetlands, mats shall be utilized to minimize soil disturbance.

	Exempt	Allowable	Allowable with	Prohibited

			Mitigation	
Vegetation management: • Emergency fire control measures provided that topography is restored • Periodic mowing and harvesting of plant products in Zone 2 only • Planting vegetation to enhance the riparian buffer • Pruning forest vegetation provided that the health and function of the forest vegetation is not compromised • Removal of individual trees which are in danger of causing damage to dwellings, other structures or human life • Removal of poison ivy • Removal of understory nuisance vegetation as defined in: Smith, Cherri L. 1998. Exotic Plant Guidelines. Department of Environment and Natural Resources. Division of Parks and Recreation. Raleigh, NC. Guideline #30	X X X X X X X			
Water dependent structures as defined in 15A NCAC 02B .0202		X		
Water supply reservoirs: • New reservoirs provided that a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is established adjacent to the reservoir • New reservoirs where a riparian buffer that meets the requirements of Items (4) and (5) of this Rule is NOT established adjacent to the reservoir		X	X	
Water wells	X			
Wetland restoration	X			

(7) REQUIREMENTS FOR CATEGORIES OF USES. Uses designated as exempt, allowable, allowable with mitigation and prohibited in Item (6) of this Rule shall have the following requirements:

(a) EXEMPT. Uses designated as exempt are allowed within the riparian buffer. Exempt uses shall be designed, constructed and maintained to minimize soil disturbance and to provide the maximum water quality protection practicable. In addition, exempt uses shall meet requirements listed in Item (6) of this Rule for the specific use.

(b) ALLOWABLE. Uses designated as allowable may proceed within the riparian buffer provided that there are no practical alternatives to the requested use pursuant to Item (8) of this Rule. These uses require written authorization from the Division or the delegated local authority.

(c) ALLOWABLE WITH MITIGATION. Uses designated as allowable with mitigation may proceed within the riparian buffer provided that there are no practical alternatives to the requested use pursuant to Item (8) of this Rule and an appropriate mitigation strategy has been approved pursuant to Item (10) of this Rule. These uses require written authorization from the Division or the delegated local authority.

(d) PROHIBITED. Uses designated as prohibited may not proceed within the riparian buffer unless a variance is granted pursuant to Item (9) of this Rule. Mitigation may be required as one condition of a variance approval.

(8) DETERMINATION OF "NO PRACTICAL ALTERNATIVES." Persons who wish to undertake uses designated as allowable or allowable with mitigation shall submit a request for a "no practical alternatives" determination to the Division or to the delegated local authority. The applicant shall certify that the criteria identified in Sub-Item (8)(a) of this Rule are met. The Division or the

delegated local authority shall grant an Authorization Certificate upon a "no practical alternatives" determination. The procedure for making an Authorization Certificate shall be as follows:

(a) For any request for an Authorization Certificate, the Division or the delegated local authority shall review the entire project and make a finding of fact as to whether the following requirements have been met in support of a "no practical alternatives" determination:
    (i) The basic project purpose cannot be practically accomplished in a manner that would better minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    (ii) The use cannot practically be reduced in size or density, reconfigured or redesigned to better minimize disturbance, preserve aquatic life and habitat, and protect water quality.
    (iii) Best management practices shall be used if necessary to minimize disturbance, preserve aquatic life and habitat, and protect water quality.

(b) Requests for an Authorization Certificate shall be reviewed and either approved or denied within 60 days of receipt of a complete submission based on the criteria in Sub-Item (8)(a) of this Rule by either the Division or the delegated local authority. Failure to issue an approval or denial within 60 days shall constitute that the applicant has demonstrated "no practical alternatives." The Division or the delegated local authority may attach conditions to the Authorization Certificate that support the purpose, spirit and intent of the riparian buffer protection program. Complete submissions shall include the following:
    (i) The name, address and phone number of the applicant;
    (ii) The nature of the activity to be conducted by the applicant;
    (iii) The location of the activity, including the jurisdiction;
    (iv) A map of sufficient detail to accurately delineate the boundaries of the land to be utilized in carrying out the activity, the location and dimensions of any disturbance in riparian buffers associated with the activity, and the extent of riparian buffers on the land;
    (v) An explanation of why this plan for the activity cannot be practically accomplished, reduced or reconfigured to better minimize disturbance to the riparian buffer, preserve aquatic life and habitat and protect water quality; and
    (vi) Plans for any best management practices proposed to be used to control the impacts associated with the activity.

(c) Any disputes over determinations regarding Authorization Certificates shall be referred to the Director for a decision. The Director's decision is subject to review as provided in Articles 3 and 4 of G.S. 150B.

(9) VARIANCES. Persons who wish to undertake uses designated as prohibited may pursue a variance. The Division or the appropriate delegated local authority may grant minor variances. The variance request procedure shall be as follows:

(a) For any variance request, the Division or the delegated local authority shall make a finding of fact as to whether the following requirements have been met:
    (i) There are practical difficulties or unnecessary hardships that prevent compliance with the strict letter of the riparian buffer protection requirements. Practical difficulties or unnecessary hardships shall be evaluated in accordance with the following:
        (A) If the applicant complies with the provisions of this Rule, he/she can secure no reasonable return from, nor make reasonable use of, his/her property. Merely proving that the variance would permit a greater profit from the property shall not be considered adequate justification for a variance. Moreover, the Division or delegated local authority shall consider whether the variance is the minimum possible deviation from the terms of this Rule that shall make reasonable use of the property possible.
        (B) The hardship results from application of this Rule to the property rather than from other factors such as deed restrictions or other hardship.

(C) The hardship is due to the physical nature of the applicant's property, such as its size, shape, or topography, which is different from that of neighboring property.

(D) The applicant did not cause the hardship by knowingly or unknowingly violating this Rule.

(E) The applicant did not purchase the property after the effective date of this Rule, and then requesting an appeal.

(F) The hardship is unique to the applicant's property, rather than the result of conditions that are widespread. If other properties are equally subject to the hardship created in the restriction, then granting a variance would be a special privilege denied to others, and would not promote equal justice;

(ii) The variance is in harmony with the general purpose and intent of the State's riparian buffer protection requirements and preserves its spirit; and

(iii) In granting the variance, the public safety and welfare have been assured water quality has been protected, and substantial justice has been done.

(b) MINOR VARIANCES. A minor variance request pertains to activities that are proposed only to impact any portion of Zone 2 of the riparian buffer. Minor variance requests shall be reviewed and approved based on the criteria in Sub-Item (9)(a) of this Rule by the either the Division or the delegated local authority pursuant to G.S. 153A Article 18, or G.S. 160A-Article 19. The Division or the delegated local authority may attach conditions to the variance approval that support the purpose, spirit and intent of the riparian buffer protection program. Requests for appeals of decisions made by the Division shall be made to the Office of Administrative Hearings. Request for appeals made by the delegated local authority shall be made to the appropriate Board of Adjustment under G.S. 160A-388 or G.S. 153A-345.

(c) MAJOR VARIANCES. A major variance request pertains to activities that are proposed to impact any portion of Zone 1 or any portion of both Zones 1 and 2 of the riparian buffer. If the Division or the delegated local authority has determined that a major variance request meets the requirements in Sub-Item (9)(a) of this Rule, then it shall prepare a preliminary finding and submit it to the Commission. Preliminary findings on major variance requests shall be reviewed by the Commission within 90 days after receipt by the Director. Requests for appeals of determinations that the requirements of Sub-Item (9)(a) of this Rule have not been met shall be made to the Office of Administrative Hearings for determinations made by the Division or the appropriate Board of Adjustments under G.S. 160A-388 or G.S. 153A-345 for determinations made by the delegated local authority. The purpose of the Commission's review is to determine if it agrees that the requirements in Sub-Item (9)(a) of this Rule have been met. Requests for appeals of decisions made by the Commission shall be made to the Office of Administrative Hearings. The following actions shall be taken depending on the Commission's decision on the major variance request:

(i) Upon the Commission's approval, the Division or the delegated local authority shall issue a final decision granting the major variance.

(ii) Upon the Commission's approval with conditions or stipulations, the Division or the delegated local authority shall issue a final decision, which includes these conditions or stipulations.

(iii) Upon the Commission's denial, the Division or the delegated local authority shall issue a final decision denying the major variance.

(10) MITIGATION. Persons who wish to undertake uses designated as allowable with mitigation shall meet the following requirements in order to proceed with their proposed use.

(a) Obtain a determination of "no practical alternatives" to the proposed use pursuant to Item (8) of this Rule.

(b) Obtain approval for a mitigation proposal pursuant to 15A NCAC 02B .0242.

(11) REQUIREMENTS SPECIFIC TO FOREST HARVESTING. The following requirements shall apply for forest harvesting operations and practices.

(a) The following measures shall apply in the entire riparian buffer:

(i) Logging decks and sawmill sites shall not be placed in the riparian buffer.

(ii) Access roads and skid trails shall be prohibited except for temporary and permanent stream crossings established in accordance with 15A NCAC 01I .0203. Temporary stream crossings shall be permanently stabilized after any site disturbing activity is completed.

(iii) Timber felling shall be directed away from the stream or water body.

(iv) Skidding shall be directed away from the stream or water body and shall be done in a manner that minimizes soil disturbance and prevents the creation of channels or ruts.

(v) Individual trees may be treated to maintain or improve their health, form or vigor.

(vi) Harvesting of dead or infected trees or application of pesticides necessary to prevent or control extensive tree pest and disease infestation shall be allowed. These practices must be approved by the Division of Forest Resources for a specific site. The Division of Forest Resources must notify the Division of all approvals.

(vii) Removal of individual trees that are in danger of causing damage to structures or human life shall be allowed.

(viii) Natural regeneration of forest vegetation and planting of trees, shrubs, or ground cover plants to enhance the riparian buffer shall be allowed provided that soil disturbance is minimized. Plantings shall consist primarily of native species.

(ix) High intensity prescribed burns shall not be allowed.

(x) Application of fertilizer shall not be allowed except as necessary for permanent stabilization. Broadcast application of fertilizer or herbicides to the adjacent forest stand shall be conducted so that the chemicals are not applied directly to or allowed to drift into the riparian buffer.

(b) In Zone 1, forest vegetation shall be protected and maintained. Selective harvest as provided for below is allowed on forest lands that have a deferment for use value under forestry in accordance with G.S. 105-277.2 through G.S. 277.6 or on forest lands that have a forest management plan prepared or approved by a registered professional forester. Copies of either the approval of the deferment for use value under forestry or the forest management plan shall be produced upon request. For such forest lands, selective harvest is allowed in accordance with the following:

(i) Tracked or wheeled vehicles are not permitted except at stream crossings designed, constructed and maintained in accordance with 15A NCAC 01I .0203.

(ii) Soil disturbing site preparation activities are not allowed.

(iii) Trees shall be removed with the minimum disturbance to the soil and residual vegetation.

(iv) The following provisions for selective harvesting shall be met:

(A) The first 10 feet of Zone 1 directly adjacent to the stream or waterbody shall be undisturbed except for the removal of individual high value trees as defined provided that no trees with exposed primary roots visible in the streambank be cut.

(B) In the outer 20 feet of Zone 1, a maximum of 50 percent of the trees greater than five inches dbh may be cut and removed. The reentry time for harvest shall be no more frequent than every 15 years, except on forest plantations where the reentry time shall be no more frequent than every five years. In either case, the trees remaining after harvest shall be as evenly spaced as possible.

(C) In Zone 2, harvesting and regeneration of the forest stand shall be allowed provided that sufficient ground cover is maintained to provide for diffusion and infiltration of surface runoff.

(12) REQUIREMENTS SPECIFIC TO LOCAL GOVERNMENTS WITH STORMWATER PROGRAMS FOR NITROGEN CONTROL. Local governments that are required to have local stormwater programs pursuant to 15A NCAC 02B .0235 shall have two options for ensuring protection of riparian buffers on new developments within their jurisdictions as follows.

(a) Obtain authority to implement a local riparian buffer protection program pursuant to 15A NCAC 02B .0241.

(b) Refrain from issuing local approvals for new development projects unless either:

(i) The person requesting the approval does not propose to impact the riparian buffer of a surface water that appears on either the most recent versions of the soil survey maps prepared by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent versions of the 1:24,000 scale (7.5 minute quadrangle) topographic maps prepared by the United States Geologic Survey (USGS).

(ii) The person requesting the approval proposes to impact the riparian buffer of a surface water that appears on the maps described in Sub-Item (12)(b)(i) of this Rule and either:

(A) Has received an on-site determination from the Division pursuant to Sub-Item (3)(a) of this Rule that surface waters are not present;

(B) Has received an Authorization Certificate from the Division pursuant to Item (8) of this Rule for uses designated as Allowable under this Rule;

(C) Has received an Authorization Certificate from the Division pursuant to Item (8) of this Rule and obtained the Division's approval on a mitigation plan pursuant to Item (10) of this Rule for uses designated as Allowable with Mitigation under this Rule; or

(D) Has received a variance from the Commission pursuant to Item (9) of this Rule.

(13) OTHER LAWS, REGULATIONS AND PERMITS. In all cases, compliance with this Rule does not preclude the requirement to comply with all federal, state and local regulations and laws.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1); S.L. 1995, c. 572;*
Temporary Adoption Eff. July 22, 1997;
Temporary Adoption Eff. June 22, 1999; April 22, 1998; January 22, 1998;
Eff. August 1, 2000.

15A NCAC 02B .0234 NEUSE RIVER BASIN - NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: WASTEWATER DISCHARGE REQUIREMENTS

The following is the National Pollutant Discharge Elimination System (NPDES) wastewater discharge management strategy for the Neuse River Basin:

(1) Purpose. The purpose of this Rule is to establish minimum nutrient control requirements for point source discharges in the Neuse River Basin in order to maintain or restore the water quality in the Neuse River Estuary and protect its designated uses.

(2) Applicability. This Rule applies to all wastewater treatment facilities in the Neuse River Basin that receive nitrogen-bearing wastewater and are required to obtain individual NPDES permits.

(3) Definitions. For the purposes of this Rule, the following definitions apply:

(a) In regard to point source dischargers, treatment facilities, wastewater flows or discharges, or like matters:

(i) "Existing" means that which obtained a NPDES permit on or before December 31, 1995.

(ii) "Expanding" means that which increases beyond its permitted flow as defined in this Rule.

(iii) "New" means that which had not obtained a NPDES permit on or before December 31, 1995.

(b) "MGD" means million gallons per day.

(c) "Nitrogen wasteload allocation" is that portion of the Neuse River nitrogen TMDL assigned to individually permitted wastewater facilities in the basin and represents the maximum allowable load of total nitrogen to the estuary from these point source dischargers.

(d) "Nitrogen estuary allocation" or "estuary allocation" means the mass loading of total nitrogen at the estuary that is reserved for a discharger or group of dischargers. A discharger's or group's estuary allocation is equivalent to its discharge allocation multiplied by its assigned transport factor.

(e) "Nitrogen discharge allocation" or "discharge allocation" means the mass loading of total nitrogen at the point(s) of discharge that is reserved for a discharger or group of dischargers. A discharger's or group's discharge allocation is equivalent to its estuary allocation divided by its assigned transport factor.

(f) "Nitrogen TMDL," or "TMDL," means the total nitrogen load to the Neuse River estuary that is predicted to maintain adequate water quality to support all designated uses in the estuary and is approved by the United States Environmental Protection Agency in accordance with the federal Clean Water Act.

(g) "Nonpoint source load allocation" is that portion of the Neuse River nitrogen TMDL assigned to all other nitrogen sources in the basin other than individually permitted wastewater facilities and represents the maximum allowable load of total nitrogen to the estuary from these nonpoint sources.

(h) "Permitted flow" means the maximum monthly average flow authorized in a facility's NPDES permit as of December 31, 1995, with the following exceptions:

Facility Name	NPDES No.	Permitted Flow (MGD)
Benson	NC0020389	3.00
Goldsboro	NC0023949	16.80
Kenly	NC0064891	0.63
Snow Hill	NC0020842	0.50
Wilson	NC0023906	14.00

(i) "Total nitrogen" means the sum of the organic, nitrate, nitrite, and ammonia forms of nitrogen.

(j) "Transport factor" is the fraction of the total nitrogen in a discharge that is predicted to reach the estuary.

(4) This Item specifies the nitrogen wasteload allocation for point sources.

(a) Beginning with the calendar year 2003, the nitrogen wasteload allocation for point sources shall not exceed 1.64 million pounds per calendar year plus any portion of the nonpoint

source load allocation purchased in accordance with the provisions in Items (7) and (8) of this Rule and 15A NCAC 02B .0240.

(b) The Commission shall order future revisions in the nitrogen wasteload allocation whenever necessary to ensure that water quality in the estuary meets all standards in 15A NCAC 02B .0200 or to conform with applicable state or federal requirements.

(5) This Item specifies nitrogen discharge allocations for point sources.

(a) Upon adoption of this Rule and until revised as provided elsewhere in this Rule, the following group and individual discharge allocations for total nitrogen shall apply in order to comply with the nitrogen wasteload allocation for point sources in Item (4) of this Rule:

(i) Dischargers with permitted flows less than 0.5 MGD shall be assigned collectively an annual discharge allocation of 138,000 pounds of total nitrogen.

(ii) Dischargers upstream of Falls Lake Dam and with permitted flows greater than or equal to 0.5 MGD shall be assigned collectively an annual discharge allocation of 443,700 pounds of total nitrogen.

(iii) Municipal dischargers downstream of Falls Lake Dam and with permitted flows greater than or equal to 0.5 MGD shall be assigned collectively an annual discharge allocation of 2,021,400 pounds of total nitrogen.

(iv) Industrial dischargers downstream of Falls Lake Dam and with permitted flows greater than or equal to 0.5 MGD shall be assigned collectively an annual discharge allocation of 396,900 pounds of total nitrogen.

(v) Within each group in Sub-Items (i) - (iv) of this Item, each individual discharger shall be assigned an individual discharge allocation and the equivalent estuary allocation. Each discharger's discharge allocation shall be calculated as its permitted flow divided by the total permitted flow of the group, multiplied by the group discharge allocation.

(b) In the event that the nitrogen wasteload allocation for point sources is revised, as provided in Item (4) of this Rule, the Commission shall apportion the revised load among the existing facilities and shall revise discharge allocations as needed. The Commission may consider such factors as:

(i) fate and transport of nitrogen in the river basin;

(ii) technical feasibility and economic reasonableness of source reduction and treatment methods;

(iii) economies of scale;

(iv) nitrogen control measures already implemented;

(v) probable need for growth and expansion;

(vi) incentives for responsible planning, utilities management, resource protection, and cooperative efforts among dischargers; and

(vii) other factors the Commission deems relevant.

(6) This Item specifies nutrient controls for existing facilities.

(a) Beginning with calendar year 2003, each discharger with a permitted flow equal to or greater than 0.5 MGD shall be subject to a total nitrogen permit limit equal to its individual discharge allocation, pursuant to Item (5) of this Rule.

(b) Effective January 1, 2003, dischargers shall be subject to the following limits for total phosphorus:

(i) All existing facilities above Falls Lake Dam with permitted flows greater than or equal to 0.05 MGD shall meet a quarterly average total phosphorus limit of 2 mg/L.

(ii) All existing facilities below Falls Lake Dam with permitted flows greater than or equal to 0.5 MGD shall meet a quarterly average total phosphorus limit of 2 mg/L.

(c) The director shall establish more stringent limits for nitrogen or phosphorus upon finding that such limits are necessary to protect water quality standards in localized areas.

(7) This Item specifies nutrient controls for new facilities.

(a) New facilities proposing to discharge wastewater shall evaluate all practical alternatives to surface water discharge, pursuant to 15A NCAC 02H .0105(c)(2), prior to submitting an application to discharge.

(b) New facilities submitting an application shall make every reasonable effort to obtain estuary allocation for the proposed wastewater discharge from existing dischargers. If estuary allocation cannot be obtained from the existing facilities, new facilities may purchase a portion of the nonpoint source load allocation for a period of 30 years at a rate of 200 percent of the cost as set in 15A NCAC 02B .0240 to implement practices designed to offset the loading created by the new facility. Payment for each 30-year portion of the nonpoint source load allocation shall be made prior to the ensuing permit issuance.

(c) No application for a new discharge shall be made or accepted without written documentation demonstrating that the requirements of Sub-Items (a) and (b) of this Item have been met.

(d) The nitrogen discharge allocation for a new facility treating municipal or domestic wastewaters shall not exceed the mass equivalent to a concentration of 3.5 mg/L at the maximum monthly average flow limit in the facility's NPDES permit.

(e) The nitrogen discharge allocation for a new facility treating industrial wastewaters shall not exceed the mass equivalent of either the best available technology economically achievable or a discharge concentration of 3.2 mg/L at the maximum monthly average flow limit in the facility's NPDES permit, whichever is less.

(f) New dischargers must meet a monthly average total phosphorous limit of 1 mg/L.

(g) The director shall establish more stringent limits for nitrogen or phosphorus upon finding that such limits are necessary to protect water quality standards in localized areas.

(8) This Item specifies nutrient controls for expanding facilities.

(a) Expanding facilities shall evaluate all practical alternatives to surface water discharge, pursuant to 15A NCAC 02H .0105(c)(2), prior to submitting an application to discharge.

(b) Facilities submitting an application for increased discharge shall make every reasonable effort to minimize increases in their nitrogen discharges, such as reducing sources of nitrogen to the facility or increasing the nitrogen treatment capacity of the facility; or to obtain estuary allocation from existing dischargers.

(c) No application for an expanding facility shall be made or accepted without written documentation demonstrating that the requirements of Sub-Items (a) and (b) of this Item have been met.

(d) If these measures do not produce adequate estuary allocation for the expanded flows, facilities may purchase a portion of the nonpoint source load allocation for a period of 30 years at a rate of 200 percent of the cost as set in 15A NCAC 02B .0240 to implement practices designed to offset the loading created by the new facility. Payment for each 30-year portion of the nonpoint source load allocation shall be made prior to the ensuing permit issuance.

(e) The nitrogen discharge allocation for an expanded facility treating municipal or domestic wastewaters shall not exceed the mass equivalent to a concentration of 3.5 mg/L at the maximum monthly average flow limit in the NPDES permit, or its existing allocation, whichever is greater.

(f) The nitrogen discharge allocation for expanding facilities of an industrial nature shall not exceed the mass equivalent to the best available technology economically achievable or a concentration of 3.2 mg/L at the maximum monthly average flow limit in the facility's modified NPDES permit, whichever is less. If the resulting mass is less than the facility's existing discharge allocation, the existing discharge allocation shall not be reduced.

(g) Expanding facilities must meet a monthly average total phosphorous limit of 1 mg/L unless they are a member in good standing of a group compliance association described in Item (9) of this Rule, in which case they must meet a quarterly average total phosphorus limit of 2 mg/L.

(h) The director shall establish more stringent limits for nitrogen or phosphorus upon finding that such limits are necessary to protect water quality standards in localized areas.

(9) This Item describes the option for dischargers to join a group compliance association to collectively meet nutrient load allocations.

(a) Any or all facilities within the basin may form a group compliance association to meet nitrogen estuary allocations collectively. Any such association must apply for and shall be subject to an NPDES permit that establishes the effective total nitrogen allocations for the

association and for its members. More than one group compliance association may be established. No facility may belong to more than one association at a time.

(b) No later than 180 days prior to expiration of the association NPDES permit, the association and its members shall submit an application for a NPDES permit for the discharge of total nitrogen to the surface waters of the Neuse River Basin. The NPDES permit shall be issued to the association and its members as co-permittees ("association NPDES permit"). It shall contain the association's estuary allocation and individual estuary allocations for each of the members.

(c) An association's estuary allocation of total nitrogen shall be the sum of its members' individual estuary allocations plus any other estuary allocation obtained by the association or its members.

(d) An association may reapportion the individual estuary allocations of its members on an annual basis. The association NPDES permit shall be modified to reflect the revised individual estuary allocations.

(e) Beginning in calendar year 2003, if an association does not meet its estuary allocation, it shall make offset payments for nonpoint source controls no later than May 1 of the following year at the rate set in 15A NCAC 02B .0240.

(f) Association members shall be exempted from the permit limits for total nitrogen contained in their individually issued NPDES permits so long as they remain members in an association. Association members shall be exempted from their individual estuary allocations in the association NPDES permit as long as the association is in compliance with its estuary allocation. If the association fails to meet its estuary allocation, the association and the members that have failed to meet their individual estuary allocations in the association NPDES permit will be out of compliance with the association NPDES permit.

(10) Regional Facilities. In the event that an existing discharger or group of dischargers accepts wastewater from another NPDES-permitted treatment facility in the Neuse River Basin and that acceptance results in the elimination of the discharge from the treatment facility, the eliminated facility's total nitrogen estuary allocation shall be transferred and added to the accepting discharger's estuary allocation.

History Note: *Authority G.S. 143-214.1; 143-215; 143-215.1; 143-215.3(a) (1); S.L. 1995, c. 572;*
Temporary Adoption Eff. January 22, 1998;
Eff. August 1, 1998;
Temporary Amendment Eff. March 15, 2000;
Temporary Amendment Expired on December 10, 2000;
Amended Eff. April 1, 2003.

15A NCAC 02B .0235 NEUSE RIVER BASIN-NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: BASINWIDE STORMWATER REQUIREMENTS

The following is the urban stormwater management strategy for the Neuse River Basin:

(1) The following local governments are designated, based on population and other factors, as parties responsible for implementing stormwater management requirements as part of the Neuse River Nutrient Sensitive Waters stormwater management strategy:
   (a) Cary,
   (b) Durham,
   (c) Garner,
   (d) Goldsboro,
   (e) Havelock,
   (f) Kinston,
   (g) New Bern,
   (h) Raleigh,
   (i) Smithfield,
   (j) Wilson,
   (k) Durham County,
   (l) Johnston County,
   (m) Orange County,
   (n) Wake County, and
   (o) Wayne County.

(2) Other incorporated areas and other counties, not listed under Item (1) of this Rule, may seek to implement their own local stormwater management plan by complying with the requirements specified in Items (5) and (6) of this Rule.

(3) The Environmental Management Commission may designate additional local governments by amending this Rule based on their potential to contribute significant nutrient loads to the Neuse River. At a minimum, the Commission shall review the need for additional designations to the stormwater management program as part of the basinwide planning process for the Neuse River Basin. Any local governments that are designated at a later date under the Neuse Nutrient Sensitive Waters Stormwater Program shall meet the requirements under Items (5) and (6) of this Rule.

(4) Local stormwater programs shall address nitrogen reductions for both existing and new development and include the following elements:
   (a) Review and approval of stormwater management plans for new developments to ensure that:
      (i) the nitrogen load contributed by new development activities is held at 70 percent of the average nitrogen load contributed by the 1995 land uses of the non-urban areas of the Neuse River Basin. The local governments shall use a nitrogen export standard of 3.6 pounds/acre/year, determined by the Environmental Management Commission as 70 percent of the average collective nitrogen load for the 1995 non-urban land uses in the basin above New Bern. The EMC may periodically update the design standard based on the availability of new scientific information. Developers shall have the option of offsetting part of their nitrogen load by funding offsite management measures by making payment to the NC Ecosystem Enhancement Program or to another seller of offset credits approved by the Division or may implement other offset measures contingent upon approval by the Division. Offset payments shall meet the requirements of Rule .0240 of this Section, which establishes procedural requirements for nutrient offset payments. However, before using offset payments, the development must attain, at a minimum, a nitrogen export that does not exceed 6 pounds/acre/year for residential development and 10 pounds/acre/year for commercial or industrial development;
      (ii) For the following local governments and any additional local governments identified in rule by the Commission, the post-construction requirements of 15 NCAC 02B .0277 shall supersede the requirements in this Sub-item for areas within their jurisdiction within the watershed of the Falls of the Neuse Reservoir: Durham, Raleigh, Durham County, Orange County, and Wake County; and

(iii) there is no net increase in peak flow leaving the site from the predevelopment conditions for the 1-year, 24-hour storm.

(b) Review of new development plans for compliance with requirements for protecting and maintaining existing riparian areas as specified in 15A NCAC 02B .0233;

(c) Implementation of public education programs;

(d) Identification and removal of illegal discharges;

(e) Identification of suitable locations for potential stormwater retrofits (such as riparian areas) that could be funded by various sources; and

(f) Submittal of an annual report on October 30 to the Division documenting progress on and net changes to nitrogen load from the local government's planning jurisdiction.

(5) Local governments shall implement stormwater management programs according to their plans approved by the Commission as of March 2001. Local governments administering a stormwater management program shall submit annual reports to the Division documenting their progress and net changes to nitrogen load by October 30 of each year.

(6) If a local government fails to properly implement an approved plan, then stormwater management requirements for existing and new urban areas within its jurisdiction shall be administered through the NPDES municipal stormwater permitting program per 15A NCAC 02H .0126:

(a) Subject local governments shall develop and implement comprehensive stormwater management programs, tailored toward nitrogen reduction, for both existing and new development.

(b) These stormwater management programs shall provide all components that are required of local government stormwater programs in Sub-items (4)(a) through (f) of this Rule.

(c) Local governments that are subject to an NPDES permit shall be covered by the permit for at least one permitting cycle (five years) before they are eligible to submit a local stormwater management program for consideration and approval by the EMC.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.1; 143-215.3(a)(1); S.L. 1995, c. 572;*
Eff. August 1, 1998;
Amended Eff. January 15, 2011 (this permanent rule replaces the temporary rule approved by the RRC on December 16, 2010).

15A NCAC 02B .0236 NEUSE RIVER BASIN-NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: AGRICULTURAL NITROGEN LOADING REDUCTION

All persons engaging in agricultural operations in the Neuse River Basin, including those related to crops, livestock, and poultry, shall collectively achieve and maintain a 30 percent net total nitrogen loading reduction from the cumulative average 1991-1995 nitrogen loadings. In addition to requirements set forth in general permits for animal operations issued pursuant to G.S. 143-215.10C, these Rules apply to all livestock and poultry operations, regardless of size, in the Neuse River Basin. A management strategy to achieve this reduction is specified in Rule .0238 of this Rule.

History Note: *Authority G.S. 143.214.1; 143.214.7; 143.215.3(a)(1).*
Eff. August 1, 1998.

15A NCAC 02B .0238 NEUSE RIVER BASIN-NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: AGRICULTURAL NITROGEN REDUCTION STRATEGY

The following requirements apply to all persons in the Neuse River Basin who engage in agricultural operations. Agricultural operations are activities which relate to the production of crops, livestock, and poultry.

(1) All persons engaging in agricultural operations in the Neuse River Basin shall collectively achieve and maintain a 30 percent net total nitrogen loading reduction from the cumulative average 1991-1995 nitrogen loadings within five years from the effective date of this Rule. Persons subject to this Rule are provided with two options for meeting the requirements of this Rule. The first option is to sign-up for and participate in implementing a collective local strategy for agricultural nitrogen reduction as described in Item (7) of this Rule. This option allows site-specific plans to be developed for those operations where further nitrogen reduction practices are necessary to achieve the collective reduction goal. The second option requires the implementation of standard Best Management Practices as specified in Item (8) of this Rule. Failure to meet requirements of this Rule may result in imposition of enforcement measures as authorized by G.S. 143-215.6A (civil penalties), G.S. 143-215.6B (criminal penalties), and G.S. 143-215.6C (injunctive relief).

(2) Formation and membership of the Basin Oversight Committee. The Environmental Management Commission shall delegate to the Secretary of the Department of Environment and Natural Resources the responsibility of forming a Basin Oversight Committee.

(a) The Secretary shall solicit one nomination for membership on this Committee from each of the following agencies:

(i) Division of Soil and Water Conservation,

(ii) United States Department of Agriculture- Natural Resources Conservation Service,

(iii) North Carolina Department of Agriculture,

(iv) North Carolina Cooperative Extension Service, and

(v) Division of Water Quality.

(b) The Secretary shall also solicit one nomination that represents environmental interests, one nomination that represents agricultural interests, and one from the scientific community with experience related to water quality problems in the Neuse River Basin.

(c) The Secretary, Department of Environment and Natural Resources, shall appoint members of the Basin Oversight Committee from the nominees provided in Sub-Items (2)(a) and (2)(b) of this Rule. Members shall be appointed for a term not to exceed five years and shall serve at the pleasure of the Secretary. The United States Department of Agriculture-Natural Resources Conservation Service member shall serve in an "ex-officio" non-voting capacity and shall function as a technical program advisor to the Committee.

(3) Role of the Basin Oversight Committee. The Environmental Management Commission shall delegate the following responsibilities to the Basin Oversight Committee.

(a) Develop a tracking and accounting methodology, as described below, for evaluating total nitrogen loading from agricultural operations and progress toward reaching the total nitrogen net loading reduction from the implementation BMPs within the Neuse River Basin. The accountability methodology must demonstrate how the nitrogen loading reduction can be met collectively by implementing best management practices approved by the Soil and Water Conservation Commission that include, but are not limited to, water control structures, riparian area establishment, and nutrient management.

(b) Submit a draft accountability process in accordance with the requirements in Sub-Items (3)(a) and (3)(c) of this Rule to the Environmental Management Commission for review within six months after the effective date of the rule and the final accountability process to the Environmental Management Commission for approval within one year after the effective date of the rule. The Environmental Management Commission shall approve the accountability process if it meets requirements in Sub-Items (3)(a) and (3)(c) of this Rule. If the Basin Oversight Committee fails to submit an approvable accountability process to the Environmental Management Commission, then the Environmental Management Commission may accept alternative accountability process proposals within 15 months of the effective date of this Rule. If the Environmental Management Commission fails to receive an approvable accountability process, then the Environmental Management Commission may

require all agricultural operations to follow the standard Best Management Practices option as specified in Item (8) of this Rule.

(c) Include in the accountability process a method to accurately track implementation of BMPs, including location and type of BMPs; to estimate nitrogen reductions from BMP implementation; to quantify increases or decreases in nitrogen loading due to changes in land use, modified agricultural activity, or atmospheric nitrogen loading, based on the best available scientific information; to ensure operation and maintenance of BMPs, including year round management for water control structures; to address life expectancy of BMPs; and a method to ensure maintenance of the nitrogen net loading reduction after the initial five years of this Rule, including substitute BMPs to replace expired practices and additional BMPs to offset new sources of nitrogen.

(d) Calculate a separate total nitrogen loading for agricultural lands in the Neuse River Basin above and below New Bern based on the average of 1991-1995 conditions. Based on this loading, calculate a separate 30 percent net reduction. Loading calculations must include atmospheric emissions and deposition of nitrogen from agricultural lands based on the best available scientific information. Allocate to counties or watersheds, as allowed in Sub-Item (4)(a) of this Rule, within the Neuse River Basin their portion of the calculated nitrogen loading reduction from agricultural operations, including any division of the reduction between specific categories of agricultural operations. Each county or watershed may not have to reduce individually its nitrogen loading by 30 percent; however, the nitrogen loading reduction from all counties or watershed above New Bern shall collectively meet their total nitrogen reduction and all counties or watersheds below New Bern shall collectively meet their total nitrogen reduction. If the Basin Oversight Committee fails to allocate the nitrogen loading reductions from agricultural operations to counties or watersheds within the Neuse River Basin, the Environmental Management Commission may assign the agricultural nitrogen reductions based on the approved accountability process as described in Sub-Items (3)(a) and (3)(c) of this Rule.

(e) Review, approve and summarize county nitrogen reduction strategies and present these strategies to the Environmental Management Commission for approval within two years from the effective date of this Rule.

(f) Review, approve and summarize local nitrogen reduction annual reports and present these reports to the Environmental Management Commission each October. Information to be included in the Annual Report is described in Item (5)(d) of this Rule.

(4) Formation and membership of the Local Advisory Committees. The Environmental Management Commission shall delegate to the Directors of the Division of Water Quality and Division of Soil and Water Conservation the responsibility of forming Local Advisory Committees.

(a) The Directors shall form Local Advisory Committees in each county (or watershed specified by the Basin Oversight Committee) within the Neuse River Basin. The Directors shall solicit nominations for membership on the Local Advisory Committee from each of the following local agencies:

(i) Soil and Water Conservation District,
(ii) United States Department of Agriculture- Natural Resources Conservation Service,
(iii) North Carolina Department of Agriculture,
(iv) North Carolina Cooperative Extension Service,
(v) North Carolina Division of Soil and Water Conservation, and
(vi) The Directors shall also solicit at least two nominations that represents a local farmer in the county watershed.

The Soil and Water Conservation District may be designated by the Basin Oversight Committee as the lead agency on the Local Advisory Committee.

(b) The Environmental Management Commission and Soil and Water Conservation Commission shall appoint members of Local Advisory Committee from the nominees provided in Sub-Item (4)(a) of this Rule and shall be appointed for a term not to exceed five years and shall serve at the pleasure of the Commissions.

(5) Role of the Local Advisory Committees. The Environmental Management Commission shall delegate the following responsibilities to employees of the Department who are members of the Local Advisory

Committees and employees of the Division of Soil and Water Conservation or its designee. These employees shall act with advice from the Local Advisory Committees.

(a) Conduct a sign-up process for persons wishing to voluntarily implement the local nitrogen reduction strategy as specified in Item (7) of this Rule. This sign-up process shall be completed within one year following the effective date of this Rule.

(b) Develop local nitrogen reduction strategies that meet the nitrogen loading reduction goal for agricultural operations assigned by the Basin Oversight Committee. The local strategies shall be designed to achieve the required nitrogen loading reduction within five years from the effective date of this Rule. A matrix of best management practice options, which account for stream order, floodplain width, and regional variations in soil types and topography, may be used in developing the local nitrogen reduction strategies. Local nitrogen reduction strategies must specify the name and location of participant agricultural farming operations, BMPs which will be required as part of the plan, estimated nitrogen reduction, schedule for BMP implementation, and operation and maintenance requirements. If the Local Advisory Committee fails to develop the local nitrogen reduction strategy, the Environmental Management Commission may develop the strategy based on the tracking and accounting method approved by the Environmental Management Commission.

(c) Submit an annual report to the Basin Oversight Committee each May on net total nitrogen loading reductions from agricultural operations, the implementation of BMPs for nitrogen control, and progress towards the total nitrogen loading reduction requirements in the Neuse River Basin above and below New Bern.

(d) Include in the annual report, at a minimum, documentation on the BMPs implemented (including type and location), their costs, documentation of any expired contracts for BMPs, estimated nitrogen net loading reductions achieved as a result of those BMPs, any increases or decreases in nitrogen loading resulting from changes in land use or modified agricultural-related activity, discussion of operation and maintenance of BMPs, and a summary of the estimated load from agricultural operations for the previous year, and any modifications to the accounting methodology. Information shall be provided in the annual report on the status of BMP implementation and estimated total nitrogen reduction by all agricultural operations within the Neuse River Basin in each county or watershed. The annual report shall also be summarized separately for cropland, livestock and poultry activities.

(6) Options for meeting the collective total nitrogen net loading reduction requirement. Each agricultural operation in the Neuse River Basin shall have two options for meeting the requirements of this Rule. The options are to either implement a local nitrogen reduction strategy, specified by Item (7) of this Rule, or implement standard Best Management Practices specified by Item (8) of this Rule.

(7) Local nitrogen reduction strategy option. All persons subject to this Rule that choose to implement the county nitrogen reduction plan must complete the sign-up process that will be conducted per the requirements of Item (5)(a) of this Rule. This sign-up process will be completed within one year from the effective date of this Rule. If a person subject to this Rule does not complete the sign-up process, he shall be subject to implementation of Best Management Practices as specified in Item (8) of this Rule. Persons who choose to participate in the local nitrogen reduction strategy must commit and implement their portion of the plan within five years of the effective date of this Rule. A person may withdraw from the local nutrient reduction strategy up until the time that the local strategy is finalized by the Local Advisory Committee and the person signs the specific plan for his property, which represents his commitment to implement the plan within five years of the effective date of the rules. After a person has made the commitment to implement the local strategy by signing the plan for his property, then such persons may not withdraw from the local nitrogen reduction strategy during the initial five-year period. The local nitrogen reduction strategy is not required to be more stringent than the standard best management practice option provided that the net nitrogen reduction goals are met collectively; however, the Local Advisory Committees may develop strategies that achieve reductions of greater than 30 percent.

(8) Standard best management practice option. If a person subject to this Rule does not complete the sign-up process for implementation of the local nitrogen reduction strategy, then he shall implement the following best management practices within four years following the effective date of this Rule.

(a) A forested riparian area, as described in Sub-Item (8)(a)(i)-(ii) of this Rule, is required on all sides of surface waters in the Neuse River Basin (intermittent streams, perennial streams, lakes, ponds and estuaries) as indicated on the most recent versions of U.S.G.S. 1:24,000 scale (7.5 minute quadrangle) topographic maps or other site-specific evidence. Design and installation of the forested riparian area shall be such that, to the maximum extent possible, sheet flow of surface water is achieved. Any activities that would result in water quality standard violations or disrupt the structural or functional integrity of the forested riparian area are prohibited. The protected riparian area shall have two zones as follows:

(i) Zone 1 shall be undisturbed forest. Zone 1 begins at the top of bank for intermittent streams and perennial streams without tributaries and extends landward a distance of 30 feet on each side of the waterbody, measured horizontally on a line perpendicular to the waterbody. For all other waterbodies, Zone 1 begins at the top of bank or the mean high water line and extends landward a distance of 30 feet, measured horizontally on a line perpendicular to the waterbody. Forest vegetation of any width that exists in Zone 1 as of July 22, 1997 must be preserved and maintained in accordance with Sub-Items (8)(a)(i)(A)-(E) of this Rule. The application of fertilizer in Zone 1 is prohibited. The following practices and activities are allowed in Zone 1:

(A) Natural regeneration of forest vegetation and planting vegetation to enhance the riparian area if disturbance is minimized, provided that any plantings shall primarily consist of locally native trees and shrubs;

(B) Selective cutting of individual trees of high value in the outer 20 feet of Zone 1, provided that the basal area of this outer 20-foot wide area remains at or above 75 square feet per acre and is computed according to the following method. Basal area of this outer 20-foot wide area shall be computed every 100 feet along the stream to ensure even distribution of forest vegetation and shall be based on all trees measured at 4.5 feet from ground level. No tracked or wheeled equipment is allowed in Zone 1 except at stream crossings which are designed, constructed and maintained in accordance with Forest Practice Guidelines Related to Water Quality (15A NCAC 1J .0201 - .0209);

(C) Horticulture or silvicultural practices to maintain the health of individual trees;

(D) Removal of individual trees which are in danger of causing damage to dwellings, other structures, or the stream channel; and

(E) Removal of dead trees and other timber cutting techniques necessary to prevent extensive pest or disease infestation if recommended by the Director, Division of Forest Resources and approved by the Director, Division of Water Quality.

(ii) Zone 2: begins at the outer edge of Zone 1 and extends landward a minimum of 20 feet as measured horizontally on a line perpendicular to the waterbody. The combined minimum width of Zones 1 and 2 shall be 50 feet on all sides of the waterbody. Vegetation in Zone 2 shall consist of a dense ground cover composed of herbaceous or woody species which provides for diffusion and infiltration of runoff and filtering of pollutants. The following practices and activities are allowed in Zone 2 in addition to those allowed in Zone 1: Periodic mowing and removal of plant products such as timber, nuts, and fruit is allowed on a periodic basis provided the intended purpose of the riparian area is not compromised by harvesting, disturbance, or loss of forest or herbaceous ground cover. Forest vegetation in Zone 2 may be managed to minimize shading on adjacent land outside the riparian area if the water quality function of the riparian area is not compromised.

(iii) The following practices and activities are not allowed in Zone 1 and Zone 2:

(A) Land disturbing activities and placement of fill and other materials, other than those allowed in Items (8)(a)(i) and (8)(b) of this Rule;

(B) New development;

(C) New on-site sanitary sewage systems which use ground absorptions;

(D) Any activity that threatens the health and function of the vegetation including, but not limited to, application of fertilizer or chemicals in amounts exceeding the manufacturer's recommended rate, uncontrolled sediment sources on adjacent lands, and the creation of any areas with bare soil.

(iv) Timber removal and skidding of trees in the riparian area shall be directed away from the water course or water body. Skidding shall be done in a manner to prevent creation of ephemeral channels perpendicular to the water body. Any tree removal must be performed in a manner that does not compromise the intended purpose of the riparian area and is in accordance with the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J .0201-.0209).

(b) The following waterbodies and land uses are exempt from the riparian area requirement:

(i) Ditches and manmade conveyances, other than modified natural streams, which under normal conditions do not receive drainage waters from any tributary ditches, canals, or streams, unless the ditch or manmade conveyance delivers runoff directly to waters classified in accordance with 15A NCAC 2B .0100;

(ii) Ditches and manmade conveyances other than modified natural streams which are used exclusively for drainage of silvicultural land or naturally forested areas. All forest harvesting operations shall be in compliance with North Carolina's Forest Practices Guidelines Related to Water Quality;

(iii) Areas mapped as perennial streams, intermittent streams, lakes, ponds or estuaries on the most recent versions of United States Geological Survey 1:24,000 scale (7.5 minute quadrangle) topographic maps where no perennial, intermittent waterbody, or lakes, ponds or estuaries exists on the ground;

(iv) Ponds and lakes created for animal watering, irrigation, or other agricultural uses that are not part of a natural drainage way that is classified in accordance with 15A NCAC 2B .0100;

(v) Water dependent structures as defined in 15A NCAC 2B .0202 provided that they are located, designed, constructed and maintained to provide maximum nutrient removal, to have the least adverse effects on aquatic life habitat and to protect water quality;

(vi) The following uses may be allowed where no practical alternative exists. A lack of practical alternatives may be shown by demonstrating that, considering the potential for a reduction in size, configuration or density of the proposed activity and all alternative designs, the basic project purpose cannot be practically accomplished in a manner which would avoid or result in less adverse impact to surface waters. Also, these structures shall be located, designed, constructed, and maintained to have minimal disturbance, to provide maximum nutrient removal and erosion protection, to have the least adverse effects on aquatic life and habitat, and to protect water quality to the maximum extent practical through the use of best management practices:

(A) Road crossings, railroad crossings, bridges, airport facilities, and utility crossings may be allowed if conditions specified in Sub-Item (8)(b)(vi) of this Rule are met;

(B) Stormwater management facilities and ponds, and utility construction and maintenance corridors for utilities such as water, sewer or gas, may be allowed in Zone 2 of the riparian area as long as the conditions specified in Sub-Item (8)(b)(vi) of this Rule are met and they are located at least 30 feet from the top of bank or mean high water line. Additional requirements for utility construction and maintenance corridors are listed in Sub-Item (8)(b)(vi) of this Rule.

(vii) A corridor for the construction and maintenance of utility lines, such as water, sewer or gas, (including access roads and stockpiling of materials) may run parallel to the stream and may be located within Zone 2 of the riparian area, as long as no practical

alternative exists and they are located at least 30 feet from the top of bank or mean high water line and best management practices are installed to minimize runoff and maximize water quality protection to the maximum extent practicable. Permanent, maintained access corridors shall be restricted to the minimum width practicable and shall not exceed 10 feet in width except at manhole locations. A 10 feet by 10 feet perpendicular vehicle turnaround is allowed provided they are spaced at least 500 feet apart along the riparian area;

(viii) Stream restoration projects, scientific studies, stream gauging, water wells, passive recreation facilities such as boardwalks, trails, pathways, historic preservation and archaeological activities are allowed; provided that they are located in Zone 2 and are at least 30 feet from the top of bank or mean high water line and are designed, constructed and maintained to provide the maximum nutrient removal and erosion protection, to have the least adverse effects on aquatic life and habitat, and to protect water quality to maximum extent practical through the use of best management practices. Activities that must cross the stream or be located within Zone 1 are allowed as long as all other requirements of this Item are met;

(ix) Stream crossings associated with timber harvesting are allowed if performed in accordance with the Forest Practices Guidelines Related to Water Quality (15A NCAC 1J.0201-.0209); and

(x) In addition to exceptions included in Sub-Item (8)(b)(i)-(ix), canals, ditches, and other drainage conveyances are exempt from the riparian area requirement if both water control structures with a water control structure management plan and a nutrient management plan, are implemented on the adjacent agricultural land according to the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission. The water control structures and nutrient management practices must provide equivalent protection and directly affect the land and waterbodies draining into the waterbody exempted from the riparian area requirement. To the maximum extent practical, water control structures shall be managed to maximize nitrogen removal throughout the year. A technical specialist designated pursuant to rules adopted by the Soil and Water Conservation Commission must provide written approval that the nutrient management and water management plans meet the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission. If the nutrient management plans and water management plans are not implemented, then a riparian area pursuant to this Section is required.

(c) The following are modifications to the riparian area requirements.

(i) On agricultural land where either water control structures with a water control structure management plan, or a nutrient management plan is implemented according to the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission, then a 20-ft forested or a 30-ft vegetated buffer is required. The water control structures or nutrient management practices must provide equivalent protection and directly affect the land and waterbodies draining into the waterbody with a modified buffer requirement. To the maximum extent practical, water control structures shall be managed to maximize nitrogen removal throughout the year. A technical specialist designated pursuant to rules adopted by the Soil and Water Conservation Commission must provide written approval that the nutrient management plan meets the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission.

(ii) A vegetated riparian area may be substituted for an equivalent width of forested riparian area within 100 feet of tile drainage.

(iii) Where the riparian area requirements would result in an unavoidable loss of tobacco allotments [(7 CFR 723.220(c)] and the BMPs of controlled drainage or nutrient management are not in place, forest cover is required only in the first 20 feet of the riparian area.

(d) Maintenance of Zones 1 and 2 is required in accordance with this Rule.

(i) Sheet flow must be maintained to the maximum extent practical through dispersing concentrated flow and re-establishment of vegetation to maintain the effectiveness of the riparian area.

(ii) Concentrated runoff from new ditches or manmade conveyances must be dispersed into sheetflow before the runoff enters Zone 2 of the riparian area. Existing ditches and manmade conveyances, as specified in Sub-Item (8)(b)(ii) of this Rule, are exempt from this requirement; however, care shall be taken to minimize pollutant loading through these existing ditches and manmade conveyances from fertilizer application or erosion.

(iii) Periodic corrective action to restore sheet flow shall be taken by the landowner if necessary to impede the formation of erosion gullies which allow concentrated flow to bypass treatment in the riparian area.

(e) Periodic maintenance of modified natural streams such as canals is allowed provided that disturbance is minimized and the structure and function of the riparian area is not compromised. A grassed travelway is allowed on one side of the waterbody when alternative forms of maintenance access are not practical. The width and specifications of the travelway shall be only that needed for equipment access and operation. The travelway shall be located to maximize stream shading.

(f) Where the standards and management requirements for riparian areas are in conflict with other laws, regulations, and permits regarding streams, steep slopes, erodible soils, wetlands, floodplains, forest harvesting, surface mining, land disturbance activities, development in Coastal Area Management Act Areas of Environmental Concern, or other environmental protection areas, the more protective shall apply.

(g) The Environmental Management Commission acknowledges that best management practices under the standard management practice option of this Rule do not fully address nitrogen loading, including atmospheric emissions and deposition, from animal operations. As information becomes available on nitrogen loadings from animal operations and best management practices to control these loadings, other best management practices from animal operations may be required by the Commission as necessary to achieve equivalent reduction in nitrogen loadings therefrom. These additional best management practices shall be required if deemed necessary to achieve a net total nitrogen loading reduction from the animal operations based on average 1991-1995 conditions.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1);*
Eff. August 1, 1998.

15A NCAC 02B .0239 NEUSE RIVER BASIN: NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: NUTRIENT MANAGEMENT

The following is the management strategy for nutrient management in the Neuse River Basin:

(1) The following persons shall obtain a certificate, issued within five years of the effective date of this Rule by the Cooperative Extension Service or the Division of Water Quality, verifying completion of training and continuing education in nutrient management. Within one year from the effective date of this Rule, the Division of Water Quality, in cooperation with the Cooperative Extension Service, shall conduct a sign-up process for persons wishing to take the nutrient management training. If these persons fail to obtain the nutrient management certificate, they are required to develop and properly implement nutrient management plans for the lands where they apply fertilizer within five years of the effective date of this Rule:

(a) Applicators who in a calendar year apply fertilizer to cropland areas, including row and vegetable crops, floriculture areas, ornamental areas and greenhouse production areas, that together comprise at least 50 acres and persons responsible for managing cropland areas, as described in Sub-Item (1)(a) of this Rule, that together comprise at least 50 acres;

(b) Applicators who in a calendar year apply fertilizer to a golf course, recreational land areas, right-of-way, or other turfgrass areas that together comprise at least 50 acres, and persons responsible for managing the turfgrass aspects of lands, as described in Sub-Item (1)(b) of this Rule, that together comprise at least 50 acres; and

(c) Commercial applicators who apply fertilizer to at least 50 total acres per year of lawn and garden areas in residential, commercial, or industrial developments, and persons responsible for managing the lawn and garden aspects of lands, as described in Sub-Item (1)(c) of this Rule, that together comprise at least 50 acres.

(2) If the persons listed in Sub-Items (1)(a)-(c) of this Rule do not attend and complete within five years of the effective date of this Rule a nutrient management training program administered by the Cooperative Extension Service, their nutrient management plans shall meet the following requirements:

(a) Nutrient management plans for cropland shall meet the standards and specifications of the USDA - Natural Resources Conservation Service or the standards and specifications adopted by the NC Soil and Water Conservation Commission. Written approval from a technical specialist designated pursuant to rules adopted by the Soil and Water Conservation Commission must be obtained by the applicator certifying that a nutrient management plan meeting these standards has been developed for the lands where they apply fertilizer.

(b) Nutrient management plans for turfgrass, floriculture, ornamental and greenhouse production application of nutrients shall meet recommended guidelines in the following documents or other recommended guidelines from land-grant universities to minimize nutrient loss to waters in the Neuse River Basin. Nutrient management plans for turfgrass shall follow the North Carolina Cooperative Extension Service (NCCES) guidelines in "Water Quality And Professional Lawn Care"; NCCES publication number WQMM-155 or "Water Quality And Home Lawn Care"; NCCES publication number WQMM-151. Copies may be obtained from the Division of Water Quality, 512 North Salisbury Street, Raleigh, North Carolina 27626 at no cost. Nutrient management plans for nursery crops and greenhouse production shall follow the Southern Nurserymen=s Association guidelines promulgated in "Best Management Practices Guide For Producing Container-Grown Plants". Copies may be obtained from the Southern Nurserymen=s Association, 1000 Johnson Ferry Road, Suite E-130, Marietta, GA 30068-2100 at a cost of thirty-five dollars ($35.00). There materials related to nutrient management plans for turfgrass, nursery crops and greenhouse production are hereby incorporated by reference including any subsequent amendments and editions and are available for inspection at the Department of Environment and Natural Resources Library, 512 North Salisbury Street, Raleigh, North Carolina. The Division of Water Quality shall develop model plans in consultation with the Cooperative Extension Service, the Natural Resources Conservation Service, the Division of Soil and Water Conservation, and the North Carolina Department of Agriculture and approved by the Director of the Division of Water Quality within one year of the effective date of this Rule. The model plans shall provide a description of the type of information to be included in the plans for source of nutrients, the amount of nutrient applied, the placement of nutrients, and the timing of nutrient applications. Written approval from a technical specialist designated pursuant to rules adopted by the Environmental Management Commission must be obtained by the applicator certifying that a

nutrient management plan meeting these standards has been developed for the lands where they apply fertilizer.

(c) For nutrient management plans developed under Sub-Items (2)(a) and (2)(b) of this Rule using dry poultry litter from animal waste management systems involving 30,000 or more birds, dry poultry litter shall be applied at agronomic rates for nitrogen based on realistic yield expectations derived from waste nutrient content, crop and soil type, or yield records.

(d) Nutrient management plans and supporting documents must be kept on-site or be producible within 24 hours of a request by the Division of Water Quality.

(e) Nutrient management plans may be written by the applicator or a consultant to the applicator.

(3) Applicators and commercial applicators subject to Item (2) of this Rule who do not develop a nutrient management plan or do not apply nutrients in accordance with a nutrient management plan meeting the specifications in Item (2) are in violation of this Rule and are subject to enforcement measures authorized in G.S. 143-215.6A (civil penalties), G.S. 143-215.6B (criminal penalties), and G.S. 143-215.6C (injunctive relief).

(4) Residential landowners and other individuals applying fertilizer to less than 50 acres per year shall to the maximum extent practical apply fertilizer to residential, commercial, industrial, turfgrass, and cropland areas at rates recommended by the Cooperative Extension Service.

History Note: *Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1);*
Eff. August 1, 1998.

15A NCAC 02B .0240 NUTRIENT OFFSET PAYMENTS

(a) The purpose of this Rule is to establish procedures for the optional payment of nutrient offset fees to the NC Ecosystem Enhancement Program, subsequently referred to as the Program, or to other public or private parties where the Program or such parties implement projects for nutrient offset purposes and accept payments for those purposes, and where either of the following applies:

(1) The following rules of this Section allow offsite options or nutrient offset payments toward fulfillment or maintenance of nutrient reduction requirements:
   (A) .0234 and .0235 of the Neuse nutrient strategy,
   (B) .0258 of the Tar-Pamlico nutrient strategy, and
   (C) applicable rules of the Jordan nutrient strategy, which is described in Rule .0262; and

(2) Other rules adopted by the Commission allow this option toward fulfillment of nutrient load reduction requirements.

(b) Offset fees paid pursuant to this Rule shall be used to achieve nutrient load reductions subject to the following geographic restrictions:

(1) Load reductions shall be located within the same 8-digit cataloguing unit, as designated by the US Geological Survey, as the loading activity that is being offset;

(2) The Division shall track impacts by 10-digit watershed, as designated by the US Geological Survey and providers shall locate projects proportional to the location of impacts to the extent that the projects would meet the least cost alternative criterion per S.L. 2007-438. The location of load reduction projects shall be reviewed during the approval process described in Paragraph (c) of this Rule;

(3) Impacts that occur in the watershed of Falls Lake in the upper Neuse River Basin may be offset only by load reductions in the same watershed; Impacts in the Neuse 01 8-digit cataloguing unit below the Falls watershed, as designated by the US Geological Survey, may be offset only by load reductions in that same lower watershed;

(4) Restrictions established in the Jordan nutrient strategy, which is described in Rule 15A NCAC 02B .0262; and

(5) Any further restrictions established by the Commission through rulemaking.

(c) The Program and other parties shall obtain Division approval of proposed nutrient offset projects prior to construction. Other parties shall sell credits in compliance with approved credit release schedules and with the requirements of this Rule. Project approval shall be based on the following standards:

(1) Load reductions eligible for credit shall not include reductions used to satisfy other requirements under the same nutrient strategy;

(2) The Program and other parties shall agree to provide adequate financial assurance to protect and maintain load reductions for the stated duration, including for maintenance, repair and renovation of the proposed measure;

(3) The Program and other parties shall agree that once credits are established for a measure and until they are exhausted, they shall provide a credit/debit ledger to the Division at regular intervals;

(4) The Program and other parties shall agree that the party responsible for a measure shall allow the Division access to it throughout its lifetime for compliance inspection purposes;

(5) The Program or other party seeking approval shall obtain a site review from Division staff prior to Division approval to verify site conditions suitable to achieve the proposed load reductions through the proposed measure; and

(6) The Program shall submit a proposal, and other parties shall submit a proposal or a draft banking instrument, addressing the following items regarding a proposed load-reducing measure:
   (A) Identify the location and site boundaries of the proposed measure, the geographic area to be served by credits in compliance with the requirements of Paragraph (b) of this Rule, existing conditions in the contributing drainage area and location of the measure, and the nature of the proposed measure with sufficient detail to support estimates of load reduction required in this Paragraph;
   (B) Provide calculations of the annual magnitudes of load reductions and identify final credit values incorporating any delivery factors or other adjustments required under rules identified in Paragraph (a) of this Rule;
   (C) Define the duration of load reductions, and provide a conservation easement or similar legal mechanism to be recorded with the County Register of Deeds and that is sufficient to ensure protection and maintenance of load reductions for the stated duration;

(D) Identify the property owner and parties responsible for obtaining all permits and other authorizations needed to establish the proposed measure, for constructing and ensuring initial performance of the proposed measure, for reporting on and successfully completing the measure, for holding and enforcing the conservation easement, and for ensuring protection and maintenance of functions for its stated duration;

(E) Provide a plan for implementing the proposed measure, including a timeline, a commitment to provide an as-built plan and report upon establishment of the measure, elements to be included in the as-built plan and report, a commitment to provide a bond or other financial assurance sufficient to cover all aspects of establishment and initial performance prior to the release of any credits, and criteria for successful completion; and

(F) Provide a monitoring and maintenance plan designed to achieve successful completion, that commits to annual reporting to the Division until success is achieved, that recognizes the Division's authority to require extension or re-initiation of monitoring depending on progress toward success, and that commits to a final report upon completion. The final report shall reaffirm the party that shall hold and enforce the conservation easement or other legal instrument.

(d) The Program shall establish and revise nutrient offset rates as set out in Rule .0274 of this Section. Offset payments accepted by the Program shall be placed into the Riparian Buffer Restoration Fund administered by the Department pursuant to G.S. 143-214.21

(e) Persons who seek to pay nutrient offset fees under rules of this Section shall do so in compliance with such rules, the requirements of Paragraph (b) of this Rule, and the following:

(1) A non-governmental entity shall purchase nutrient offset credit from a party other than the Program if such credit is available in compliance with the criteria of this Rule at the time credit is sought, and shall otherwise demonstrate to the permitting authority that such credit is not available before seeking to make payment to the Program;

(2) Offset payments made to the Program shall be contingent upon acceptance of the payment by the Program. The financial, temporal and technical ability of the Program to satisfy the mitigation request will be considered to determine whether the Program will accept or deny the request;

(3) Where persons seek to offset more than one nutrient type, they shall make payment to address each type;

(4) The offset payment shall be an amount sufficient to fund 30 years of nutrient reduction.

(5) Persons who seek offsets to meet new development stormwater permitting requirements shall provide proof of offset credit purchase to the permitting authority prior to approval of the development plan; and

(6) A wastewater discharger that elects to purchase offset credits for the purpose of fulfilling or maintaining nutrient reduction requirements shall submit proof of offset credit acquisition or a letter of commitment from the Program or third party provider with its request for permit modification. Issuance of a permit that applies credits to nutrient limits shall be contingent on receipt of proof of offset credit acquisition. A discharger may propose to make incremental payments for additional nutrient allocations, contingent upon receiving a letter of commitment from the Program or third party provider to provide the offset credit needed for permit issuance. In that event the Division may issue or modify that permit accordingly, and shall condition any flow increase associated with that incremental purchase on payment in full for the additional allocation. Offset responsibility for nutrient increases covered under this Paragraph shall be transferred to the Program or third party provider when it has received the entire payment.

(f) Credits associated with load reducing activities funded under this Rule shall be awarded exclusively to the person, municipality, discharger, or group of dischargers who paid the offset fee.

History Note: *Authority G.S. 143-214.1; 143-214.20; 143-214.21; S.L. 1995, c. 572; S.L. 2007, c. 438; S.L. 2009, c. 337; S.L. 2009, c. 484; S.L. 2009, c. 486;*
Eff. August 1, 1998;
Amended Eff. August 1, 2006;
Amended Eff. September 1, 2010.

15A NCAC 02B .0241 NEUSE RIVER BASIN: NUTRIENT SENSITIVE WATERS MANAGEMENT STRATEGY: DELEGATION OF AUTHORITY FOR THE PROTECTION AND MAINTENANCE OF EXISTING RIPARIAN BUFFERS

(a) PURPOSE. This Rule sets out the requirements for delegation of the responsibility for implementing and enforcing the Neuse Basin existing riparian buffer protection program, as described in Rule 15A NCAC 2B .0233, to local governments.

(b) PROCEDURES FOR GRANTING AND RESCINDING DELEGATION. The Commission shall grant and rescind local government delegation of the Neuse River Basin Riparian Buffer Protection requirements according to the following procedures.

(1) Local governments within the Neuse River Basin may submit a written request to the Commission for authority to implement and enforce the State's riparian buffer protection requirements within their jurisdiction. The written request shall be accompanied by information that shows:
   (A) The local government has land use jurisdiction for the riparian buffer demonstrated by delineating the local land use jurisdictional boundary on USGS 1:24,000 topographical map(s) or other finer scale map(s);
   (B) The local government has the administrative organization, staff, legal authority, financial and other resources necessary to implement and enforce the State's riparian buffer protection requirements based on its size and projected amount of development;
   (C) The local government has adopted ordinances, resolutions, or regulations necessary to establish and maintain the State's riparian buffer protection requirements; and
   (D) The local government has provided a plan to address violations with appropriate remedies and actions including, but not limited to, civil or criminal remedies that shall restore buffer nutrient removal functions on violation sites and provide a deterrent against the occurrence of future violations.

(2) Within 90 days after the Commission has received the request for delegation, the Commission shall notify the local government whether it has been approved, approved with modifications, or denied.

(3) The Commission, upon determination that a delegated local authority is failing to implement or enforce the Neuse Basin riparian buffer protection requirements in keeping with a request approved under Sub-item (b)(2) of this Rule, shall notify the delegated local authority in writing of the local program's inadequacies. If the delegated local authority has not corrected the deficiencies within 90 days of receipt of the written notification, then the Commission shall rescind the delegation of authority to the local government and shall implement and enforce the State's riparian buffer protection requirements.

(4) The Commission may delegate its duties and powers for granting and rescinding local government delegation of the State's riparian buffer protection requirements, in whole or in part, to the Director.

(c) APPOINTMENT OF A RIPARIAN BUFFER PROTECTION ADMINISTRATOR. Upon receiving delegation, local governments shall appoint a Riparian Buffer Protection Administrator who shall coordinate the implementation and enforcement of the program. The Administrator shall attend an initial training session by the Division and subsequent annual training sessions. The Administrator shall ensure that local government staffs working directly with the program receive training to understand, implement and enforce the program.

(d) PROCEDURES FOR USES WITHIN RIPARIAN BUFFERS THAT ARE ALLOWABLE AND ALLOWABLE WITH MITIGATION. Upon receiving delegation, local authorities shall review proposed uses within the riparian buffer and issue approvals if the uses meet the State's riparian buffer protection requirements. Delegated local authorities shall issue an Authorization Certificate for uses if the proposed use meets the State's riparian buffer protection requirements, or provides for appropriate mitigated provisions to the State's riparian buffer protection requirements. The Division may challenge a decision made by a delegated local authority for a period of 30 days after the Authorization Certificate is issued. If the Division does not challenge an Authorization Certificate within 30 days of issuance, then the delegated local authority's decision shall stand.

(e) VARIANCES. After receiving delegation, local governments shall review variance requests, provide approvals for minor variance requests and make recommendations to the Commission for major variance requests pursuant to the State's riparian buffer protection program.

(f) LIMITS OF DELEGATED LOCAL AUTHORITY. The Commission shall have jurisdiction to the exclusion of local governments to implement the State's riparian buffer protection requirements for the following types of activities:

(1) Activities conducted under the authority of the State;

(2) Activities conducted under the authority of the United States;

(3) Activities conducted under the authority of multiple jurisdictions; and
(4) Activities conducted under the authority of local units of government.

(g) RECORD-KEEPING REQUIREMENTS. Delegated local authorities shall maintain on-site records for a minimum of five years. Delegated local authorities must furnish a copy of these records to the Director within 30 days of receipt of a written request for the records. The Division shall inspect local riparian buffer protection programs to ensure that the programs are being implemented and enforced in keeping with a request approved under Sub-item (b)(2) of this Rule. Each delegated local authority's records shall include the following:

(1) A copy of variance requests;
(2) The variance request's finding of fact;
(3) The result of the variance proceedings;
(4) A record of complaints and action taken as a result of the complaint;
(5) Records for stream origin calls and stream ratings; and
(6) Copies of request for authorization, records approving authorization and Authorization Certificates.

History Note: *Authority 143-214.1; 143-214.7; 143-215.3(a)(1); S.L. 1998 c. 221; Eff. August 1, 2000.*

APPENDIX F

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CONTENTS

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Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
ACER BARBATUM	FLORIDA MAPLE	
ACER LEUCODERME	CHALK MAPLE	
ACER RUBRUM VAR RUBRUM	RED MAPLE	
ACER RUBRUM VAR TRILOBUM	RED MAPLE	
ACER SACCHARUM	SUGAR MAPLE	
ACHILLEA MILLEFOLIUM	COMMON YARROW	
ADIANTUM PEDATUM	NORTHERN MAIDENHAIR-FERN	
AGALINIS PURPUREA	LARGE-PURPLE FALSE-FOXGLOVE	
AGROSTIS PERENNANS	PERENIAL BENTGRASS	
AILANTHUS ALTISSIMA***	TREE-OF-HEAVEN***	
ALBIZIA JULIBRISSIN***	SILK TREE***	
ALLIUM AMPELOPRASUM***	WILD LEEK***	
ALLIUM VINEALE***	FIELD GARLIC***	
ALNUS SERRULATA	BROOK-SIDE ALDER	
AMBROSIA ARTEMISIIFOLIA	ANNUAL RAGWEED	
AMPHICARPAEA BRACTEATA	AMERICAN HOG-PEANUT	
ANDROPOGON TERNARIUS	SILVER BLUESTEM	
ANDROPOGON VIRGINICUS	BROOM-SEDGE	
ANEMONELLA THALICTROIDES	WINDFLOWER	
ANTENNARIA PLANTAGINIFOLIA	PLANTAIN-LEAF PUSSYTOES	
ANTENNARIA SOLITARIA	SINGLE-HEAD PUSSYTOES	
ANTHEMIS ARVENSIS	CORN CAMOMILE	
APOCYNUM CANNABINUM	CLASPING-LEAF DOGBANE	
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT	
ARNOGLOSSUM ATRIPLICIFOLIUM	PALE INDIAN-PLANTAIN	
ASCLEPIAS AMPLEXICAULIS	CLASPING MILKWEED	
ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	
ASIMINA PARVIFLORA	DWARF PAW-PAW	
ASPLENIUM PLATYNEURON	EBONY SPLEENWORT	
ASTER DIVARICATUS	SERPENTINE ASTER	
ASTER DUMOSUS	BUSHY ASTER	
ASTER SPECTABILIS	WESTERN SHOWY ASTER	CP: pine barrens and woodland borders
ATHYRIUM ASPLENIOIDES	SOUTHERN LADY FERN	
AUREOLARIA VIRGINICA	DOWNY FALSE-FOXGLOVE	
BARBAREA VERNA	EARLY WINTER-CRESS	
BETULA NIGRA	RIVER BIRCH	
BIDENS ARISTOSA	TICKSEED BEGGAR-TICKS	
BOEHMERIA CYLINDRICA	FALSE NETTLE	
CAMPSIS RADICANS	TRUMPET-CREEPER	
CARDAMINE ANGUSTATA	SLENDER TOOTHWORT	
CARDAMINE HIRSUTA***	HAIRY BITTER-CRESS***	
CAREX CRINITA	FRINGED SEDGE	
CAREX DIGITALIS	SLENDER WOOD SEDGE	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
CAREX FESTUCACEA	FESCUE SEDGE	
CAREX INTUMESCENS	BLADDER SEDGE	
CAREX LAXIFLORA	LOOSE-FLOWERED SEDGE	
CAREX LEPTALEA	BRISTLY-STALK SEDGE	
CAREX LURIDA	SHALLOW SEDGE	
CAREX NIGROMARGINATA	BLACK-EDGE SEDGE	
CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	
CAREX STRICTA	TUSSOCK SEDGE	
CARPINUS CAROLINIANA	AMERICAN HORNBEAM	
CARYA ALBA	MOCKERNUT HICKORY	
CARYA GLABRA VAR GLABRA	PIGNUT HICKORY	
CARYA OVATA	SHAG-BARK HICKORY	
CELTIS LAEVIGATA	SUGARBERRY	
CENTROSEMA VIRGINIANUM	COASTAL BUTTERFLY-PEA	
CERASTIUM FONTANUM	COMMON MOUSE-EAR CHICKWEED	
CERCIS CANADENSIS	EASTERN REDBUD	
CHAMAECRISTA FASCICULATA	PRAIRIE SENNA	
CHAMAESYCE MACULATA	SPOTTED SPURGE	
CHASMANTHIUM LATIFOLIUM	RIVER OATS	
CHASMANTHIUM LAXUM	SLENDER SPIKEGRASS	
CHASMANTHIUM SESSILIFLORUM	LONGLEAF SPIKEGRASS	CP: hardwood forests
CHIMAPHILA MACULATA	SPOTTED WINTERGREEN	
CHIONANTHUS VIRGINICUS	FRINGE TREE	
CHRYSOGONUM VIRGINIANUM	GREEN-AND-GOLD	
CHRYSOPSIS MARIANA	MARYLAND GOLDEN ASTER	
CIRSIUM HORRIDULUM	YELLOW THISTLE	
CLAYTONIA VIRGINICA	NARROW-LEAVED SPRING BEAUTY	
COMMELINA COMMUNIS	ASIATIC DAYFLOWER	
CONYZA CANADENSIS	CANADA HORSEWEED	
COREOPSIS AURICULATA	LOBED TICKSEED	
COREOPSIS MAJOR	WOOD TICKSEED	
COREOPSIS TINCTORIA	GOLDEN TICKSEED	
CORNUS FLORIDA	FLOWERING DOGWOOD	
CORNUS FOEMINA	STIFF DOGWOOD	
CORYLUS AMERICANA	AMERICAN HAZELNUT	
CRATAEGUS FLAVA	A HAWTHORN	
CUNILA ORIGANOIDES	DITTANY	
CUSCUTA CAMPESTRIS	FIELD DODDER	
CYPERUS ESCULENTUS	CHUFA FLAT-SEDGE	
CYPERUS RETRORSUS	RETRORSE FLATSEDGE	
CYTISUS SCOPARIUS	SCOTCH BROOM	
DANTHONIA COMPRESSA	FLATTENED OATGRASS	
DANTHONIA SERICEA	SILKY OAT-GRASS	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
DANTHONIA SPICATA	POVERTY OAT-GRASS	
DENNSTAEDTIA PUNCTILOBULA	EASTERN HAY-SCENTED FERN	
DESMODIUM NUDIFLORUM	BARE-STEMMED TICK-TREEFOIL	
DESMODIUM PANICULATUM	NARROW-LEAF TICK-TREFOIL	
DESMODIUM ROTUNDIFOLIUM	PROSTRATE TICK-TREEFOIL	
DICHANTHELIUM CLANDESTINUM	DEER-TONGUE WITCHGRASS	
DICHANTHELIUM DICHOTOMUM VAR DICHOTOMUM	SMALL-FRUITED PANICGRASS	
DICHANTHELIUM LAXIFLORUM	LAX-FLOWER WITCHGRASS	
DICHANTHELIUM SPHAEROCARPON	ROUNDFRUIT PANICGRASS	
DIGITARIA SANGUINALIS	HAIRY CRABGRASS	
DIODIA TERES	ROUGH BUTTONWEED	
DIOSPYROS VIRGINIANA	PERSIMMON	
DIPHASIASTRUM DIGITATUM	FAN CLUB-MOSS	
DRABA VERNA	VERNAL WHITLOW GRASS	
DULICHIUM ARUNDINACEUM	THREE-WAY SEDGE	
ECHINOCHLOA CRUS-GALLI***	BARNYARD GRASS***	
ELEOCHARIS FLAVESCENS	PALE SPIKERUSH	
ELEPHANTOPUS TOMENTOSUS	TOBACCOWEED	
ELYMUS HYSTRIX VAR. HYSTRIX	BOTTLEBRUSH GRASS	
EPIFAGUS VIRGINIANA	BEECHDROPS	
EPIGAEA REPENS	TRAILING ARBUTUS	
ERAGROSTIS SPECTABILIS	PURPLE LOVE-GRASS	
ERECHTITES HIERACIIFOLIA	FIREWEED	
ERIGERON ANNUUS	WHITE-TOP FLEABANE	
ERIGERON STRIGOSUS	DAISY FLEABANE	
ERYTHRONIUM AMERICANUM	YELLOW TROUT-LILY	
ERYTHRONIUM UMBILICATUM SSP UMBILICATUM	YELLOW TROUT-LILY	
EUONYMUS AMERICANUS	AMERICAN STRAWBERRY-BUSH	
EUPATORIUM CAPILLIFOLIUM	SMALL DOG-FENNEL THOROUGHWORT	
EUPATORIUM HYSSOPIFOLIUM	HYSSOPLEAF THOROUGHWORT	
EUPATORIUM ROTUNDIFOLIUM	ROUND-LEAF THOROUGH-WORT	
EUPATORIUM SEROTINUM	LATE-FLOWERING THOROUGH-WORT	
EUPHORBIA COROLLATA	FLOWERING SPURGE	
EUPHORBIA MARGINATA	SNOW-ON-THE-MOUNTAIN	
EUTHAMIA CAROLIANA	CAROLINA FLAT-TOP GOLDENROD	
FAGUS GRANDIFOLIA	AMERICAN BEECH	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
FRAGARIA VIRGINIANA	VIRGINIA STRAWBERRY	
FRAXINUS AMERICANA	WHITE ASH	
FRAXINUS PENNSYLVANICA	GREEN ASH	
GALACTIA VOLUBILIS	DOWNY MILKPEA	
GALIUM APARINE	CATCHWEED BEDSTRAW	
GALIUM CIRCAEZANS	WILD LICORICE	
GALIUM OBTUSUM	BLUNT-LEAF BEDSTRAW	
GALIUM PILOSUM	HAIRY BEDSTRAW	
GALIUM TRIFLORUM	SWEET-SCENT BEDSTRAW	
GAYLUSSACIA FRONDOSA	DANGLE-BERRY	
GERANIUM MACULATUM	WILD GERANIUM	
GEUM CANADENSE	WHITE AVENS	
GLEDITSIA TRIACANTHOS	HONEY-LOCUST	
GLYCERIA STRIATA	FOWL MANNA-GRASS	
HAMAMELIS VIRGINIANA	AMERICAN WITCH-HAZEL	
HELENIUM AMARUM	FIVE-LEAF SNEEZEWEED	
HELENIUM AUTUMNALE	COMMON SNEEZEWEED	
HEPATICA AMERICANA	LIVERLEAF	
HEUCHERA AMERICANA	AMERICAN ALUMROOT	
HEXALECTRIS SPICATA	**CRESTED CORALROOT**	**PMC: dry or mesic woods on basic soils**
HEXASTYLIS LEWISII	LEWIS'S HEARTLEAF	PSC: forests, pocosin edges
HEXASTYLIS MINOR	LITTLE HEARTLEAF	
HEXASTYLIS SHUTTLEWORTHII	LARGE-FLOWERED HEARTLEAF	
HEXASTYLIS VIRGINICA	VIRGINIA HEARTLEAF	
HIERACIUM GRONOVII	HAIRY HAWKWEED	
HIERACIUM VENOSUM	RATTLESNAKE HAWKWEED	
HOUSTONIA CAERULEA	QUACKER'S BONNETS	
HYPERICUM GENTIANOIDES	ORANGE-GRASS ST. JOHN'S-WORT	
HYPERICUM HYPERICOIDES	ST. ANDREW'S CROSS	
HYPERICUM NUDIFLORUM	PRETTY ST. JOHN'S-WORT	
HYPERICUM PUNCTATUM	COMMON ST. JOHN'S-WORT	
HYPERICUM STRAGULUM	ST. ANDREW'S CROSS	
ILEX DECIDUA	DECIDUOUS HOLLY	
ILEX OPACA	AMERICAN HOLLY	
IMPATIENS CAPENSIS	SPOTTED JEWEL-WEED	
IPOMOEA PANDURATA	BIG-ROOT MORNING-GLORY	
IRIS VERNA	DWARF IRIS	
ISOETES ENGELMANNII	ENGALMAN'S QUILLWORT	
JUGLANS NIGRA	BLACK WALNUT	
JUNCUS CORIACEUS	LEATHERY RUSH	
JUNCUS EFFUSUS	SOFT RUSH	
JUNCUS TENUIS	SLENDER RUSH	
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
JUSTICIA AMERICANA	COMMON WATER-WILLOW	
KALMIA LATIFOLIA	MOUNTAIN LAUREL	
KRIGIA VIRGINICA	DWARF DANDELION	
LECHEA PULCHELLA	LEGGETT'S PINWEED	
LESPEDEZA BICOLOR	SHRUBBY BUSHCLOVER	
LESPEDEZA CAPITATA	ROUND-HEAD BUSH-CLOVER	
LESPEDEZA CUNEATA	CHINESE BUSHCLOVER	
LESPEDEZA PROCUMBENS	TRAILING BUSH-CLOVER	
LESPEDEZA VIRGINICA	SLENDER BUSH-CLOVER	
LEUCANTHEMUM VULGARE	OXEYE DAISY	
LEUCOTHOE RECURVA	RECURVED DOG-HOBBLE	
LIATRIS SQUARROSA	SCALY GAY-FEATHER	
LINDERA BENZOIN	SPICEBUSH	
LINUM SULCATUM VAR SULCATUM	**GLADE FLAX**	**P: diabase glades**
LIQUIDAMBAR STYRACIFLUA	SWEET GUM	
LIRIODENDRON TULIPIFERA	TULIP TREE	
LOBELIA CARDINALIS	CARDINAL FLOWER	
LOBELIA INFLATA	INDIAN-TOBACCO	
LOBELIA NUTTALLII	NUTTALL'S LOBELIA	
LOBELIA PUBERULA	DOWNY LOBELIA	
LOBELIA SPICATA	PALE-SPIKED LOBELIA	
LONICERA DIOICA	LIMBER HONEYSUCKLE	
LONICERA JAPONICA	JAPANESE HONEYSUCKLE***	
LONICERA SEMPERVIRENS	TRUMPET HONEYSUCKLE	
LUDWIGIA ALTERNIFOLIA	BUSHY SEEDBOX	
LUDWIGIA DECURRENS	PRIMROSE WILLOW	
LUDWIGIA PALUSTRIS	MARSH SEEDBOX	
LUZULA MULTIFLORA	HEATH WOODRUSH	MP: moist woods
LYCOPUS UNIFLORUS	NORTHERN BUGLEWEED	
MACLURA POMIFERA	OSAGEORANGE	
MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	C: mainland forests with maritime influence on the southeastern coast of North Carolina; introduced elsewhere
MALUS ANGUSTIFOLIA	SOUTHERN CRABAPPLE	
MELICA MUTICA	NARROW MELIC GRASS	
MERTENSIA VIRGINICA	VIRGINIA BLUEBELLS	PCM: rich forests on slopes and bottomlands
MICROSTEGIUM VIMINEUM***	JAPANESE GRASS***	
MIMULUS ALATUS	SHARP-WING MONKEYFLOWER	
MITCHELLA REPENS	PARTRIDGE-BERRY	
MORUS RUBRA	RED MULBERRY	
MUHLENBERGIA TENUIFLORA	SLENDER MUHLY	
MURDANNIA KEISAK	MARSH DEWFLOWER	
NARCISSUS SP***	DAFFODIL***	
NUPHAR LUTEA	AMERICAN LOTUS	CS: blackwater streams, rivers and

Species Observed During 2006 Vegetation Community and Rare Plant Survey		
SCIENTIFIC NAME	**COMMON NAME**	**HABITAT IN North Carolina**
		lakes
NUTTALLANTHUS CANADENSIS	BUTTER-AND-EGGS	
NYSSA SYLVATICA	BLACK GUM	
OENOTHERA BIENNIS	COMMON EVENING-PRIMROSE	
OENOTHERA FRUTICOSA	NARROW-LEAVED SUNDROPS	
ONOCLEA SENSIBILIS	SENSITIVE FERN	
ORONTIUM AQUATICUM	GOLDEN CLUB	
OSMUNDA CINNAMOMEA	CINNAMON FERN	
OSMUNDA REGALIS	ROYAL FERN	
OSTRYA VIRGINIANA	EASTERN HOP-HORNBEAM	
OXALIS CORNICULATA	CREEPING WOODSORREL	
OXALIS DILLENII	DILLEN'S WOODSORREL	
OXALIS STRICTA	UPRIGHT YELLOW WOOD-SORREL	
OXALIS VIOLACEA	VIOLET WOOD-SORREL	
OXYDENDRUM ARBOREUM	SOURWOOD	
PANICUM ANCEPS	PANIC GRASS	
PANICUM DICHOTOMIFLORUM	SPREADING PANICGRASS	
PANICUM FLEXILE	**WIRY PANIC GRASS**	**PM: glades and openings over mafic rocks**
PARTHENOCISSUS QUINQUEFOLIA	VIRGINIA CREEPER	
PASPALUM FLORIDANUM	FLORIDA PASPALUM	
PASPALUM NOTATUM	BAHIA GRASS	
PASSIFLORA INCARNATA	PURPLE PASSION-FLOWER	
PASSIFLORA LUTEA	YELLOW PASSIONFLOWER	
PAULOWNIA TOMENTOSA***	ROYAL PAULOWNIA***	
PENNISETUM AMERICANUM	AMERICAN MILLET GRASS	
PHEGOPTERIS HEXAGONOPTERA	BROAD BEECH FERN	
PHLOX PILOSA	DOWNY PHLOX	
PHYTOLACCA AMERICANA	COMMON POKEWEED	
PINUS ECHINATA	SHORTLEAF PINE	
PINUS TAEDA	LOBLOLLY PINE	
PINUS VIRGINIANA	VIRGINIA PINE	
PIPTOCHAETIUM AVENACEUM	BLACKSEED NEEDLEGRASS	
PLANTAGO ARISTATA	LARGE-BRACT PLANTAIN	
PLANTAGO RUGELII	BLACK-SEED PLANTAIN	
PLANTAGO VIRGINICA	PALE-SEEDED PLANTAIN	
PLATANUS OCCIDENTALIS	SYCAMORE	
PLEOPELTIS POLYPODIOIDES	RESURRECTION FERN	
PLUCHEA CAMPHORATA	MARSH FLEABANE	
POA COMPRESSA	CANADA BLUEGRASS***	
POA CUSPIDATA	BLUEGRASS	
PODOPHYLLUM PELTATUM	MAY APPLE	
POLYGALA CURTISSII	CURTIS'S MILKWORT	

Species Observed During 2006 Vegetation Community and Rare Plant Survey		
SCIENTIFIC NAME	**COMMON NAME**	**HABITAT IN North Carolina**
POLYGONUM HYDROPIPEROIDES	MILD WATER-PEPPER	
POLYGONUM PERSICARIA	LADY'S THUMB	
POLYGONUM SAGITTATUM	ARROW-LEAVED TEARTHUMB	
POLYGONUM SETACEUM	SWAMP SMARTWEED	
POLYSTICHUM ACROSTICHOIDES	CHRISTMAS FERN	
PORTERANTHUS TRIFOLIATUS	BOWMAN'S-ROOT	
POTENTILLA CANADENSIS	CANADA CINQUEFOIL	
POTENTILLA SIMPLEX	OLD-FIELD CINQUEFOIL	
PRENANTHES SERPENTARIA	LION'S-FOOT	
PRUNELLA VULGARIS	SELF-HEAL	
PRUNUS AMERICANA	AMERICAN PLUM	
PRUNUS SEROTINA	BLACK CHERRY	
PSEUDOGNAPHALIUM OBTUSIFOLIUM	FRAGRANT CUDWEED	
PTERIDIUM AQUILINUM	BRACKEN FERN	
PUERARIA MONTANA	KUDZU	
PYCNANTHEMUM INCANUM	HOARY MOUNTAIN-MINT	
PYCNANTHEMUM MUTICUM	BLUNT MOUNTAIN MINT	
PYCNANTHEMUM PYCNANTHEMOIDES	SOUTHERN MOUNTAIN-MINT	
PYCNANTHEMUM TENUIFOLIUM	SLENDER MOUNTAIN-MINT	
PYRUS COMMUNIS***	COMMON PEAR***	
QUERCUS ALBA	WHITE OAK	
QUERCUS BICOLOR	SWAMP WHITE OAK	P: upland swamp forests
QUERCUS COCCINEA	SCARLET OAK	
QUERCUS FALCATA	SPANISH OAK	
QUERCUS LAEVIS	TURKEY OAK	
QUERCUS MARILANDICA	BLACKJACK OAK	
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	
QUERCUS MONTANA	CHESTNUT OAK	
QUERCUS PALUSTRIS	PIN OAK	P: swamps
QUERCUS PHELLOS	WILLOW OAK	
QUERCUS RUBRA	NORTHERN RED OAK	
QUERCUS SHUMARDII	SHUMARD OAK	
QUERCUS STELLATA	POST OAK	
QUERCUS VELUTINA	BLACK OAK	
RANUNCULUS ABORTIVUS	KIDNEY-LEAVED BUTTERCUP	
RANUNCULUS RECURVATUS	HOOKED CROWFOOT	
RHEXIA MARIANA VAR EXALBIDA	MARYLAND MEADOW-BEAUTY	
RHODODENDRON PERICLYMENOIDES	PINK AZALEA	
RHUS COPALLINA	WINGED SUMAC	
ROBINIA PSEUDOACACIA	BLACK LOCUST	
ROSA CAROLINA	CAROLINA ROSE	
RUBUS ARGUTUS	PRICKLY FLORIDA BLACKBERRY	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
RUBUS IDAEUS SSP IDAEUS	EUROPEAN RED RASPBERRY***	
RUBUS TRIVIALIS	SOUTHERN DEWBERRY	
RUDBECKIA LACINIATA	CUT-LEAVED CONEFLOWER	
RUELLIA CAROLINIENSIS	CAROLINA PETUNIA	
RUELLIA HUMILIS	**LOW WILD-PETUNIA**	**P: diabase glades**
RUELLIA PURSHIANA	**PURSH'S WILD-PETUNIA**	**PM: glades and woodlands, mostly over mafic or calcareous rocks**
SABATIA ANGULARIS	SQUARE-STEMMED ROSE PINK	
SACCHARUM BREVIBARBE	SHORT-BEARD PLUMEGRASS	
SAGITTARIA LATIFOLIA	BROADLEAF ARROWHEAD	
SALIX NIGRA	BLACK WILLOW	
SALVIA LYRATA	LYRE-LEAF SAGE	
SAMBUCUS CANADENSIS	COMMON ELDERBERRY	
SANGUINARIA CANADENSIS	BLOODROOT	
SANICULA CANADENSIS	SHORT-STYLED SANICLE	
SASSAFRAS ALBIDUM	SASSAFRAS	
SAURURUS CERNUUS	LIZARD'S TAIL	
SAXIFRAGA VIRGINIENSIS	VIRGINIA SAXIFRAGE	
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	
SCIRPUS CYPERINUS	COTTONGRASS BULRUSH	
SCLERANTHUS ANNUUS	ANNUAL KNAWEL	
SCUTELLARIA ELLIPTICA	HAIRY SKULLCAP	
SCUTELLARIA INTEGRIFOLIA	HYSSOP SKULLCAP	
SENECIO ANONYMUS	SMALL'S RAGWORT	
SERICOCARPUS ASTEROIDES	TOOTHED WHITE-TOP ASTER	
SILPHIUM TEREBINTHINACEUM	**PRAIRIE DOCK**	**P: diabase glades, other open or semi-open sites over mafic rock**
SMILAX BONA-NOX	SAW GREENBRIER	
SMILAX ROTUNDIFOLIA	COMMON GREENBRIER	
SOLANUM CAROLINENSE	CAROLINA HORSE-NETTLE	
SOLIDAGO CAESIA VAR CURTISII	CURTIS' GOLDENROD	
SOLIDAGO CANADENSIS	CANADA GOLDENROD	
SOLIDAGO NEMORALIS	FIELD GOLDENROD	
SOLIDAGO ODORA	SWEET GOLDENROD	
SOLIDAGO PINETORUM	SMALL'S GOLDENROD	
SOLIDAGO SPECIOSA	SHOWY GOLDENROD	
SORGHUM HALEPENSE	JOHNSON GRASS	
SPIRANTHES CERNUA	NODDING LADIES'-TRESSES	
SPIRANTHES LACERA VAR GRACILIS	SOUTHERN SLENDER LADIES'TRESSES	
SPIRANTHES OVALIS	LESSER LADIES'-TRESSES	
SPIRANTHES PRAECOX	GRASSLEAF LADIES'-TRESSES	

Species Observed During 2006 Vegetation Community and Rare Plant Survey

SCIENTIFIC NAME	COMMON NAME	HABITAT IN North Carolina
STAPHYLEA TRIFOLIA	AMERICAN BLADDERNUT	
STELLARIA PUBERA	GIANT CHICKWEED	
STROPHOSTYLES UMBELLATA	PINK WILD-BEAN	
STYLOSANTHES BIFLORA	PENCILFLOWER	
STYRAX GRANDIFOLIUS	BIGLEAF SNOWBELL	
SYMPLOCOS TINCTORIA	HORSE-SUGAR	
TANACETUM VULGARE	COMMON TANSY	
TARAXACUM OFFICINALE	COMMON DANDELION	
TEESDALIA NUDICAULIS	COMMON SHEPHERD'S-CRESS	
TEPHROSIA VIRGINIANA	GOAT'S-RUE	
THALICTRUM REVOLUTUM	WAXLEAF MEADOWRUE	
THELYPTERIS NOVEBORACENSIS	NEW YORK FERN	
THELYPTERIS PALUSTRIS	MARSH FERN	
TOXICODENDRON RADICANS	POISON IVY	
TRICHOSTEMA DICHOTOMUM	FORKED BLUECURLS	
TRILLIUM CATESBAEI	CATESBY'S TRILLIUM	
TYPHA LATIFOLIA	BROAD-LEAF CATTAIL	
ULMUS ALATA	WINGED ELM	
ULMUS AMERICANA	AMERICAN ELM	
ULMUS RUBRA	SLIPPERY ELM	
VACCINIUM ARBOREUM	FARKLEBERRY	
VACCINIUM FUSCATUM		
VACCINIUM PALLIDUM	EARLY LOWBUSH BLUEBERRY	
VACCINIUM STAMINEUM	SQUAW HUCKLEBERRY	
VERBASCUM THAPSUS	GREAT MULLEIN	
VERNONIA NOVEBORACENSIS	NEW YORK IRONWEED	
VIBURNUM ACERIFOLIUM	MAPLE-LEAF VIBURNUM	
VIBURNUM DENTATUM	SOUTHERN ARROW-WOOD	
VIBURNUM PRUNIFOLIUM	SMOOTH BLACK-HAW	
VIBURNUM RAFINESQUIANUM	DOWNY ARROWWOOD	
VIOLA PRIMULIFOLIA	PRIMROSE-LEAF VIOLET	
VIOLA SORORIA	WOOLLY BLUE VIOLET	
VIOLA TRICOLOR	THREE COLORED VIOLET	
VITIS AESTIVALIS	SUMMER GRAPE	
VITIS ROTUNDIFOLIA	MUSCADINE GRAPE	
WISTERIA SINENSIS	CHINESE WISTERIA	
WOODSIA OBTUSA	BLUNT-LOBE WOODSIA	
WOODWARDIA AREOLATA	NETTED CHAINFERN	
XANTHORHIZA SIMPLICISSIMA	YELLOW ROOT	
ZEPHYRANTHES ATAMASCA	ATAMASCO LILY	

Source: AMEC 2007a

Plant species encountered during LCTA Core Plot Inventory Camp Butner Training Site, NC (1999 Inventory)		
SPECIES	**COMMON NAME**	**FAMILY**
Acer rubrum	red maple	Aceraceae
Ailanthus altissima	tree-of-heaven	Simaroubaceae
Amelanchier arborea	serviceberry	Roseaceae
Andropogon sp.	bluestem	Poaceae
Arrhenatherum elatius	oatgrass	Poaceae
Aristolochia serpentaria	Virginia snakeroot	Aristolochiaceae
Asplenium platyneuron	ebony spleenwort	Aspleniaceae
Aster sp.	aster	Asteraceae
Athyrium filix-femina	common ladyfern	Dryopteridaceae
Betula nigra	river birch	Betulaceae
Boehmeria cylindrica	smallspike false nettle	Urticaceae
Carpinus caroliniana	hornbeam / musclewood	Betulaceae
Carya glabra	pignut hickory	Juglandaceae
Carya ovata	shagbark hickory	Juglandaceae
Castanea pumila	Allegheny chinkapin	Fagaceae
Campsis radicans	trumpet creeper	Bignoniaceae
Carex sp.	sedge	Cyperaceae
Carya tormentosa	mockernut hickory	Juglandaceae
Cercis canadensis	redbud	Fabaceae
Chasmanthium latifolium	indian woodoats	Poaceae
Chimaphila maculata	spotted wintergreen	Pyrolaceae
Corylus americana	hazelnut	Betulaceae
Conyza canadensis		Asteraceae
Cornus florida	flowering dogwood	Cornaceae
Crataegus crus-galli	cockspur hawthorne	Rosaceae
Desmodium nudiflorum	nakedflower tick-trefoil	Fabaceae
Dichanthium sp.	panicgrass	Poaceae
Dichanthium scoparium	velvet panicum	Poaceae
Diospyros virginiana	persimmon	Ebenaceae
Epilobium angustifolium	fireweed	Onagraceae
Euonymus americana	strawberrybush	Celastraceae
Eupatorium capillifolium	dog fennel	Asteraceae
Fagus grandifolia	American beech	Fagaceae
Fraxinus americana	white ash	Oleaceae
Fraxinus sp.	ash	Oleaceae
Fragaria virginiana	wild strawberry	Rosaceae
Galium sp.	bedstraw	Rubiaceae
Gamochaeta purpurea	purple cudweed	Asteraceae
Gaylussacia sp.	huckleberry	Ericaceae
Goodyera pubescens	rattlesnake plantain	Orchidaceae
Hamamelis virginiana	witchhazel	Hamamelidaceae
Hexastylis sp.	wild ginger / heartleaf	Aristolochiaceae
Hypericum hypericoides	St. Andrew's Cross	Clusiaceae
Hypericum sp.	St. John's-wort	Clusiaceae
Ilex decidua	possumhaw	Aquifoliaceae
Ilex opaca	American holly	Aquifoliaceae

Plant species encountered during LCTA Core Plot Inventory Camp Butner Training Site, NC (1999 Inventory)		
SPECIES	**COMMON NAME**	**FAMILY**
Ipomoea purpurea	morning glory	Convolvulaceae
Juncus effusus	soft rush	Juncaceae
Juncus sp.	rush	Juncaceae
Juniperus virginiana	eastern redcedar	Cupressaceae
Lespedeza bicolor	bicolor lespedeza	Fabaceae
Lespedeza procumbens	trailing lespedeza	Fabaceae
Lespedeza sp.	lespedeza	Fabaceae
Liquidambar stryaciflua	sweetgum	Hamamelidaceae
Liriodendron tulipifera	yellow-poplar	Magnoliaceae
Lonicera japonica	Japanese honeysuckle	Caprifoliaceae
Lycopodium digitatum	fan clubmoss	Lycopodiaceae
Lycopus virginicus	Virginia water horehound	Lamiaceae
Maianthemum racemosum	false Solomon's-seal	Liliaceae
Mitchella repens	partridgeberry	Rubiaceae
Microstegium vimineum	Japanese grass	Poaceae
Morus rubra	red mulberry	Moraceae
Nuttallanthus canadensis	Canada toadflax	Scrophulariaceae
Nyssa sylvatica	blackgum	Nyssaceae
Ostrya virginiana	hophornbeam	Betulaceae
Oxalis sp.	wood sorrel	Oxalidaceae
Oxydendrum arboreum	sourwood	Ericaeae
Parthenocissus quinquefolia	Virginia creeper	Vitaceae
Phytolacca americana	pokeweed	Phytolaccaceae
Photinia pyrifolia	red chokeberry	Rosaceae
Pinus echinata	shortleaf pine	Pinaceae
Pinus taeda	loblolly pine	Pinaceae
Pinus virginiana	Virginia pine	Pinaceae
Plantago sp.	Plantain	Plantaginaceae
Plantago aristata	largebracted plantain	Plantaginaceae
Platanus occidentalis	American sycamore	Platanaceae
Polystichum acrostichoides	Christmas fern	Dryopteridaceae
Prenanthes altissima	lion's foot	Asteraceae
Prunus serotina	black cherry	Rosaceae
Quercus alba	white oak	Fagaceae
Quercus coccinea	scarlet oak	Fagaceae
Quercus falcata	southern red oak	Fagaceae
Quercus marilandica	blackjack oak	Fagaceae
Quercus phellos	willow oak	Fagaceae
Quercus rubra	northern red oak	Fagaceae
Quercus stellata	post oak	Fagaceae
Quercus velutina	black oak	Fagaceae
Rhus copallinum	winged sumac	Anacardiaceae
Rubus sp.	blackberry	Anacardiaceae
Sassafras albidum	sassafras	Lauraceae
Smilax rotundifolia	greenbrier	Smilacaceae
Solidago caesia	wreath goldenrod	Asteraceae
Solidago sp.	goldenrod	Asteraceae

Plant species encountered during LCTA Core Plot Inventory Camp Butner Training Site, NC (1999 Inventory)		
SPECIES	**COMMON NAME**	**FAMILY**
Symphyotrichum grandiflorum	largeflower aster	Asteraceae
Toxicodedron radicans	poison ivy	Anacardiaceae
Trifolium arvense	rabbitsfoot clover	Fabaceae
Trifolium sp.	clover	Fabaceae
Ulmus alata	winged elm	Ulmaceae
Ulmus americana	American elm	Ulmaceae
Vaccinium sp.	blueberry	Ericaceae
Vibernum acerifolium	mapleleaf viburnum	Caprifoliaceae
Viburnum prunifolium	blackhaw	Caprifoliaceae
Viburnum rafinesquianum	downy arrowwood	Caprifoliaceae
Vitis rotundifolia	muscadine grape	Vitaceae
Viburnum rufidulum	rusty blackhaw	Caprifoliaceae

CBTS Wetland Species (Documented in USACE-WES 1998)		
Group	**Scientific Name**	**Common Name**
Plant	*Acer rubrum*	Red maple
Plant	*Acer saccharum ssp. floridanum*	Sugar maple
Plant	*Alnus serrulata*	Hazel alder
Plant	*Arisaema triphyllum*	Jack in the pulpit
Plant	*Betula nigra*	River birch
Plant	*Carex alata*	Broadwing sedge
Plant	*Carex complanta*	--
Plant	*Carex crinita*	Fringed sedge
Plant	*Carex debilis*	White edge sedge
Plant	*Carex lurida*	Shallow sedge
Plant	*Carex stipata*	Sawbreak sedge
Plant	*Carpinus caroliniana*	American hornbeam
Plant	*Cornus foemina*	Stiff dogwood
Plant	*Dryopteris celsa*	Log fern
Plant	*Eulalia viminea*	Japanese stilt grass
Plant	*Fraxinus pennsylvanica*	Green ash
Plant	*Glyceria striata*	Fowl mannagrass
Plant	*Ilex opaca*	American holly
Plant	*Impatiens capensis*	Jewelweed
Plant	*Juncus effusus*	Common rush
Plant	*Juniperus virginiana*	Eastern redcedar
Plant	*Leersia virginica*	Whitegrass
Plant	*Lindera benzoin*	Spicebush
Plant	*Liquidambar styraciflua*	Sweetgum
Plant	*Lonicera japonica*	Japanesse honeysuckle
Plant	*Lycopus virginicus*	Virginia bugleweed
Plant	*Nyssa sylvatica*	Blackgum
Plant	*Onoclea sensibilis*	Sensitive fern
Plant	*Osmunda cinnamomea*	Cinnamon fern
Plant	*Parthenocissus quinquefolia*	Virginia creeper
Plant	*Phalaris occidentalis*	Reed canarygrass
Plant	*Polystichum acrostichoides*	Loblolly pine
Plant	*Quercus alba*	White oak
Plant	*Quercus phellos*	Willow oak
Plant	*Quercus shumardii*	Shumard oak
Plant	*Smilax glauca*	Cat greenbriar
Plant	*Smilax rotundifolia*	Common greenbriar
Plant	*Tilia americana*	American basswood
Plant	*Toxicodendron radicans*	Poision ivy
Plant	*Ulmus alata*	Winged elm
Plant	*Vaccinium conymbosum*	--
Plant	*Viburnum dentatum*	Arrowwood
Plant	*Woodwardia areolata*	Netted chainfern
Plant	*Zephyranthes atamasca*	Atamasco lily

Species Observed During 2006 Vegetation Community and Flora Survey and 2012 – 2013 Vegetation Community and Flora Plant Survey, CBTS

The following table lists the plant species observed on the CBTS during the 2006 vegetation community and flora survey and/or the 2012 – 2013 vegetation community and flora survey.

*** - non-native plants

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
TREE				
ACER BARBATUM	FLORIDA MAPLE	ACBA3	X	
ACER RUBRUM VAR RUBRUM	RED MAPLE	ACRUR	X	X
ACER RUBRUM VAR TRILOBUM	RED MAPLE	ACRUT	X	
ACER SACCHARUM	SUGAR MAPLE	ACSAS	X	
AILANTHUS ALTISSIMA***	TREE-OF-HEAVEN***	AIAL	X	X
BETULA NIGRA	RIVER BIRCH	BENI	X	X
CARPINUS CAROLINIANA	IRONWOOD	CACA18	X	X
CARYA ALBA	MOCKERNUT HICKORY	CAAL27	X	X
CARYA GLABRA VAR GLABRA	PIGNUT HICKORY	CAGL8	X	X
CARYA OVATA	SHAG-BARK HICKORY	CAOV2	X	X
CELTIS LAEVIGATA	SUGARBERRY	CELA	X	
CORNUS FLORIDA	FLOWERING DOGWOOD	COFL2	X	X
DIOSPYROS VIRGINIANA	PERSIMMON	DIVI5	X	X
FAGUS GRANDIFOLIA	AMERICAN BEECH	FAAM	X	X
FRAXINUS AMERICANA	WHITE ASH	FRAM2	X	X
FRAXINUS PENNSYLVANICA	GREEN ASH	FRPE	X	X
GLEDITSIA TRIACANTHOS	HONEY-LOCUST	GLTR	X	
ILEX OPACA	AMERICAN HOLLY	ILOP	X	X
JUGLANS NIGRA	BLACK WALNUT	JUNI	X	
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	JUVI	X	X
LIQUIDAMBAR STYRACIFLUA	SWEET GUM	LIST2	X	X
LIRIODENDRON TULIPIFERA	TULIP TREE	LITU	X	X
MACLURA POMIFERA	OSAGEORANGE	MAPO	X	
MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	MAGR4	X	X
MALUS ANGUSTIFOLIA	SOUTHERN CRABAPPLE	MAAN3	X	
MORUS RUBRA	RED MULBERRY	MORU2	X	X
NYSSA SYLVATICA	BLACK GUM	NYSY	X	X
OSTRYA VIRGINIANA	EASTERN HOP-HORNBEAM	OSVI	X	X
OXYDENDRUM ARBOREUM	SOURWOOD	OXAR	X	X
PAULOWNIA TOMENTOSA***	ROYAL PAULOWNIA***	PATO2	X	X
PINUS ECHINATA	SHORTLEAF PINE	PIEC2	X	X
PINUS TAEDA	LOBLOLLY PINE	PITA	X	X
PINUS VIRGINIANA	VIRGINIA PINE	PIVI2	X	X
PLATANUS OCCIDENTALIS	SYCAMORE	PLOC	X	X
PRUNUS AMERICANA	AMERICAN PLUM	PRAM	X	
PRUNUS SEROTINA	BLACK CHERRY	PRSE2	X	X
PYRUS COMMUNIS***	COMMON PEAR***	PYCO	X	X
QUERCUS ALBA	WHITE OAK	QUAL	X	X
QUERCUS BICOLOR	SWAMP WHITE OAK	QUBI	X	
QUERCUS COCCINEA	SCARLET OAK	QUCO2	X	
QUERCUS FALCATA	SPANISH OAK	QUCO2	X	X
QUERCUS HEMISPHAERICA	DARLINGTON OAK	QUHE2		X
QUERCUS LAEVIS	TURKEY OAK	QULA2	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
QUERCUS MARILANDICA	BLACKJACK OAK	QUMA3	X	
QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	QUMI	X	
QUERCUS MONTANA	CHESTNUT OAK	QUMO4	X	
QUERCUS PALUSTRIS	PIN OAK	QUPA2	X	
QUERCUS PHELLOS	WILLOW OAK	QUPH	X	X
QUERCUS RUBRA	NORTHERN RED OAK	QURU	X	X
QUERCUS SHUMARDII	SHUMARD OAK	QUSH	X	X
QUERCUS STELLATA	POST OAK	QUST	X	X
QUERCUS VELUTINA	BLACK OAK	QUVE	X	X
ROBINIA PSEUDOACACIA	BLACK LOCUST	ROPS	X	X
SALIX NIGRA	BLACK WILLOW	SANI	X	X
SASSAFRAS ALBIDUM	SASSAFRAS	SAAL5	X	X
ULMUS ALATA	WINGED ELM	ULAL	X	X
ULMUS AMERICANA	AMERICAN ELM	ULAM	X	X
ULMUS RUBRA	SLIPPERY ELM	ULRU	X	
	VINE			
CAMPSIS RADICANS	TRUMPET-CREEPER	CARA2	X	X
LONICERA DIOICA	LIMBER HONEYSUCKLE	LODI2	X	
LONICERA JAPONICA	JAPANESE HONEYSUCKLE***	LOJA	X	X
LONICERA SEMPERVIRENS	TRUMPET HONEYSUCKLE	LOSE	X	X
MITCHELLA REPENS	PARTRIDGE-BERRY	MIRE	X	X
PARTHENOCISSUS QUINQUEFOLIA	VIRGINIA CREEPER	PAQU2	X	X
PASSIFLORA INCARNATA	PURPLE PASSION-FLOWER	PAIN6	X	
PASSIFLORA LUTEA	YELLOW PASSIONFLOWER	PALU2	X	
PUERARIA MONTANA***	KUDZU	PUMO	X	X
ROSA CAROLINA	CAROLINA ROSE	ROCA4	X	
RUBUS ARGUTUS	PRICKLY FLORIDA BLACKBERRY	RUAR2	X	X
RUBUS IDAEUS SSP IDAEUS	EUROPEAN RED RASPBERRY***	RUIDI	X	X
RUBUS TRIVIALIS	SOUTHERN DEWBERRY	RUTR	X	X
SMILAX BONA-NOX	SAW GREENBRIER	SMBO2	X	X
SMILAX ROTUNDIFOLIA	COMMON GREENBRIER	SMRO	X	X
TOXICODENDRON RADICANS	POISON IVY	TORA2	X	X
VITIS AESTIVALIS	SUMMER GRAPE	VIAE	X	
VITIS ROTUNDIFOLIA	MUSCADINE GRAPE	VIRO3	X	X
WISTERIA SINENSIS***	CHINESE WISTERIA***	WISI	X	X
	SHRUB			
ALBIZIA JULIBRISSIN***	MIMOSA***	ALJU	X	X
ALNUS SERRULATA	BROOK-SIDE ALDER	ALSE2	X	X
ASIMINA PARVIFLORA	DWARF PAW-PAW	ASTR	X	
CERCIS CANADENSIS	EASTERN REDBUD	CECA4	X	X
CHIONANTHUS VIRGINICUS	FRINGE TREE	CHVI3	X	
CORNUS FOEMINA	STIFF DOGWOOD	COFO	X	
CORYLUS AMERICANA	AMERICAN HAZELNUT	COAM3	X	
CRATAEGUS FLAVA	A HAWTHORN	CRAP3	X	X
EPIGAEA REPENS	TRAILING ARBUTUS	EPRE2	X	
EUONYMUS AMERICANA	AMERICAN STRAWBERRY-BUSH	EUAM7	X	X
GAYLUSSACIA FRONDOSA	DANGLE-BERRY	GAFR2	X	
HAMAMELIS VIRGINIANA	AMERICAN WITCH-HAZEL	HAVI4	X	
ILEX DECIDUA	DECIDUOUS HOLLY	ILDE	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
ILEX OPACA	AMERICAN HOLLY	ILOP		X
KALMIA LATIFOLIA	MOUNTAIN LAUREL	KALA	X	
LINDERA BENZOIN	SPICEBUSH	LIBE3	X	
RHODODENDRON PERICLYMENOIDES	PINK AZALEA	RHPE4	X	
RHUS COPALLINUM	WINGED SUMAC	RHCO	X	X
ROSA MULTIFLORA	MULTIFLORA ROSE	ROMU		X
SAMBUCUS CANADENSIS	COMMON ELDERBERRY	SACA12	X	
STAPHYLEA TRIFOLIA	AMERICAN BLADDERNUT	STTR	X	
STYRAX GRANDIFOLIUS	BIGLEAF SNOWBELL	STGR4	X	
SYMPLOCOS TINCTORIA	HORSE-SUGAR	SYTI	X	X
VACCINIUM ARBOREUM	FARKLEBERRY	VAAR	X	X
VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	VACO		X
VACCINIUM FUSCATUM	BLACK HIGHBUSH BLUEBERRY	VAFU	X	X
VACCINIUM PALLIDUM	EARLY LOWBUSH BLUEBERRY	VAPA4	X	
VACCINIUM STAMINEUM	SQUAW HUCKLEBERRY	VAST	X	X
VIBURNUM ACERIFOLIUM	MAPLE-LEAF VIBURNUM	VIAC	X	
VIBURNUM DENTATUM	SOUTHERN ARROW-WOOD	VIDE	X	
VIBURNUM PRUNIFOLIUM	SMOOTH BLACK-HAW	VIPR	X	
VIBURNUM RAFINESQUIANUM	DOWNY ARROWWOOD	VIRA	X	
XANTHORHIZA SIMPLICISSIMA	YELLOW ROOT	XASI	X	X
	HERB			
ACHILLEA MILLEFOLIUM	COMMON YARROW	ACMIM2	X	X
AGALINIS PURPUREA	LARGE-PURPLE FALSE-FOXGLOVE	AGPU5	X	
ALLIUM AMPELOPRASUM***	WILD LEEK***	ALAM	X	X
ALLIUM VINEALE***	FIELD GARLIC***	ALVI	X	
AMBROSIA ARTEMISIIFOLIA	ANNUAL RAGWEED	AMARA2	X	X
AMPHICARPAEA BRACTEATA	AMERICAN HOG-PEANUT	AMBR2	X	X
ANEMONELLA THALICTROIDES	WINDFLOWER	ANTH5	X	
ANTENNARIA PLANTAGINIFOLIA	PLANTAIN-LEAF PUSSYTOES	ANPL	X	
ANTENNARIA SOLITARIA	SINGLE-HEAD PUSSYTOES	ANSO	X	
ANTHEMIS ARVENSIS	CORN CAMOMILE	ANAR6	X	
APOCYNUM CANNABINUM	CLASPING-LEAF DOGBANE	APCA	X	X
ARISAEMA TRIPHYLLUM	JACK IN THE PULPIT	ARTR		X
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT	ARSE3	X	
ARNOGLOSSUM ATRIPLICIFOLIUM	PALE INDIAN-PLANTAIN	ARAT	X	
ASCLEPIAS AMPLEXICAULIS	CLASPING MILKWEED	ASAM	X	
ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	ASTUT2	X	X
ASTER DIVARICATUS	SERPENTINE ASTER	ASDI	X	
ASTER DUMOSUS	BUSHY ASTER	ASDU	X	X
ASTER SPECTABILIS	WESTERN SHOWY ASTER	ASSP11	X	
AUREOLARIA VIRGINICA	DOWNY FALSE-FOXGLOVE	AUVI	X	
BARBAREA VERNA	EARLY WINTER-CRESS	BAVE	X	X
BIDENS ARISTOSA	TICKSEED BEGGAR-TICKS	BIAR	X	X
BOEHMERIA CYLINDRICA	FALSE NETTLE	BOCY	X	X
CARDAMINE ANGUSTATA	SLENDER TOOTHWORT	CARA2	X	
CARDAMINE HIRSUTA***	HAIRY BITTER-CRESS***	CAHI3	X	
CENTROSEMA VIRGINIANUM	COASTAL BUTTERFLY-PEA	CEVI2	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
CERASTIUM FONTANUM	COMMON MOUSE-EAR CHICKWEED	CEFO2	X	
CHAMAECRISTA FASCICULATA	PRAIRIE SENNA	CHFA2	X	
CHAMAESYCE MACULATA	SPOTTED SPURGE	CHMA11	X	
CHIMAPHILA MACULATA	STRIPED WINTERGREEN	CHMA3	X	
CHRYSOGONUM VIRGINIANUM	GREEN-AND-GOLD	CHVI5	X	
CHRYSOPSIS MARIANA	MARYLAND GOLDEN ASTER	CHMA14	X	
CIRSIUM HORRIDULUM	YELLOW THISTLE	CIHO2	X	X
CLAYTONIA VIRGINICA	NARROW-LEAVED SPRING BEAUTY	CLVI3	X	
CNIDOSCOLUS URENS VAR. STIMULOSUS	FINGER ROT	CNURS		X
COMMELINA COMMUNIS***	ASIATIC DAYFLOWER***	COCO3	X	
CONYZA CANADENSIS	CANADA HORSEWEED	COCA5	X	
COREOPSIS AURICULATA	LOBED TICKSEED	COAU	X	
COREOPSIS MAJOR	WOOD TICKSEED	COMA6	X	
COREOPSIS TINCTORIA	GOLDEN TICKSEED	COTI3	X	
CUNILA ORIGANOIDES	DITTANY	CUOR	X	
CUSCUTA CAMPESTRIS	FIELD DODDER	CUCA2	X	X
CYTISUS SCOPARIUS	SCOTCH BROOM	CYSC4	X	
DAUCUS CAROTA	QUEEN ANNE'S LACE	DACA6		X
DESMODIUM NUDIFLORUM	BARE-STEMMED TICK-TREEFOIL	DENU4	X	
DESMODIUM PANICULATUM	NARROW-LEAF TICK-TREFOIL	DEPA6	X	
DESMODIUM ROTUNDIFOLIUM	PROSTRATE TICK-TREEFOIL	DERO3	X	
DIODIA TERES	ROUGH BUTTONWEED	DITE2	X	X
DRABA VERNA	VERNAL WHITLOW GRASS	DRVE2	X	
ELEPHANTOPUS TOMENTOSUS	TOBACCOWEED	ELTO2	X	X
EPIFAGUS VIRGINIANA	BEECHDROPS	EPVI2	X	X
ERECHTITES HIERACIIFOLIA	FIREWEED	ERHI9	X	X
ERIGERON ANNUUS	WHITE-TOP FLEABANE	ERAN	X	X
ERIGERON STRIGOSUS	DAISY FLEABANE	ERSTS2	X	
ERYTHRONIUM AMERICANUM	YELLOW TROUT-LILY	ERAM5	X	
ERYTHRONIUM UMBILICATUM SSP UMBILICATUM	YELLOW TROUT-LILY	ERUM2	X	
EUPATORIUM CAPILLIFOLIUM	SMALL DOG-FENNEL THOROUGHWORT	EUCA5	X	X
EUPATORIUM HYSSOPIFOLIUM	HYSSOPLEAF THOROUGHWORT	EUHY	X	
EUPATORIUM ROTUNDIFOLIUM	ROUND-LEAF THOROUGH-WORT	EURO4	X	X
EUPATORIUM SEROTINUM	LATE-FLOWERING THOROUGH-WORT	EUSE2	X	X
EUPHORBIA COROLLATA	FLOWERING SPURGE	EUCO10	X	
EUPHORBIA MARGINATA	SNOW-ON-THE-MOUNTAIN	EUMA8	X	
EUTHAMIA CAROLIANA	CAROLINA FLAT-TOP GOLDENROD	EUCA26	X	
FRAGARIA VIRGINIANA	VIRGINIA STRAWBERRY	FRVI	X	X
GALACTIA VOLUBILIS	DOWNY MILKPEA	GAVO	X	
GALIUM APARINE	CATCHWEED BEDSTRAW	GAAP2	X	
GALIUM CIRCAEZANS	WILD LICORICE	GACI2	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
GALIUM OBTUSUM	BLUNT-LEAF BEDSTRAW	GAOB	X	
GALIUM PILOSUM	HAIRY BEDSTRAW	GAPI2	X	
GALIUM TRIFLORUM	SWEET-SCENT BEDSTRAW	GATR3	X	
GAMOCHAETA PURPUREA	SPOONLEAF PURPLE EVERLASTING	GAPU3		X
GERANIUM MACULATUM	WILD GERANIUM	GEMA	X	X
GEUM CANADENSE	WHITE AVENS	GECA7	X	
HELENIUM AMARUM	FIVE-LEAF SNEEZEWEED	HEAM	X	
HELENIUM AUTUMNALE	COMMON SNEEZEWEED	HEAU	X	
HEPATICA AMERICANA	LIVERLEAF	HEAM8	X	X
HEUCHERA AMERICANA	AMERICAN ALUMROOT	HEAM8	X	
HEXALECTRIS SPICATA	CRESTED CORALROOT	HESP3	X	
HEXASTYLIS LEWISII	LEWIS'S HEARTLEAF	HELE2	X	
HEXASTYLIS MINOR	LITTLE HEARTLEAF	HEMI13	X	X
HEXASTYLIS SHUTTLEWORTHII	LARGE-FLOWERED HEARTLEAF	HESH2	X	
HEXASTYLIS VIRGINICA	VIRGINIA HEARTLEAF	HEVI3	X	
HIERACIUM GRONOVII	HAIRY HAWKWEED	HIGR3	X	
HIERACIUM VENOSUM	RATTLESNAKE HAWKWEED	HIVE	X	
HOUSTONIA CAERULEA	QUACKER'S BONNETS	HOCA4	X	X
HYPERICUM GENTIANOIDES	ORANGE-GRASS ST. JOHN'S-WORT	HYGE	X	
HYPERICUM HYPERICOIDES	ST. ANDREW'S CROSS	HYHY	X	X
HYPERICUM NUDIFLORUM	PRETTY ST. JOHN'S-WORT	HYNU	X	
HYPERICUM PUNCTATUM	COMMON ST. JOHN'S-WORT	HYPU	X	
HYPERICUM STRAGULUM	ST. ANDREW'S CROSS	HYST4	X	
IMPATIENS CAPENSIS	SPOTTED JEWEL-WEED	IMCA	X	X
IPOMOEA PANDURATA	BIG-ROOT MORNING-GLORY	IPPA	X	
IRIS VERNA	DWARF IRIS	IRVE	X	
JUSTICIA AMERICANA	COMMON WATER-WILLOW	JUAM	X	
KRIGIA VIRGINICA	DWARF DANDELION	KRVI	X	X
LECHEA PULCHELLA	LEGGETT'S PINWEED	LEPU4	X	
LESPEDEZA BICOLOR	SHRUBBY BUSHCLOVER	LEBI2	X	X
LESPEDEZA CAPITATA	ROUND-HEAD BUSH-CLOVER	LECA8	X	X
LESPEDEZA CUNEATA	CHINESE BUSHCLOVER	LECU	X	X
LESPEDEZA PROCUMBENS	TRAILING BUSH-CLOVER	LEPR	X	X
LESPEDEZA VIRGINICA	SLENDER BUSH-CLOVER	LEVI7	X	X
LEUCANTHEMUM VULGARE	OXEYE DAISY	LEVU	X	
LEUCOTHOE RECURVA	RECURVED DOG-HOBBLE	LERE6	X	
LIATRIS SQUARROSA	SCALY GAY-FEATHER	LISQ	X	
LINUM SULCATUM VAR SULCATUM	GLADE FLAX	LISU4	X	
LOBELIA CARDINALIS	CARDINAL FLOWER	LOCA2	X	X
LOBELIA INFLATA	INDIAN-TOBACCO	LOIN	X	
LOBELIA NUTTALLII	NUTTALL'S LOBELIA	LONU	X	
LOBELIA PUBERULA	DOWNY LOBELIA	LOPU	X	
LOBELIA SPICATA	PALE-SPIKED LOBELIA	LOSP	X	
LUDWIGIA ALTERNIFOLIA	BUSHY SEEDBOX	LUAL2	X	
LUDWIGIA DECURRENS	PRIMROSE WILLOW	LUDE4	X	
LUDWIGIA PALUSTRIS	MARSH SEEDBOX	LUPA	X	X
LYCOPUS UNIFLORUS	NORTHERN BUGLEWEED	LYUN	X	

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MIMULUS ALATUS	SHARP-WING MONKEYFLOWER	MIAL2	X	X
MURDANNIA KEISAK***	MARSH DEWFLOWER	MUKE	X	
NARCISSUS SP***	DAFFODIL***	NARCI	X	
NUPHAR LUTEA	AMERICAN LOTUS	NULU	X	
NUTTALLANTHUS CANADENSIS	CANADA TOADFLAX	NUCA	X	X
OENOTHERA BIENNIS	COMMON EVENING-PRIMROSE	OEBI	X	X
OENOTHERA FRUTICOSA	NARROW-LEAVED SUNDROPS	OEFR	X	
ORONTIUM AQUATICUM	GOLDEN CLUB	ORAQ	X	
OXALIS CORNICULATA	CREEPING WOODSORREL	OXCO	X	
OXALIS DILLENII	DILLEN'S WOODSORREL	OXDI2	X	
OXALIS STRICTA	UPRIGHT YELLOW WOOD-SORREL	OXST	X	X
OXALIS VIOLACEA	VIOLET WOOD-SORREL	OXVI	X	
PENNISETUM AMERICANUM	AMERICAN MILLET GRASS	PEAM4	X	
PHLOX PILOSA	DOWNY PHLOX	PHPI	X	
PHYTOLACCA AMERICANA	COMMON POKEWEED	PHAM4	X	X
PLANTAGO LANCEOLATA	NARROWLEAF PLANTAIN	PLLA		X
PLUCHEA CAMPHORATA	MARSH FLEABANE	PLCA7	X	
PODOPHYLLUM PELTATUM	MAY APPLE	POPE	X	X
POLYGALA CURTISSII	CURTIS'S MILKWORT	POCU5	X	
POLYGONUM HYDROPIPEROIDES	MILD WATER-PEPPER	POHY2	X	X
POLYGONUM PERSICARIA	LADY'S THUMB	POPE3	X	
POLYGONUM SAGITTATUM	ARROW-LEAVED TEARTHUMB	POSA5	X	
POLYGONUM SETACEUM	SWAMP SMARTWEED	POSE6	X	X
PONTEDERIA CORDATA	PICKERELWEED	POCO14		X
PORTERANTHUS TRIFOLIATUS	BOWMAN'S-ROOT	POTR11	X	
POTENTILLA CANADENSIS	CANADA CINQUEFOIL	POCA17	X	
POTENTILLA SIMPLEX	OLD-FIELD CINQUEFOIL	POSI2	X	
PRENANTHES SERPENTARIA	LION'S-FOOT	PRSE	X	
PRUNELLA VULGARIS	SELF-HEAL	PRVU	X	
PSEUDOGNAPHALIUM OBTUSIFOLIUM	RABBIT-TOBACCO	PSOBS	X	X
PYCNANTHEMUM INCANUM	HOARY MOUNTAIN-MINT	PYIN	X	
PYCNANTHEMUM MUTICUM	BLUNT MOUNTAIN MINT	PYMU	X	
PYCNANTHEMUM PYCNANTHEMOIDES	SOUTHERN MOUNTAIN-MINT	PYPY	X	
PYCNANTHEMUM TENUIFOLIUM	SLENDER MOUNTAIN-MINT	PYTE	X	X
RANUNCULUS ABORTIVUS	KIDNEY-LEAVED BUTTERCUP	RAAB	X	
RANUNCULUS RECURVATUS	HOOKED CROWFOOT	RARE2	X	
RHEXIA MARIANA VAR EXALBIDA	MARYLAND MEADOW-BEAUTY	RHMAE	X	
RUDBECKIA LACINIATA	CUT-LEAVED CONEFLOWER	RULA3	X	
RUELLIA CAROLINIENSIS	CAROLINA PETUNIA	RUCA4	X	
RUELLIA HUMILIS	LOW WILD-PETUNIA	RUHU	X	
RUELLIA PURSHIANA	PURSH'S WILD-PETUNIA	RUPU2	X	
SABATIA ANGULARIS	SQUARE-STEMMED ROSE PINK	SAAN	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
SACCHARUM BREVIBARBE	SHORT-BEARD PLUMEGRASS	SABR18	X	
SAGITTARIA LATIFOLIA	BROADLEAF ARROWHEAD	SALA2	X	
SALVIA LYRATA	LYRE-LEAF SAGE	SALY2	X	X
SANGUINARIA CANADENSIS	BLOODROOT	SACA13	X	
SANICULA CANADENSIS	SHORT-STYLED SANICLE	SACA13	X	
SAURURUS CERNUUS	LIZARD'S TAIL	SACE	X	X
SAXIFRAGA VIRGINIENSIS	VIRGINIA SAXIFRAGE	SAVI5	X	
SCLERANTHUS ANNUUS*	ANNUAL KNAWEL***	SCAN2	X	
SCUTELLARIA ELLIPTICA	HAIRY SKULLCAP	SCEL	X	
SCUTELLARIA INTEGRIFOLIA	HYSSOP SKULLCAP	SCIN2	X	X
SENECIO AUREUS	SMALL'S RAGWORT	SEAU2	X	
SERICOCARPUS ASTEROIDES	TOOTHED WHITE-TOP ASTER	SEAS3	X	
SILPHIUM TEREBINTHINACEUM	PRAIRIE DOCK	SITE	X	
SOLANUM CAROLINENSE	CAROLINA HORSE-NETTLE	SOCA3	X	X
SOLIDAGO CAESIA	A GOLDENROD	SOCA4	X	
SOLIDAGO CANADENSIS	CANADA GOLDENROD	SOCA6	X	
SOLIDAGO NEMORALIS	FIELD GOLDENROD	SONE	X	
SOLIDAGO ODORA	SWEET GOLDENROD	SOOD	X	X
SOLIDAGO PINETORUM	SMALL'S GOLDENROD	SOPI	X	
SOLIDAGO SPECIOSA	SHOWY GOLDENROD	SOSP2	X	
SPIRANTHES CERNUA	NODDING LADIES'-TRESSES	SPCE	X	
SPIRANTHES LACERA VAR GRACILIS	SOUTHERN SLENDER LADIES'TRESSES	SPGR8	X	
SPIRANTHES OVALIS	LESSER LADIES'-TRESSES	SPOV	X	
SPIRANTHES PRAECOX	GRASSLEAF LADIES'-TRESSES	SPPR2	X	
STELLARIA PUBERA	GIANT CHICKWEED	STPU	X	
STROPHOSTYLES UMBELLATA	PINK WILD-BEAN	STRUM	X	
STYLOSANTHES BIFLORA	PENCILFLOWER	STBI2	X	
TANACETUM VULGARE	COMMON TANSY	TAVU	X	
TARAXACUM OFFICINALE	COMMON DANDELION	TAOF	X	X
TEESDALIA NUDICAULIS	COMMON SHEPHERD'S-CRESS	TENU	X	
TEPHROSIA VIRGINIANA	GOAT'S-RUE	TEVI	X	X
THALICTRUM REVOLUTUM	WAXLEAF MEADOWRUE	THRE	X	
TRICHOSTEMA DICHOTOMUM	FORKED BLUECURLS	TRDI2	X	
TRIDENS STRICTUS	LONGSPIKE TRIDENS	TRST2		X
TRIFOLIUM CAMPESTRE	FIELD CLOVER	TRCA5		X
TRIFOLIUM PRATENSE	RED CLOVER	TRPR2		X
TRIFOLIUM REPENS	WHITE CLOVER	TRRE3		X
TRILLIUM CATESBAEI	CATESBY'S TRILLIUM	TRCA11	X	
TRIODANIS PERFOLIATA	CLASPING VENUS' LOOKING-GLASS	TRPE4		X
TYPHA LATIFOLIA	BROAD-LEAF CATTAIL	TYLA	X	X
VERBASCUM THAPSUS	GREAT MULLEIN	VETH	X	
VERNONIA NOVEBORACENSIS	NEW YORK IRONWEED	VENO	X	
VIOLA PRIMULIFOLIA	PRIMROSE-LEAF VIOLET	VIPRO2	X	
VIOLA SORORIA	WOOLLY BLUE VIOLET	VISO	X	
VIOLA TRICOLOR	THREE COLORED VIOLET	VITR	X	
ZEPHYRANTHES ATAMASCA	ATAMASCO LILY	ZEAT	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
GRAMMINOID				
AGROSTIS PERENNANS	PERENIAL BENTGRASS	AGPE	X	
ANDROPOGON TERNARIUS	SILVER BLUESTEM	ANTE2	X	
ANDROPOGON VIRGINICUS	BROOM-SEDGE	ANVIV	X	X
ARUNDINARIA GIGANTEA	GIANT CANE	ARGI		X
CAREX ALBOLUTESCENS	GREENWHITE SEDGE	CAAL5		X
CAREX CRINITA	FRINGED SEDGE	CACRC2	X	
CAREX DIGITALIS	SLENDER WOOD SEDGE	CADI5	X	
CAREX INTUMESCENS	BLADDER SEDGE	CAIN12	X	X
CAREX LAXIFLORA	LOOSE-FLOWERED SEDGE	CALA19	X	
CAREX LEPTALEA	BRISTLY-STALK SEDGE	CALEL4	X	
CAREX LURIDA	SHALLOW SEDGE	CALU5	X	
CAREX NIGROMARGINATA	BLACK-EDGE SEDGE	CANI3	X	
CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	CAPE6	X	
CAREX STRICTA	TUSSOCK SEDGE	CAST8	X	
CHASMANTHIUM LATIFOLIUM	RIVER OATS	CHLA5	X	
CHASMANTHIUM LAXUM	SLENDER SPIKEGRASS	CHLA6	X	X
CHASMANTHIUM SESSILIFLORUM	LONGLEAF SPIKEGRASS	CHSE2	X	X
CYPERUS ESCULENTUS	CHUFA FLAT-SEDGE	CYES	X	
CYPERUS RETRORSUS	RETRORSE FLATSEDGE	CYRE5	X	
DANTHONIA COMPRESSA	FLATTENED OATGRASS	DACO	X	
DANTHONIA SERICEA	SILKY OAT-GRASS	DASE2	X	
DANTHONIA SPICATA	POVERTY OAT-GRASS	DASP2	X	
DICHANTHELIUM CLANDESTINUM	DEER-TONGUE WITCHGRASS	DICL	X	
DICHANTHELIUM DICHOTOMUM VAR DICHOTOMUM	SMALL-FRUITED PANICGRASS	DIDID	X	
DICHANTHELIUM LAXIFLORUM	LAX-FLOWER WITCHGRASS	DILA9	X	
DICHANTHELIUM SPHAEROCARPON	ROUNDFRUIT PANICGRASS	DISP2	X	
DIGITARIA SANGUINALIS	HAIRY CRABGRASS	DISA	X	X
DULICHIUM ARUNDINACEUM	THREE-WAY SEDGE	DUAR3	X	X
ECHINOCHLOA CRUS-GALLI***	BARNYARD GRASS***	ECCR	X	X
ELEOCHARIS FLAVESCENS	PALE SPIKERUSH	ELFL	X	
ELEOCHARIS PARVULA	DWARF SPIKERUSH	ELPA5		X
ELYMUS HYSTRIX VAR. HYSTRIX	BOTTLEBRUSH GRASS	ELHY	X	X
ERAGROSTIS SPECTABILIS	PURPLE LOVE-GRASS	ERSP	X	X
FESTUCA RUBRA	RED FESCUE	FERU2		X
GLYCERIA STRIATA	FOWL MANNA-GRASS	GLST	X	
JUNCUS CORIACEUS	LEATHERY RUSH	JUCO4	X	X
JUNCUS EFFUSUS	SOFT RUSH	JUEF	X	X
JUNCUS TENUIS	SLENDER RUSH	JUTE	X	X
LUZULA MULTIFLORA	HEATH WOODRUSH	LUMU2	X	X
MELICA MUTICA	NARROW MELIC GRASS	MEMU	X	
MICROSTEGIUM VIMINEUM***	JAPANESE GRASS***	MIVI	X	X
MUHLENBERGIA TENUIFLORA	SLENDER MUHLY	MUTE	X	
PANICUM ANCEPS	PANIC GRASS	PAAN	X	
PANICUM DICHOTOMIFLORUM	SPREADING PANICGRASS	PADI	X	
PANICUM FLEXILE	WIRY PANIC GRASS	PAFL2	X	
PASPALUM FLORIDANUM	FLORIDA PASPALUM	PAFL4	X	X
PASPALUM NOTATUM***	BAHIA GRASS	PANO2	X	X
PIPTOCHAETIUM AVENACEUM	BLACKSEED NEEDLEGRASS	PIAV	X	

SCIENTIFIC NAME	COMMON NAME	USDA CODE	2006	2012–2013
PLANTAGO ARISTATA	LARGE-BRACT PLANTAIN	PLAR3	X	
PLANTAGO RUGELII	BLACK-SEED PLANTAIN	PLRU	X	
PLANTAGO VIRGINICA	PALE-SEEDED PLANTAIN	PLVI	X	
POA COMPRESSA***	CANADA BLUEGRASS***	POCO	X	
POA CUSPIDATA	BLUEGRASS	POCU4	X	
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	SCSC	X	
SCIRPUS CYPERINUS	COTTONGRASS BULRUSH	SCCY	X	
SORGHUM HALEPENSE	JOHNSON GRASS	SOHA	X	X
	FERN			
ADIANTUM PEDATUM	NORTHERN MAIDENHAIR-FERN	ADPE	X	
ASPLENIUM PLATYNEURON	EBONY SPLEENWORT	ASPLP	X	X
ATHYRIUM ASPLENIOIDES	SOUTHERN LADY FERN	ATAS	X	X
DENNSTAEDTIA PUNCTILOBULA	EASTERN HAY-SCENTED FERN	DEPU2	X	
DIPHASIASTRUM DIGITATUM	FAN CLUB-MOSS	DIDI8	X	
ISOETES SPP.	QUILLWORT	ISOET	X	
ONOCLEA SENSIBILIS	SENSITIVE FERN	ONSE	X	X
OSMUNDA CINNAMOMEA	CINNAMON FERN	OSCI	X	X
OSMUNDA REGALIS	ROYAL FERN	OSRE	X	
PHEGOPTERIS HEXAGONOPTERA	BROAD BEECH FERN	PHHE11	X	
PLEOPELTIS POLYPODIOIDES	RESURRECTION FERN	PLPO2	X	
POLYSTICHUM ACROSTICHOIDES	CHRISTMAS FERN	POAC4	X	X
PTERIDIUM AQUILINUM	BRACKEN FERN	PTAQ	X	X
THELYPTERIS NOVEBORACENSIS	NEW YORK FERN	THNO	X	X
THELYPTERIS PALUSTRIS	MARSH FERN	THPA	X	
WOODSIA OBTUSA	BLUNT-LOBE WOODSIA	WOOB2	X	
WOODWARDIA AREOLATA	NETTED CHAINFERN	WOAR	X	

Mammals Documented to Occur at CBTS (2006 Inventory)

Order	Family	Scientific Name	Common Name	Abundance[1,2]	Community[3]
Artiodactyla	Cervidae	*Odocoileus virginianus*	whitetail deer	A	BH CC LS MPH O
Carnivora	Canidae	*Canis latrans*	coyote	U	O UH
Carnivora	Canidae	*Urocyon cinereoargenteus*	gray fox	R	O
Carnivora	Mephitidae	*Mephitis mephitis*	striped skunk	R	O
Carnivora	Mustelidae	*Lutra canadensis*	river otter	R	LS ST
Carnivora	Procyonidae	*Procyon lotor*	raccoon	A	BH LS ST
Chiroptera	Vespertilionidae	*Eptesicus fuscus*	big brown bat	Ud	ST
Chiroptera	Vespertilionidae	*Lasiurus borealis*	eastern red bat	Ud	ST
Chiroptera	Vespertilionidae	*Nycticeius humeralis*	evening bat	Ud	ST
Chiroptera	Vespertilionidae	*Pipistrellus subflavus*	eastern pipistrelle	Ud	ST
Didelphimorphia	Didelphidae	*Didelphis marsupialis*	Virginia opossum	C	O
Lagomorpha	Leporidae	*Sylvilagus floridanus*	eastern cottontail	A	MPH O UH
Lipotyphla	Soricidae	*Blarina carolinensis*	southern shorttail shrew	U*	MPH WPND
Lipotyphla	Soricidae	*Sorex longirostris*	southeastern shrew	C*	BH CC MPH UH WPND
Lipotyphla	Talpidae	*Scalopus aquaticus*	eastern mole	C	BH UH
Rodentia	Castoridae	*Castor canadensis*	beaver	C	BH LS ST WPND
Rodentia	Muridae	*Peromyscus leucopus*	white-footed mouse	A*	BH CC MPH O ST UH
Rodentia	Muridae	*Reithrodontomys humulis*	eastern harvest mouse	C*	CC OF MPH WPND
Rodentia	Muridae	*Sigmodon hispidus*	hispid cotton rat	O*	CC OF
Rodentia	Sciuridae	*Marmota monax*	woodchuck	U	O
Rodentia	Sciuridae	*Sciurus carolinensis*	eastern gray squirrel	C	MPH UH
Rodentia	Sciuridae	*Tamias striatus*	eastern chipmunk	R	CC
Rodentia	Muridae	*Mus musculus*	house mouse	U*	O

[1] A = abundant; C = common; O = occasional; U = uncommon; R = rare; Ud = undetermined

[2] values with asterisks were estimated based on relative proportions of live trap and pitfall captures; non-asterisk values were approximated based on frequency of incidental sightings or signs.

[3] Habitat/plant community associations where observed or captured: BH = Bottomland Hardwoods; CC = Clearcut; MPH = Pine/Mixed Hardwoods; LS = Lakeshore; O = Open; OF = Old Field; ST = Stream/Riparian; UH = Upland Hardwoods; WPND = man-made pond; WVP = vernal pond

Source: AMEC 2007b

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Anseriformes	Anatidae	*Aix sponsa*	wood duck	R	ST	U
Anseriformes	Anatidae	*Anas platyrhynchos*	mallard	--	LS	U
Anseriformes	Anatidae	*Branta canadensis*	Canada goose	--	LS	U
Apodiformes	Apodidae	*Chaetura pelagica*	chimney swift	--	O	U
Apodiformes	Trochilidae	*Archilochus colubris*	ruby-throated hummingbird	R	BH UH	B
Caprimulgiformes	Caprimulgidae	*Caprimulgus carolinensis*	Chuck-will's-widow	U	CC	B
Caprimulgiformes	Caprimulgidae	*Caprimulgus vociferus*	whip-poor-will	C	CC O	B
Caprimulgiformes	Caprimulgidae	*Chordeiles minor*	common nighthawk	--	O	U
Charadriformes	Charadriidae	*Charadrius vociferus*	killdeer	R	O	B
Charadriformes	Scolopacidae	*Tringa solitaria*	solitary sandpiper	--	LS	M
Ciconiiformes	Ardeidae	*Ardea alba*	great egret	--	LS	M
Ciconiiformes	Ardeidae	*Ardea herodias*	great blue heron	U	LS O WPND	U
Ciconiiformes	Ardeidae	*Butorides virescens*	green heron	--	LS	U
Ciconiiformes	Cathartidae	*Coragyps atratus*	black vulture	C	MPH O	U
Circoniiformes	Cathartidae	*Cathartes aura*	turkey vulture	C	CC	U
Columbiformes	Columbidae	*Zenaida macroura*	mourning dove	O	BH CC MPH O UH	B
Coraciiformes	Alcedinidae	*Ceryle alcyon*	belted kingfisher	U	BH LS ST	B
Cuculiformes	Cuculidae	*Coccyzus americanus*	yellow-billed cuckoo	U	BH MPH UH	B
Falconiformes	Accipitridae	*Accipiter cooperii.*	Cooper's hawk	--	O	U
Falconiformes	Accipitridae	*Buteo jamaicensis*	red-tailed hawk	U	CC UH	B
Falconiformes	Accipitridae	*Buteo lineatus*	red-shouldered hawk	U	BH CC MPH O	B
Falconiformes	Accipitridae	*Pandion haliaetus*	osprey	--	LS	U
Galliformes	Odontophoridae	*Colinus virginianus*	northern bobwhite	O	CC MPH O	B
Galliformes	Phasianidae	*Meleagris gallopavo*	wild turkey	A	BH LS MPH ST UH	B
Passeriformes	Bombycillidae	*Bombycilla cedrorum*	cedar waxwing	U	MPH O	B
Passeriformes	Cardinalidae	*Cardinalis cardinalis*	northern cardinal	C	BH CC MPH O OF UH	B
Passeriformes	Cardinalidae	*Passerina caerulea*	blue grosbeak	U	CC O	B
Passeriformes	Cardinalidae	*Passerina cyanea*	indigo bunting	O	CC MPH O OF	B
Passeriformes	Corvidae	*Corvus brachyrhynchos*	American crow	O	BH CC MPH O	B
Passeriformes	Corvidae	*Corvus ossifragus*	fish crow	--	O	U
Passeriformes	Corvidae	*Cyanocitta cristata*	bluejay	O	BH CC MPH O UH	B

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Passeriformes	Emberizidae	*Junco hyemalis*	dark-eyed junco	--	BH O	W
Passeriformes	Emberizidae	*Melospiza georgiana*	swamp sparrow	--	WVP	W
Passeriformes	Emberizidae	*Melospiza melodia*	song sparrow	--	CC OF WVP	U
Passeriformes	Emberizidae	*Pipilo erythrophthalmus*	eastern towhee	O	BH CC MPH O UH	B
Passeriformes	Emberizidae	*Spizella passerina*	chipping sparrow	C	BH CC MPH O	B
Passeriformes	Emberizidae	*Spizella pusilla*	field sparrow	U	CC OF WVP	B
Passeriformes	Emberizidae	*Zonotrichia albicollis*	white-throated sparrow	--	MPH OF O	W
Passeriformes	Fringillidae	*Carduelis tristis*	American goldfinch	O	BH CC MPH O OF UH	B
Passeriformes	Fringillidae	*Carpodacus mexicanus*	house finch	R	MPH O	B
Passeriformes	Icteridae	*Agelaius phoeniceus*	red-winged blackbird	--	O	U
Passeriformes	Icteridae	*Icterus galbula*	Baltimore oriole	--	OF	M
Passeriformes	Icteridae	*Molothrus ater*	brown-headed cowbird	O	BH MPH O UH	B
Passeriformes	Icteridae	*Quiscalus quiscula*	common grackle	R	MPH	U
Passeriformes	Mimidae	*Dumetella carolinensis*	gray catbird	R	OF	B
Passeriformes	Mimidae	*Mimus polyglottos*	northern mockingbird	U	O	B
Passeriformes	Mimidae	*Toxostoma rufum*	brown thrasher	U	O OF	B
Passeriformes	Paridae	*Baeolophus bicolor*	tufted titmouse	C	BH CC MPH O UH	B
Passeriformes	Paridae	*Poecile carolinensis*	Carolina chickadee	O	BH CC MPH UH	B
Passeriformes	Parulidae	*Dendroica caerulescens*	black-throated blue warbler	--	BH CC UH	M
Passeriformes	Parulidae	*Dendroica coronata*	yellow-rumped warbler	--	BH MPH	W
Passeriformes	Parulidae	*Dendroica discolor*	prairie warbler	U	CC MPH OF	B
Passeriformes	Parulidae	*Dendroica pinus*	pine warbler	C	BH CC MPH O UH	B
Passeriformes	Parulidae	*Geothlypis trichas*	common yellowthroat	U	BH CC LS MPH UH WPND	B
Passeriformes	Parulidae	*Helmitheros vermivorum*	worm-eating warbler	--	BH MPH	M
Passeriformes	Parulidae	*Icteria virens*	yellow-breasted chat	O	BH CC MPH UH	B
Passeriformes	Parulidae	*Mniotilta varia*	black-and-white warbler	--	O	U
Passeriformes	Parulidae	*Oporornis formosus*	Kentucky warbler	R	BH MPH	B
Passeriformes	Parulidae	*Parula americana*	northern parula	O	BH UH	B
Passeriformes	Parulidae	*Seiurus aurocapilla*	ovenbird	A	BH MPH O UH	B
Passeriformes	Parulidae	*Seiurus motacilla*	Louisana waterthrush	R	BH ST	B
Passeriformes	Parulidae	*Setophaga ruticilla*	American redstart	R	BH	B

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Passeriformes	Parulidae	*Wilsonia canadensis*	Canada warbler	R	UH	M
Passeriformes	Parulidae	*Wilsonia citrina*	hooded warbler	O	BH MPH UH	B
Passeriformes	Regulidae	*Regulus calendula*	ruby-crowned kinglet	--	BH	W
Passeriformes	Regulidae	*Regulus satrapa*	golden-crowned kinglet	--	OF	W
Passeriformes	sittidae	*Sitta carolinensis*	white-breasted nuthatch	U	BH MPH UH	B
Passeriformes	Sittidae	*Sitta pusilla*	brown-headed nuthatch	U	MPH O UH	B
Passeriformes	Sylviidae	*Polioptila caerulea*	bluegray gnatcatcher	C	BH CC MPH O UH WVP	B
Passeriformes	Thraupidae	*Piranga olivacea*	scarlet tanager	O	BH MPH UH	B
Passeriformes	Thraupidae	*Piranga rubra*	summer tanager	O	BH CC MPH O UH	B
Passeriformes	Troglodytidae	*Thryothorus ludovicianus*	Carolina wren	C	BH CC MPH O OF UH	B
Passeriformes	Troglodytidae	*Ttroglodytes troglodytes*	winter wren	--	BH	W
Passeriformes	Turdidae	*Catharus guttatus*	hermit thrush	--	UH	W
Passeriformes	Turdidae	*Hylocichla mustelina*	wood thrush	C	BH MPH O UH	B
Passeriformes	Turdidae	*Sialia Sialis*	eastern bluebird	U	BH CC MPH O	B
Passeriformes	Turdidae	*Turdis migratorius*	American robin	U	O	B
Passeriformes	Tyrannidae	*Contopus virens*	eastern wood-pewee	O	BH CC MPH O	B
Passeriformes	Tyrannidae	*Empidonax virescens*	Acadian flycatcher	O	BH MPH UH	B
Passeriformes	Tyrannidae	*Myiarchus crinitus*	great-crested flycatcher	U	CC MPH O UH	B
Passeriformes	Tyrannidae	*Sayornis phoebe*	eastern phoebe	R	BH ST WVP	B
Passeriformes	Vireonidae	*Vireo flavifrons*	yellow-throated vireo	R	BH UH	B
Passeriformes	Vireonidae	*Vireo griseus*	white-eyed vireo	R	BH CC	B
Passeriformes	Vireonidae	*Vireo olivaceus*	red-eyed vireo	A	BH CC MPH O UH	B
Passeriformes	Vireonidae	*Vireo solitarius*	blue-headed vireo	U	BH MPH UH	B
Piciformes	Picidae	*Colaptes auratus*	northern flicker	U	MPH O UH	B
Piciformes	Picidae	*Dryocopus pileatus*	pileated woodpecker	R	BH UH	B
Piciformes	Picidae	*Melanerpes carolinus*	red-bellied woodpecker	U	BH MPH O UH	B
Piciformes	Picidae	*Melanerpes erythrocephalus*	red-headed woodpecker	R	BH CC MPH O	B
Piciformes	Picidae	*Picoides pubescens*	downy woodpecker	O	BH CC MPH O UH	B
Piciformes	Picidae	*Picoides villosus*	hairy woodpecker	U	BH MPH UH	B
Strigiformes	Strigidae	*Bubo virginianus*	great horned owl	--	O	U

Resident, breeding, and migratory bird species documented to occur at CBTS (2006 Inventory)						
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**	**Breeding Status[3]**
Strigiformes	Strigidae	*Megascops asio*	eastern screech owl	--	BH	U
Strigiformes	Strigidae	*Strix varia*	barred owl	--	BH	U

[1] Abundance estimation for breeding birds based on the proportion of overall records supplemented by incidental sightings: A = abundant; C = common; O = Occasional U = uncommon; R = rare
[2] Habitat /Plant Community Associations: BH = Bottomland Hardwoods; CC = Clearcut; MPH =Pine/Mixed Hardwoods; LS = Lakeshore; O = Open; OF = Old Field; ST = Stream/Riparian; UH = Upland Hardwoods; WPND = man-made pond; WVP = vernal pond
[3]Breeding Status: B = breeding: seasonal or year-round resident; M = Migrant, not breeding; U = observed, but breeding status undetermined; potential breeder based on habitat availability; W = wintering resident, not breeding

Source: AMEC 2007b

Reptiles and amphibians documented to occur at CBTS (2006 Inventory)					
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**
Amphibians					
Anura	Bufonidae	*Bufo americanus*	American toad	A	BH CC MPH UH WPND WVP
Anura	Bufonidae	*Bufo fowleri*	Fowler's toad	C	BH MPH ST WPND WVP MPH
Anura	Hylidae	*Acris crepitans*	northern cricket frog	A	BH LS OF ST UH WPND WVP
Anura	Hylidae	*Hyla chrysoscelis*	Cope's gray treefrog	C	MPH UH WPND WVP
Anura	Hylidae	*Pseudacris crucifer*	spring peeper	A	BH WPND WVP
Anura	Hylidae	*Pseudacris feriarum*	upland chorus frog	A	BH MPH ST WPND WVP
Anura	Hylidae	*Hyla cinerea*	green treefrog	R	LS
Anura	Microhylidae	*Gastrophryne carolinensis*	narrowmouthed toad	U	BH CC MPH O WPND
Anura	Ranidae	*Rana catesbeiana*	bullfrog	A	MPH ST WPND
Anura	Ranidae	*Rana clamitans*	greenfrog	A	BH MPH ST WPND
Anura	Ranidae	*Rana palustris*	pickerel frog	U	BH CC UH WPND WVP
Anura	Ranidae	*Rana sphenocephala*	southern leopard frog	C	BH ST WPND WVP
Caudata	Ambystomatidae	*Ambystoma maculatum*	spotted salamander	U	BH CC UH WVP
Caudata	Ambystomatidae	*Ambystoma opacum*	marbled salamander	A	BH CC MPH UH WPND WVP
Caudata	Ambystomatidae	*Ambystoma talpoideum*	mole salamander	R	WPND
Caudata	Plethodontidae	*Desmognathus fuscus*	northern dusky salamander	R	ST UH
Caudata	Plethodontidae	*Eurycea cirigerra*	two-lined salamander	C	ST
Caudata	Plethodontidae	*Eurycea guttolineata*	three-lined salamander	R	ST
Caudata	Plethodontidae	*Hemidactylium scutatum*	four-toed salamander	R	BH LS MPH O ST UH WPND
Caudata	Plethodontidae	*Plethedon cinereus*	red-backed salamander	C	CC O UH
Caudata	Plethodontidae	*Plethodon cylindraceus*	white-spotted slimy salamander	U	BH ST UH
Caudata	Plethodontidae	*Pseudotriton montanus*	mud salamander	R	UH
Caudata	Salamandridae	*Notophthalmus viridescens*	red-spotted newt	U	BH MPH OF UH WVP
Turtles					
Cryptodeira	Emydidae	*Chrysemys picta picta*	eastern painted turtle	U	LS
Cryptodeira	Emydidae	*Terrapene carolina*	eastern box turtle	C	UH BH MPH O ST
Cryptodeira	Emydidae	*Trachemys scripta*	yellow-bellied slider	U	LS O

Reptiles and amphibians documented to occur at CBTS (2006 Inventory)

Order	Family	Scientific Name	Common Name	Abundance[1]	Community[2]
Cryptodeira	Kinosternidae	*Sternotherus odoratus*	common musk turtle	R	BH
Lizards and Snakes					
Squamata	Colubridae	*Carphophis amoenus*	worm snake	A	BH CC LS MPH O UH
Squamata	Colubridae	*Coluber constrictor*	northern black racer	U	MPH OF UH
Squamata	Colubridae	*Diadophis punctatus edwardsii*	ring-necked snake	A	BH MPH UH
Squamata	Colubridae	*Elaphe obsoleta*	black rat snake	U	WVP
Squamata	Colubridae	*Heterodon platirhinos*	eastern hog-nosed snake	R	MPH
Squamata	Colubridae	*Lampropreltis calligaster rhombomaculeta*	mole kingsnake	R	O
Squamata	Colubridae	*Nerodia sipedon*	northern watersnake	U	O ST WPND
Squamata	Colubridae	*Regina septemvittata*	queen snake	R	ST
Squamata	Colubridae	*Storeria dekayi*	brown snake	U	BH OF
Squamata	Colubridae	*Thamnophis sirtalis*	eastern garter snake	C	CC O
Squamata	Colubridae	*Virginia valeriae*	smooth earth snake	R	MPH
Squamata	Phrynosomatidae	*Sceloporus undulatus*	fence lizard	A	BH CC LS MPH OF UH WPND
Squamata	Scincidae	*Eumeces fasciatus*	five-lined skink	C	BH MPH O UH
Squamata	Scincidae	*Scincella lateralis*	ground skink	C	BH CC LS MPH OF ST UH WPND
Squamata	Serpentes	*Opheodrys aestivus*	rough greensnake	R	LS

[1] Abundance approximated based on sighting and capture frequency: A = abundant; C = common; U = uncommon; R = rare

[2] Habitat /Plant Community Associations: BH = Bottomland Hardwoods; CC = Clearcut; MPH =Pine/Mixed Hardwoods; LS = Lakeshore; O = Open; OF = Old Field; ST = Stream/Riparian; UH = Upland Hardwoods; WPND = man-made pond; WVP = vernal pond

Source: AMEC 2007b

Fish species documented to occur at CBTS (2006 Inventory)					
Order	**Family**	**Scientific Name**	**Common Name**	**Abundance[1]**	**Community[2]**
Cypriniformes	Cyprinidae	*Clinostomus funduloides*	rosyside dace	O	ST
Cypriniformes	Cyprinidae	*Luxilus albeolus*	white shiner	C	ST
Cypriniformes	Cyprinidae	*Nocomis leptocephalus*	bluehead chub	C	ST
Cypriniformes	Cyprinidae	*Notemigonus crysoleucas*	Golden shiner	O	ST
Cypriniformes	Cyprinidae	*Phoxinus oreas*	mountain redbelly dace	C	ST
Cypriniformes	Cyprinidae	*Semotilus atromaculatus*	creek chub	O	ST
Perciformes	Centrarchidae	*Lepomis auritus*	redbreast sunfish	C	ST
Perciformes	Centrarchidae	*Lepomis cyanellus*	green sunfish	C	ST
Perciformes	Centrarchidae	*Lepomis macrochirus*	bluegill	A	ST
Perciformes	Centrarchidae	*Lepomis microlophus*	redear sunfish	R	ST
Perciformes	Centrarchidae	*Micropterus salmoides*	largemouth bass	U	ST
Perciformes	Percidae	*Etheostoma nigrum*	Johnny darter	U	ST
Perciformes	Percidae	*Percina roanoka*	Roanoke darter	U	ST
Percopsiformes	Aphredoderidae	*Aphredoderus sayanus*	pirate perch	R	ST
Siluriformes	Ictaluridae	*Ameiurus natalis*	yellow bullhead	U	ST
Siluriformes	Ictaluridae	*Ameiurus platycephalus*	flat bullhead	R	ST
Siluriformes	Ictaluridae	*Noturus insignis*	margined madtom	O	ST

[1] Abundance estimates based on CPUE: A = rare; C = common; O = occasional; U = uncommon; R = rare
[2] ST = stream habitat

Source: AMEC 2007b

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Class Insecta			
Blattodea	Blattellidae	*spp.*	a cockroach
Coleoptera	Anobiidae	*sp.*	a drugstore beetle
Coleoptera	Bostrichidae	*sp.*	a horned powder-post beetle
Coleoptera	Buprestidae	*Buprestis salisburyensis*	a wood-boring beetle
Coleoptera	Cantharidae	*Podabrus sp.*	a soldier beetle
Coleoptera	Cantharidae	*sp.*	a soldier beetle
Coleoptera	Carabidae	*Agonum octopunctatum*	a ground beetle
Coleoptera	Carabidae	*Amara impuncticollis*	a ground beetle
Coleoptera	Carabidae	*Amphasia interstitialis*	a ground beetle
Coleoptera	Carabidae	*Anisodactylus nigerrimus*	a ground beetle
Coleoptera	Carabidae	*Anisodactylus rusticus*	a ground beetle
Coleoptera	Carabidae	*Carabus vinctus*	a ground beetle
Coleoptera	Carabidae	*Chlaenius aestivus*	a ground beetle
Coleoptera	Carabidae	*Chlaenius emarginatus*	a ground beetle
Coleoptera	Carabidae	*Chlaenius impunctifrons*	a ground beetle
Coleoptera	Carabidae	*Chlaenius sericeus*	a ground beetle
Coleoptera	Carabidae	*Cicindela sexguttata*	a ground beetle
Coleoptera	Carabidae	*Clivina bipustulata*	a ground beetle
Coleoptera	Carabidae	*Cyclotrachelus spoliatus*	a ground beetle
Coleoptera	Carabidae	*Cyclotrachelus unicolor*	a ground beetle
Coleoptera	Carabidae	*Dicaelus ambiguus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus dilatatus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus elongatus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus furvus*	a ground beetle
Coleoptera	Carabidae	*Dicaelus politus*	a ground beetle
Coleoptera	Carabidae	*Galerita bicolor*	a ground beetle
Coleoptera	Carabidae	*Harpalus herbivagus*	a ground beetle
Coleoptera	Carabidae	*Harpalus pennsylvanicus*	a ground beetle
Coleoptera	Carabidae	*Harpalus protractus*	a ground beetle
Coleoptera	Carabidae	*Helluomorphoides nigripennis*	a ground beetle
Coleoptera	Carabidae	*Loxandrus brevicollis*	a ground beetle
Coleoptera	Carabidae	*Loxandrus vitiosus*	a ground beetle
Coleoptera	Carabidae	*Notiobia terminata*	a ground beetle
Coleoptera	Carabidae	*Notiophilus aeneus*	a ground beetle
Coleoptera	Carabidae	*Notobia sayi*	a ground beetle
Coleoptera	Carabidae	*Oodes amaroides*	a ground beetle
Coleoptera	Carabidae	*Pasimachus depressus*	a ground beetle
Coleoptera	Carabidae	*Pasimachus sp.*	a ground beetle
Coleoptera	Carabidae	*Platynus decentis*	a ground beetle
Coleoptera	Carabidae	*Poecilus lucublandus*	a ground beetle
Coleoptera	Carabidae	*Scaphinotus andrewsi*	a ground beetle
Coleoptera	Carabidae	*Scarites subterraneus*	a ground beetle

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Coleoptera	Carabidae	*Selenophorus hylacis*	a ground beetle
Coleoptera	Carabidae	*Selenophorus opalinus*	a ground beetle
Coleoptera	Carabidae	*Sphaeroderus canadensis*	a ground beetle
Coleoptera	Carabidae	*Stenolophus ochropezus*	a ground beetle
Coleoptera	Cerambycidae	*sp.*	a longhorned beetle
Coleoptera	Chrysomelidae	*Disonycha leptolineata*	a leaf beetle
Coleoptera	Chrysomelidae	*sp.*	a leaf beetle
Coleoptera	Coccinellidae	*sp.*	a ladybird beetle
Coleoptera	Curculionidae	*Hylobius sp.*	a snout beetle
Coleoptera	Curculionidae	*sp.*	a snout beetle
Coleoptera	Elateridae	*Limonius sp.*	a click beetle
Coleoptera	Elateridae	*Melanotus morosus*	a click beetle
Coleoptera	Elateridae	*sp.*	a click beetle
Coleoptera	Heteroceridae	*sp.*	a variegated mud-loving beetle
Coleoptera	Hydrophilidae	*sp.*	a water scavenger beetle
Coleoptera	Lampyridae	*sp.*	a firefly beetle
Coleoptera	Latridiidae	*sp.*	a minute brown scavenger beetle
Coleoptera	Lycidae	*sp.*	a net-winged beetle
Coleoptera	Mordellidae	*sp.*	a tumbling flower beetle
Coleoptera	Nitidulidae	*sp.*	a sap-feeding beetle
Coleoptera	Passalidae	*Odontotaenius disjunctus*	a bessbug
Coleoptera	Pyrochroidae	*Neopyrochroa femoralis*	a fire-colored beetle
Coleoptera	Scarabaeidae	*Copris minutus*	a scarab beetle
Coleoptera	Scarabaeidae	*Phyllophaga sp.*	a scarab beetle
Coleoptera	Scarabaeidae	*Serica sp.*	a scarab beetle
Coleoptera	Scarabaeidae	*sp.*	a scarab beetle
Coleoptera	Scirtidae	*sp.*	a marsh beetle
Coleoptera	Silvanidae	*sp.*	a flat bark beetle
Coleoptera	Staphylinidae	*Platydracus maculosus*	a rove beetle
Coleoptera	Staphylinidae	*sp.*	a rove beetle
Coleoptera	Tenebrionidae	*Helops aereus*	a darkling beetle
Coleoptera	Tenebrionidae	*Merinus laevis*	a darkling beetle
Coleoptera	Tenebrionidae	*Polypleurus geminatus*	a darkling beetle
Coleoptera	Tenebrionidae	*sp.*	a darkling beetle
Coleoptera	Tenebrionidae	*Uloma puctulata*	a darkling beetle
Coleoptera	Throscidae	*sp.*	a wood-boring beetle
Diptera	Anthomyiidae	*sp.*	a root-maggot fly
Diptera	Asilidae	*sp.*	a robber fly
Diptera	Cecidomyiidae	*sp.*	a gall midge
Diptera	Cecidomyiidae	*sp.*	a gall midge
Diptera	Chaoboridae	*sp.*	a phantom midge
Diptera	Chironomidae	*sp.*	a midge
Diptera	Chironomidae	*sp.*	a midge
Diptera	Culicidae	*sp.*	a mosquitoe

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Diptera	Dolichopodidae	*sp.*	a longlegged fly
Diptera	Heleomyzidae	*sp.*	a fly
Diptera	Mycetophilidae	*sp.*	a fungus gnat
Diptera	Phoridae	*sp.*	a scuttle fly
Diptera	Tipulidae	*sp.*	a crane fly
Diptera	Tipulidae	*sp.*	a crane fly
Hemiptera	Cicadellidae	*sp.*	a leafhopper
Hemiptera	Cicadellidae	*sp.*	a leafhopper
Hemiptera	Coreidae	*sp.*	a leaffooted bug
Hemiptera	Corixidae	*sp.*	a water boatman
Hemiptera	Pentatomidae	*sp.*	a stink bug
Hemiptera	Pentatomidae	*sp.*	a stink bug
Hemiptera	Reduviidae	*sp.*	an assassin bug
Hemiptera	Reduviidae	*sp.*	an assassin bug
Heteroptera	Reduviidae	*Melanolestes picipes*	an assassin bug
Hymenoptera	Evaniidae	*sp.*	an ensign wasp
Hymenoptera	Formicidae	*Acanthomyops sp.*	an ant
Hymenoptera	Formicidae	*Aphaenogaster sp.*	an ant
Hymenoptera	Formicidae	*Camponotus sp.*	an ant
Hymenoptera	Formicidae	*Formica sp.*	an ant
Hymenoptera	Formicidae	*Lasius alienus*	an ant
Hymenoptera	Formicidae	*Leptothorax sp.*	an ant
Hymenoptera	Formicidae	*sp.*	an ant
Hymenoptera	Formicidae	*Tapinoma sessile*	an ant
Hymenoptera	Ichneumonidae	*sp.*	an Ichneumonid wasp
Hymenoptera	Mutillidae	*sp.*	a velvet ant
Hymenoptera	Pompilidae	*sp.*	spider wasp
Hymenoptera	Vespidae	*Vespa crabro*	a wasp
Lepidoptera	Apatelodidae	*Apatelodes torrefacta*	spotted apatelodes
Lepidoptera	Arctiidae	*Apantesis sp.*	a tiger moth
Lepidoptera	Arctiidae	*Cisthene packardii*	Packard's lichen moth
Lepidoptera	Arctiidae	*Cisthene plumbea*	lead-colored lichen moth
Lepidoptera	Arctiidae	*Halysidota tessellaris*	banded tussock moth
Lepidoptera	Arctiidae	*Holomelina sp.*	a holomelina
Lepidoptera	Arctiidae	*Holomelina aurantiaca*	orange holomelina
Lepidoptera	Arctiidae	*Holomelina opella*	tawny holomelina
Lepidoptera	Arctiidae	*Hyphantria cunea*	Fall webworm moth
Lepidoptera	Arctiidae	*Hypoprepia fucosa*	painted lichen moth
Lepidoptera	Arctiidae	*Spilosoma virginica*	Virginian tiger moth
Lepidoptera	Cossidae	*Cossula magnifica*	pecan carpenterworm moth
Lepidoptera	Cossidae	*Prionoxystus ribiniae*	carpenterworm moth
Lepidoptera	Epiplemidae	*Calledapteryx dryopterata*	brown scoopwing moth
Lepidoptera	Gelechiidae	*sp.*	a Gelechid moth
Lepidoptera	Geometridae	*Anacamptodes vellivolata*	large purplish gray

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Lepidoptera	Geometridae	*Anavitrinella pampinaria*	common gray
Lepidoptera	Geometridae	*Besma quercivoraria*	oak besma
Lepidoptera	Geometridae	*Cyclophora packardi*	Packard's wave
Lepidoptera	Geometridae	*Ectropis crepuscularia*	saddleback looper
Lepidoptera	Geometridae	*Epimecis hortaria*	tulip-tree beauty
Lepidoptera	Geometridae	*Euchlaena amoenaria*	deep yellow euchlaena
Lepidoptera	Geometridae	*Euchlaena sp.*	a euchlaena
Lepidoptera	Geometridae	*Euclaena obtusaria/muzaria*	obtuse euclaena
Lepidoptera	Geometridae	*Eulithis diversilineata*	lesser grapevine looper moth
Lepidoptera	Geometridae	*Eupithecia sp.*	a eupithecia
Lepidoptera	Geometridae	*Eutrapela clemataria*	curve-toothed geometer
Lepidoptera	Geometridae	*Glena sp.*	a gray
Lepidoptera	Geometridae	*Heliomata cycladata*	common spring moth
Lepidoptera	Geometridae	*Hethemia pistaciaria*	pistachio emerald
Lepidoptera	Geometridae	*Hydriomena sp.*	a hydriomena
Lepidoptera	Geometridae	*Hypagyrtis unipunctata*	one-spotted variant
Lepidoptera	Geometridae	*Hypomecis umbrosaria*	umber moth
Lepidoptera	Geometridae	*Iridopsis defectaria*	brown-shaded gray
Lepidoptera	Geometridae	*Iridopsis humaria*	pale-winged gray
Lepidoptera	Geometridae	*Iridopsis larvaria*	bent-line gray
Lepidoptera	Geometridae	*Itame pustularia*	lesser maple spanworm moth
Lepidoptera	Geometridae	*Lambdina fervidaria*	curve-lined looper
Lepidoptera	Geometridae	*Lambdina pellucidaria*	eastern pine looper
Lepidoptera	Geometridae	*Macaria bicolorata*	bicolored angle
Lepidoptera	Geometridae	*Macaria granitata*	granite angle
Lepidoptera	Geometridae	*Macaria multilineata*	many-lined angle
Lepidoptera	Geometridae	*Macaria transitaria*	blurry chocolate angle
Lepidoptera	Geometridae	*Melanolophia signataria*	signate melanolophia
Lepidoptera	Geometridae	*Metarranthis hypochraria*	common metarranthis
Lepidoptera	Geometridae	*Metarranthis sp.*	a metarranthis
Lepidoptera	Geometridae	*Nemoria bistriaria*	red-fringed emerald
Lepidoptera	Geometridae	*Nemoria lixaria*	red bordered emerald
Lepidoptera	Geometridae	*Nepytia semiclusaria*	pine conelet looper
Lepidoptera	Geometridae	*Pero hubneraria*	Hubner's pero
Lepidoptera	Geometridae	*Plagodis alcoolaria*	birch looper
Lepidoptera	Geometridae	*Plagodis fervidaria*	fervid plagodis
Lepidoptera	Geometridae	*Plagodis phlogosaria*	straight-lined plagodis
Lepidoptera	Geometridae	*Probole sp.*	a probole
Lepidoptera	Hesperidae	*Euphyes vestris*	dun skipper
Lepidoptera	Hesperiidae	*Acyloxypha numitor*	least skipper
Lepidoptera	Hesperiidae	*Atalopedes campestris*	sachem
Lepidoptera	Hesperiidae	*Atrytonopsis hianna*	dusted skipper
Lepidoptera	Hesperiidae	*Epargyreus clarus*	silver-spotted skipper
Lepidoptera	Hesperiidae	*Erynnis brizo*	sleepy duskywing

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Lepidoptera	Hesperiidae	*Erynnis horatius*	Horace's duskywing
Lepidoptera	Hesperiidae	*Erynnis juvenalis*	Juvenal's duskywing
Lepidoptera	Hesperiidae	*Euphyes dion*	dion skipper
Lepidoptera	Hesperiidae	*Hylephila phyleus*	fiery skipper
Lepidoptera	Hesperiidae	*Ierema accius*	clouded skipper
Lepidoptera	Hesperiidae	*Nastra lherminier*	swarthy skipper
Lepidoptera	Hesperiidae	*Panoquina ocola*	ocola skipper
Lepidoptera	Hesperiidae	*Poanes zabulon*	Zabulon skipper
Lepidoptera	Hesperiidae	*Polites origenes*	crossline skipper
Lepidoptera	Hesperiidae	*Polites themistocles*	tawny-edged skipper
Lepidoptera	Hesperiidae	*Pompeius verna*	little glassywing
Lepidoptera	Hesperiidae	*Thorybes pylades*	northern cloudywing
Lepidoptera	Hesperiidae	*Wallengrenia egeremet*	northern broken dash
Lepidoptera	Hesperiidae	*Wallengrenia otho*	southern broken dash
Lepidoptera	Lasiocampidae	*Artace cribraria*	dot-lined white
Lepidoptera	Lasiocampidae	*Malacosoma americanum*	eastern tent caterpillar
Lepidoptera	Lasiocampidae	*Malacosoma disstria*	forest tent caterpiller
Lepidoptera	Limacodidae	*Adoneta spinuloides*	purple-crested slug moth
Lepidoptera	Limacodidae	*Apoda biguttata*	shagreened slug moth
Lepidoptera	Limacodidae	*Lithacodes fasciola*	yellow-shouldered slug moth
Lepidoptera	Limacodidae	*Monoleuca semifascia*	pin-striped vermilion slug moth
Lepidoptera	Limacodidae	*Natada nasoni*	Nason's slug moth
Lepidoptera	Limacodidae	*Tortricidia flexuosa*	abbreviated button slug moth
Lepidoptera	Lycaenidae	*Callophrys gryneus*	juniper hairstreak
Lepidoptera	Lycaenidae	*Calycopis cecrops*	red-banded hairstreak
Lepidoptera	Lycaenidae	*Celastrina ladon*	spring azure
Lepidoptera	Lycaenidae	*Celastrina neglecta*	summer azure
Lepidoptera	Lycaenidae	*Everes comyntas*	eastern tailed blue
Lepidoptera	Lycaenidae	*Feniseca tarquinius*	harvester
Lepidoptera	Lycaenidae	*Satyrium liparops*	striped hairstreak
Lepidoptera	Lycaenidae	*Satyrum titus*	coral hairstreak
Lepidoptera	Lycaenidae	*Strymon melinus*	gray hairstreak
Lepidoptera	Lymantriidae	*Dasychira tephra*	tephra tussock moth
Lepidoptera	Megalopygidae	*Lagoa crispata*	black-waved flannel moth
Lepidoptera	Mimallonidae	*Lacosoma chiridota*	scalloped sack-bearer moth
Lepidoptera	Noctuidae	*Acronicta afflicta*	afflicted dagger moth
Lepidoptera	Noctuidae	*Acronicta americana*	American dagger moth
Lepidoptera	Noctuidae	*Acronicta exilis*	exiled dagger moth
Lepidoptera	Noctuidae	*Acronicta inclara* complex	unclear dagger moth
Lepidoptera	Noctuidae	*Acronicta lithospila*	streaked dagger moth
Lepidoptera	Noctuidae	*Acronicta modica*	medium dagger moth
Lepidoptera	Noctuidae	*Acronicta spp.*	a dagger moth
Lepidoptera	Noctuidae	*Acronicta tristis*	sad dagger moth
Lepidoptera	Noctuidae	*Agrotis ipsilon*	black cutworm moth

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Order	**Family**	**Scientific Name**	**Common Name**
Lepidoptera	Noctuidae	*Allotria elonympha*	false underwing
Lepidoptera	Noctuidae	*Amphipyra pyramidoides*	copper underwing
Lepidoptera	Noctuidae	*Anorthodes tarda*	the slowpoke
Lepidoptera	Noctuidae	*Baileya ophthalmica*	eyed baileya moth
Lepidoptera	Noctuidae	*Catacola coccinata*	scarlet underwing
Lepidoptera	Noctuidae	*Catocala sp.*	girlfriend underwing
Lepidoptera	Noctuidae	*Celiptera frustulum*	black bit moth
Lepidoptera	Noctuidae	*Charadra deridens*	the laugher
Lepidoptera	Noctuidae	*Chytolita petrealis*	stone-winged owlet
Lepidoptera	Noctuidae	*Chytonix palliatricula*	cloaked marvel
Lepidoptera	Noctuidae	*Colocasia flavicornis*	yellowhorn
Lepidoptera	Noctuidae	*Cosmia calami*	Americam dunbar
Lepidoptera	Noctuidae	*Elaphria grata*	grateful midget
Lepidoptera	Noctuidae	*Elaphria sp.*	festive midget moth
Lepidoptera	Noctuidae	*Galgula partita*	the wedgling
Lepidoptera	Noctuidae	*Hypena baltimoralis*	Baltimore bomolocha
Lepidoptera	Noctuidae	*Hypena palparia*	mottled bomolocha
Lepidoptera	Noctuidae	*Hypena scabra*	green cloverworm moth
Lepidoptera	Noctuidae	*Hyperstrotia pervertens*	dotted graylet moth
Lepidoptera	Noctuidae	*Lacinipolia renigera*	bristly cutworm moth
Lepidoptera	Noctuidae	*Lascoria ambigualis*	ambiguous moth
Lepidoptera	Noctuidae	*Lesmone detrahens*	detracted owlet moth
Lepidoptera	Noctuidae	*Leucania sp.*	a wainscot
Lepidoptera	Noctuidae	*Leuconycta diphteroides*	green leuconycta
Lepidoptera	Noctuidae	*Morrisonia confusa*	confused woodgrain moth
Lepidoptera	Noctuidae	*Mythimna unipuncta*	armyworm moth
Lepidoptera	Noctuidae	*Nigetia formosalis*	thin-winged owlet moth
Lepidoptera	Noctuidae	*Paectes abrostoloides*	large paectes
Lepidoptera	Noctuidae	*Palthis angulalis*	dark-spotted palthis
Lepidoptera	Noctuidae	*Pangrapta decoralis*	decorated owlet moth
Lepidoptera	Noctuidae	*Pangrapta sp.*	an owlet
Lepidoptera	Noctuidae	*Panopoda rufimargo*	red-lined panopoda
Lepidoptera	Noctuidae	*Parallelia bistriaris*	maple looper moth
Lepidoptera	Noctuidae	*Phosphila miselioides*	spotted phosphila
Lepidoptera	Noctuidae	*Phyprosopus callitrichoides*	curve-lined owlet
Lepidoptera	Noctuidae	*Platysenta videns*	white-dotted groundling
Lepidoptera	Noctuidae	*Polygrammate hebraeicum*	the Hebrew moth
Lepidoptera	Noctuidae	*Schinia sp.*	a flower moth
Lepidoptera	Noctuidae	*Schinia arcigera*	Arcigera flower moth
Lepidoptera	Noctuidae	*Schinia rivulosa*	ragweed flower moth
Lepidoptera	Noctuidae	*Schinia trifascia*	three-lined flower moth
Lepidoptera	Noctuidae	*sp.*	a noctuid moth
Lepidoptera	Noctuidae	*sp.*	a dart
Lepidoptera	Noctuidae	*Spodoptera frugiperda*	Fall armyworm moth

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Lepidoptera	Noctuidae	*Tarachidia candefacta*	olive-shaded bird dropping moth
Lepidoptera	Noctuidae	*Thioptera nigrofimbria*	black-bordered lemon moth
Lepidoptera	Noctuidae	*Ulolonche culea*	sheathed quaker moth
Lepidoptera	Noctuidae	*Zale lunata*	lunate zale
Lepidoptera	Noctuidae	*Zale squamularis*	gray-banded zale
Lepidoptera	Noctuidae	*Zanclognatha pedipilalis*	grayish zanclognatha
Lepidoptera	Notodontidae	*Datana sp.*	a Datana moth
Lepidoptera	Notodontidae	*Furcula sp.*	a furcula
Lepidoptera	Notodontidae	*Heterocampa biundata*	wavy-lined heterocampa
Lepidoptera	Notodontidae	*Heterocampa guttivitta*	maple prominent moth
Lepidoptera	Notodontidae	*Heterocampa obliqua*	oblique heterocampa
Lepidoptera	Notodontidae	*Heterocampa sp.*	a Heterocampa
Lepidoptera	Notodontidae	*Heterocampa umbrata*	white-blotched heterocampa
Lepidoptera	Notodontidae	*Hyperaeschra georgica*	Georgian prominent
Lepidoptera	Notodontidae	*Lochmaeus bilineata*	double-lined prominent
Lepidoptera	Notodontidae	*Macrurocampa marthesia*	mottled prominent
Lepidoptera	Notodontidae	*Nadata gibbosa*	white-dotted prominent
Lepidoptera	Notodontidae	*Oligocentria lignicolor*	white-streaked prominent
Lepidoptera	Notodontidae	*sp.*	a prominent
Lepidoptera	Notodontidae	*Symmerista albifrons*	white-headed prominent moth
Lepidoptera	Nymphalidae	*Asterocampa celtis*	hackberry emperor
Lepidoptera	Nymphalidae	*Danaus plexippus*	monarch
Lepidoptera	Nymphalidae	*Enodia anthedon*	northern pearly eye
Lepidoptera	Nymphalidae	*Euptoieta claudia*	variegated fritillary
Lepidoptera	Nymphalidae	*Euptychia gemma*	gemmed satyr
Lepidoptera	Nymphalidae	*Hermeuptychia sosybius*	Carolina satyr
Lepidoptera	Nymphalidae	*Junonia coenia*	common buckeye
Lepidoptera	Nymphalidae	*Limenitis arthemis*	red-spotted purple
Lepidoptera	Nymphalidae	*Megisto cymela*	little wood satyr
Lepidoptera	Nymphalidae	*Nymphalis antiopa*	mourning cloak
Lepidoptera	Nymphalidae	*Phyciodes tharos*	pearl crescent
Lepidoptera	Nymphalidae	*Polygonia comma*	eastern comma
Lepidoptera	Nymphalidae	*Polygonia interrogationis*	questionmark
Lepidoptera	Nymphalidae	*Satyrodes appalachia*	Appalachian brown
Lepidoptera	Nymphalidae	*speyeria cybele*	great spangled fritillary
Lepidoptera	Nymphalidae	*Vanessa atalanta*	red admiral
Lepidoptera	Nymphalidae	*Vanessa virginiensis*	American lady
Lepidoptera	Papilionidae	*Battus philenor*	pipevine swallowtail
Lepidoptera	Papilionidae	*Papilio glaucus*	eastern tiger swallowtail
Lepidoptera	Papilionidae	*Papilio troilus*	spicebush swallowtail
Lepidoptera	Pieridae	*Anthocharis midea*	falcate orangetip
Lepidoptera	Pieridae	*Colias eurytheme*	orange sulphur
Lepidoptera	Pieridae	*Colias philodice*	clouded sulphur
Lepidoptera	Pieridae	*Eurema nicippe*	sleepy orange

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Lepidoptera	Pieridae	*Phoebis sennae*	cloudless sulphur
Lepidoptera	Pterophoridae	*sp.*	a plume moth
Lepidoptera	Pyralidae	*Antaeotricha sp.*	a Pyralid moth
Lepidoptera	Pyralidae	*Clyderopteron sp.*	a Pyralid moth
Lepidoptera	Pyralidae	*Conchylodes ovulalis*	zebra conchylodes moth
Lepidoptera	Pyralidae	*Crambus laqueatellus*	eastern grass-veneer moth
Lepidoptera	Pyralidae	*Desmia funeralis*	grape leaffolder moth
Lepidoptera	Pyralidae	*Desmia maculalis*	grape leafroller moth
Lepidoptera	Pyralidae	*Diacme elealis*	paler diacme moth
Lepidoptera	Pyralidae	*Diasemiodes janassalis*	a Pyralid moth
Lepidoptera	Pyralidae	*Dolichomia olinalis*	yellow-fringed dolichomia moth
Lepidoptera	Pyralidae	*Euzophera sp.*	borer moth
Lepidoptera	Pyralidae	*Nomophila nearctica*	lucerne moth
Lepidoptera	Pyralidae	*Ostrinia sp.*	a borer moth
Lepidoptera	Pyralidae	*Palpita magniferalis*	splendid palpita moth
Lepidoptera	Pyralidae	*Pyrausta acrionalis*	mint-loving Pyrausta moth
Lepidoptera	Pyralidae	*Pyromorpha dimidiata*	orange-patched smoky moth
Lepidoptera	Pyralidae	*sp.*	a Pyralid moth
Lepidoptera	Pyralidae	*Synclita obliteralis*	waterlily leafcutter moth
Lepidoptera	Pyralidae	*Udea rubigalis*	celery leaftier moth
Lepidoptera	Saturniidae	*Actias luna*	luna moth
Lepidoptera	Saturniidae	*Antheraea polyphemus*	Polyphemus moth
Lepidoptera	Saturniidae	*Automeris io*	IO moth
Lepidoptera	Saturniidae	*Callosamia angulifera*	tulip-tree silkmoth
Lepidoptera	Saturniidae	*Citheronia regalis*	regal moth
Lepidoptera	Saturniidae	*Dryocampa rubicunda*	rosy maple moth
Lepidoptera	Sesiidae	*sp.*	a clear-winged moth
Lepidoptera	Sphingidae	*Deidamia inscripta*	lettered sphinx
Lepidoptera	Sphingidae	*Lapara coniferarum*	pine sphinx
Lepidoptera	Ypnnomeutidae	*Atteva punctella*	Ailanthus webworm moth
Microcoryphia	Machilidae	*sp.*	a bristletail
Odonata	Aeshnidae	*Anax junius*	common green darner
Odonata	Aeshnidae	*Basiaeschna janata*	springtime darner
Odonata	Aeshnidae	*Epiaeschna heros*	swamp darner
Odonata	Aeshnidae	*Gomphaeschna antilope*	taper-tailed darner
Odonata	Calopterygidae	*Calopteryx maculata*	ebony jewelwing
Odonata	Coenagrionidae	*Argia fumipennis*	variable dancer
Odonata	Coenagrionidae	*Argia fumipennis violacea*	variable dancer
Odonata	Coenagrionidae	*Argia moesta*	powdered dancer
Odonata	Coenagrionidae	*Argia tibialis*	blue-tipped dancer
Odonata	Coenagrionidae	*Enallagma signatum*	orange bluet
Odonata	Coenagrionidae	*Ischnura posita*	fragile forktail
Odonata	Corduliidae	*Epitheca cynosura*	common baskettail
Odonata	Corduliidae	*Epitheca princeps*	prince baskettail

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Odonata	Corduliidae	*Helocordulia uhleri*	Uhler's sundragon
Odonata	Corduliidae	*Somatochlora linearis*	mocha emerald
Odonata	Gomphidae	*Dromogomphus spinosus*	black-shouldered spinyleg
Odonata	Gomphidae	*Gomphus exilis*	lancet clubtail
Odonata	Gomphidae	*Gomphus lividus*	ashy clubtail
Odonata	Lestidae	*Lestes vigilax*	swamp spreadwing
Odonata	Libellulidae	*Celithemis elisa*	calico pennant
Odonata	Libellulidae	*Celithemis eponena*	Halloween pennant
Odonata	Libellulidae	*Celithemis fasciata*	banded pennant
Odonata	Libellulidae	*Dythemis velox*	swift setwing
Odonata	Libellulidae	*Erethymis simplicicollis*	eastern pondhawk
Odonata	Libellulidae	*Libellula cyanea*	spangled skimmer
Odonata	Libellulidae	*Libellula deplanata*	blue corporal
Odonata	Libellulidae	*Libellula incesta*	slaty skimmer
Odonata	Libellulidae	*Libellula luctuosa*	widow skimmer
Odonata	Libellulidae	*Libellula lydia*	common whitetail
Odonata	Libellulidae	*Libellula semifasciata*	painted skimmer
Odonata	Libellulidae	*Libellula vibrans*	great blue skimmer
Odonata	Libellulidae	*Pachydiplax longipennis*	blue dasher
Odonata	Libellulidae	*Perithemis tenera*	eastern amberwing
Odonata	Libellulidae	*Tramea lacerata*	black saddlebags
Odonata	Macromiidea	*Didymops transversa*	stream cruiser
Odonata	Petaluridae	*Tachopteryx thoreyi*	gray petaltail
Orthoptera	Acrididae	*Chortophaga viridifasciata*	short-horned grasshopper
Orthoptera	Gryllidae	*Gryllus sp.*	a cricket
Orthoptera	Rhaphidophoridae	*Ceuthophilus crassifemoris*	camel cricket
Orthoptera	Tetrigidae	*sp.*	pygma grasshoper
Orthoptera	Tetrigidae	*Tettigidea lateralis*	pygma grasshoper
Orthoptera	Tettigoniidae	*Atlanticus sp.*	long-horned grasshopper
Orthoptera	Tettigoniidae	*Atlanticus testaceus*	long-horned grasshopper
Orthoptera	Tettigoniidae	*sp.*	a katydid
Trichoptera	Hydroptilidae	*sp.*	a caddisfly
Trichoptera	Leptoceridae	*sp.*	a long-horned caddisfly
Class Arachnida			
Araneae	Agelenidae	*Agelenopsis kastoni*	a funnel-web spider
Araneae	Agelenidae	*sp.*	a funnel-web spider
Araneae	Amaurobiidae	*Coras medicinalis*	a hacklemesh weavers
Araneae	Amaurobiidae	*Wadotes calcaratus*	a hacklemesh weavers
Araneae	Anyphaenidae	*Anyphaena pectorosa*	a ghost spider
Araneae	Anyphaenidae	*Wulfila alba*	a ghost spider
Araneae	Araneidae	*Larinia directa*	a rob weaver spider
Araneae	Atypidae	*Sphodros coylei*	a purseweb spider
Araneae	Clubionidae	*Clubiona sp*	a sac spider

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Araneae	Gnaphosidae	*Drassyllus aprilinus*	a ground spider
Araneae	Gnaphosidae	*Drassyllus covensis*	a ground spider
Araneae	Gnaphosidae	*Drassyllus ellipes*	a ground spider
Araneae	Gnaphosidae	*Drassyllus novus*	a ground spider
Araneae	Gnaphosidae	*Gnaphosa fontinalis*	a ground spider
Araneae	Gnaphosidae	*Haplodrassus signifer*	a ground spider
Araneae	Gnaphosidae	*Zelotes hentzi*	a ground spider
Araneae	Linyphiidae	*Ceraticelus sp*	a spider
Araneae	Liocranidae	*Agroeca pratensis*	a spider
Araneae	Lycosidae	*Gladicosa gulosa*	a wolf spider
Araneae	Lycosidae	*Gladicosa sp*	a wolf spider
Araneae	Lycosidae	*Hogna carolinensis*	a wolf spider
Araneae	Lycosidae	*Hogna frondicola*	a wolf spider
Araneae	Lycosidae	*Hogna helluo*	a wolf spider
Araneae	Lycosidae	*Pardosa milvina*	a wolf spider
Araneae	Lycosidae	*Pirata sp.*	a wolf spider
Araneae	Lycosidae	*Schizocosa duplex*	a wolf spider
Araneae	Lycosidae	*Schizocosa ocreata*	a wolf spider
Araneae	Lycosidae	*Schizocosa saltatrix*	a wolf spider
Araneae	Lycosidae	*Schizocosa sp.*	a wolf spider
Araneae	Lycosidae	*sp.*	a wolf spider
Araneae	Lycosidae	*Trebasoca marxi*	a wolf spider
Araneae	Lycosidae	*Varacosa avara*	a wolf spider
Araneae	Miturgidae	*Strotarchus piscatorius*	a prowling spider
Araneae	Oxyopidae	*Oxyopes aglossus*	a lynx spider
Araneae	Oxyopidae	*Oxyopes salticus*	a lynx spider
Araneae	Oxyopidae	*Peucetia viridans*	a lynx spider
Araneae	Philodromidae	*Philodromus marxi*	a crab spider
Araneae	Pisauridae	*Dolomedes scriptus*	a nursery web spider
Araneae	Pisauridae	*Dolomedes sp.*	a nursery web spider
Araneae	Pisauridae	*Pisaurina mira*	a nursery web spider
Araneae	Pisauridae	*sp.*	a nursery web spider
Araneae	Salticidae	*Eris militaris*	a jumping spider
Araneae	Salticidae	*Ghelna sp.*	a jumping spider
Araneae	Salticidae	*Maevia inclemens*	a jumping spider
Araneae	Salticidae	*Pelegrina galathea*	a jumping spider
Araneae	Salticidae	*Pelegrina peckhamorum*	a jumping spider
Araneae	Salticidae	*Phidippus pius*	a jumping spider
Araneae	Salticidae	*sp.*	a jumping spider
Araneae	Salticidae	*Thiodina puerpera*	a jumping spider
Araneae	Salticidae	*Thiodina sylvana*	a jumping spider
Araneae	Salticidae	*Tutelina elegans*	a jumping spider
Araneae	Salticidae	*Tutelina formicarius*	a jumping spider
Araneae	Tetragnathidae	*Leucage venusta*	an orbweaver spider

Terrestrial invertebrates (Insects, Land Snails, Spiders, Millipedes and Centipedes) documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Araneae	Tetragnathidae	*sp.*	an orbweaver spider
Araneae	Theridiidae	*Latrodectus variolus*	a cobweb spider
Araneae	Thomisidae	*sp.*	a crab spider
Araneae	Thomisidae	*Tmarus angulatus*	a crab spider
Araneae	Thomisidae	*Xysticus ferox*	a crab spider
Opiliones	Cosmetidae	*Vonones sayi*	a harvestmen
Pseudoscorpiones		*sp.*	a pseudoscorpion
Class Chilopoda			
Geophilomorpha	Geophilidae	*Geophilus sp.*	a centipede
Geophilomorpha	Geophilidae	*Geophilus varians*	a centipede
Geophilomorpha	Linotaeniidae	*Strigamia bidens*	a centipede
Lithobiomorpha	Lithobiidae	*Bothropolys multidentatus*	a centipede
Scolopendromorpha	Cryptopidae	*Theatops posticus*	a centipede
Scolopendromorpha	Scolocryptopidae	*Scolocryptops sexspinosus*	a centipede
Scolopendromorpha	Scolopendridae	*Hemiscolopendra marginata*	a centipede
Class Diplopoda			
Callipodidae	Abacionidae	*Abicon magnum*	a millipede
Julida	Julidae	*Ophyiulus pilosus*	a millipede
Julida	Parajulidae	*Ptyoiulus ectenes*	a millipede
Julida	Parajulidae	*Ptyoiulus ectenes*	a millipede
Polydesmida	Xystodesmidae	*Apheloria tigana*	a millipede
Spirobolida	Spirobolidae	*Narceus americanus*	a millipede
Class Entognatha			
Collembola		*sp.*	a springtail
Class Gastropoda			
Stylommatophora	Haplotrematidae	*Haplotrema concavum*	gray-foot lancetooth
Stylommatophora	Polygyridae	*Mesodon andrewsae*	balsam globe
Stylommatophora	Polygyridae	*Triodopsis tridentata*	northern threetooth
Stylommatophora	Zonitidae	*Mesomphix rugeli*	wrinkled button
Stylommatophora	Zonitidae	*Ventridens intertexus*	pyramid dome
Source: AMEC 2007b			

Aquatic Invertebrates documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Class Entognatha			
Collembola	Sminthuridae	*sp.*	springtail
Class Gastropoda			
Architaenioglossa	Viviparidae	*Campeloma sp.*	a freshwater snail
Basommatophora	Lymnaeidae	*Pseudosuccinea sp.*	a freshwater snail
Basommatophora	Planorbidae	*Helisoma sp.*	a freshwater snail
Class Hirudinea			
Rhynchobdellida	Glossiphoniidae	*Placobdella papillifera*	a leech
Class Insecta			
Coleoptera	Curculionidae	*sp.*	a snout beetle
Coleoptera	Dryopidae	*Helichus lithophilus*	long-toed water beetle
Coleoptera	Dytiscidae	*Acilius sp.*	predaceous diving beetle
Coleoptera	Dytiscidae	*Cybister fimbriolatus*	predaceous diving beetle
Coleoptera	Dytiscidae	*Hydroporus sp.*	predaceous diving beetle
Coleoptera	Elmidae	*Dubiraphia vitatta*	riffle beetle
Coleoptera	Elmidae	*sp.*	riffle beetle
Coleoptera	Elmidae	*Stenelmis spp.*	riffle beetle
Coleoptera	Gyrinidae	*Dineutus sp.*	whirligig beetle
Coleoptera	Hydrophilidae	*Tropisternus sp*	water scavenger beetle
Coleoptera	Psphenidae	*Ectopria sp.*	water penny beetle
Coleoptera	Psphenidae	*Psephenus herricki*	water penny beetle
Diptera	Chironomidae	*Clinotanypus sp.*	a midge
Diptera	Chironomidae	*Kronopelopia sp.*	a midge
Diptera	Chironomidae	*Paratanytarsus sp.*	a midge
Diptera	Chironomidae	*Polypedium flavum*	a midge
Diptera	Chironomidae	*Polypedium sp.*	a midge
Diptera	Chironomidae	*Psectrocladius pilosus*	a midge
Diptera	Chironomidae	*sp.*	a midge
Diptera	Chironomidae	*Stenochironomus spp.*	a midge
Diptera	Culicidae	*Culex territans*	a mosquitoe
Diptera	Tipulidae	*Hexatoma sp.*	a crane fly
Diptera	Tipulidae	*Longurio sp.*	a crane fly
Ephemeroptera	Baetidae	*Callibaetis sp.*	a mayfly
Ephemeroptera	Baetidae	*Centroptilum sp.*	a mayfly
Ephemeroptera	Caenidae	*Caenis spp.*	a mayfly
Ephemeroptera	Ephemeridae	*Hexagenia sp.*	a mayfly
Ephemeroptera	Heptageniidae	*Epeorus dispar*	a mayfly
Ephemeroptera	Heptageniidae	*Heptagenia spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Heptogenia spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Macaffertium spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Stenacron interpunctatum*	a mayfly

Aquatic Invertebrates documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Ephemeroptera	Heptageniidae	*Stenacron pallidum*	a mayfly
Ephemeroptera	Heptageniidae	*Stenacron spp.*	a mayfly
Ephemeroptera	Heptageniidae	*Stenonema femoratum*	a mayfly
Ephemeroptera	Leptophebiidae	*Habrophlebiodes sp.*	a mayfly
Ephemeroptera	Oligoneuridae	*Isonychia sp.*	a mayfly
Heteroptera	Belostomatidae	*Lethocerus griseus*	a giant water bug
Heteroptera	Corixidae	*Hesperocorixa sp.*	a water boatman
Heteroptera	Corixidae	*Palmacorixa buenoi*	a water boatman
Heteroptera	Corixidae	*Trichocorixa calva*	a water boatman
Heteroptera	Gelastocoridae	*Gelastocoris oculatus*	a toad bug
Heteroptera	Gerridae	*Gerris marginatus*	a water strider
Heteroptera	Gerridae	*Trepobates subnitidus*	a water strider
Heteroptera	Mesoveliidae	*Mesovelia sp.*	a water treader
Heteroptera	Naucoridae	*Pelocoris femoraltus*	a creeping water bug
Heteroptera	Nepidae	*Ranatra kirkaldi*	a water scorpian
Heteroptera	Veliidae	*Microvelia sp.*	a broad-shouldered water strider
Heteroptera	Veliidae	*Rhagovelia obesa*	a broad-shouldered water strider
Hymenoptera	Formicidae	*Myrmica sp.*	an ant
Lepidoptera	Tortricidae	*Tortricidae*	a tortricid moth
Megaloptera	Corydalidae	*Corydalus cornutus*	eastern dobsonfly
Megaloptera	Corydalidae	*Nigronia fasciatus*	a fishfly
Megaloptera	Sialidae	*Sialis americana*	an alderfly
Megaloptera	Sialidae	*Sialis sp.*	an alderfly
Odonata	Aeshnidae	*Anax junius*	common green darner
Odonata	Aeshnidae	*Boyeria vinosa*	fawn darner
Odonata	Coenagrionidae	*Argia spp.*	a dancer damselfly
Odonata	Coenagrionidae	*Enallagma spp.*	a bluet damselfly
Odonata	Coenagrionidae	*Ischnura sp.*	a forktail damselfly
Odonata	Coenagrionidae	*sp.*	a damselfly
Odonata	Corduligastridae	*Corduligaster maculata*	twin-spotted spiketail
Odonata	Corduliidae	*Epitheca sp.*	a baskettail
Odonata	Gomphidae	*Erpetogomphus designatus*	eastern ringtail
Odonata	Gomphidae	*sp.*	a clubtail
Odonata	Gomphidae	*Stylogomphis albistylus*	least clubtail
Odonata	Libellulidae	*Erythrodiplax minuscula*	little blue dragonlet
Odonata	Libellulidae	*Libellula lydia*	common whitetail
Odonata	Libellulidae	*Libellula sp.*	a skimmer dragonfly
Odonata	Libellulidae	*Pachydiplax longipennis*	blue dasher
Plecoptera	Perlidae	*Acroneuria sp.*	a stonefly
Plecoptera	Perlidae	*sp.*	a stonefly
Trichoptera	Hydropsychidae	*Cheumatopsyche spp.*	a netspinning caddisfly
Trichoptera	Hydropsychidae	*Hydropsyche sp.*	a netspinning caddisfly
Trichoptera	Limnephilidae	*Pycnopsyche sp.*	northern caddisfly
Trichoptera	Odontoceridae	*Psilotreta sp.*	a caddisfly
Trichoptera	Philopotamidae	*Chimarra spp.*	a fingernet caddisfly

Aquatic Invertebrates documented to occur at CBTS (2006 Inventory)			
Order	**Family**	**Scientific Name**	**Common Name**
Class Malacostraca			
Amphipoda	Gammaridae	*Crangonyx sp.*	an amphipod
Decapoda	Cambaridae	*sp.*	a crawfish
Decapoda	Cambaridae	*Cambarus sp.*	a crawfish
Decapoda	Cambaridae	*Procambarus sp.*	a crawfish
Decapoda	Cambaridae	*Procambarus acutus*	White River crawfish
Decapoda	Cambaridae	*Cambarus sp. C*	a crawfish
Decapoda	Cambaridae	*Cambarus reduncus*	a crawfish
Isopoda	Ascellidae	*Caecidotea forbesi*	a sow bug
Source: AMEC 2007b			

Vertebrates Observed During Non-Comprehensive Surveys of CBTS				
Group	**Scientific Name**	**Common Name**	**NCNHP 1994 Observations**	**CBTS 1998-2000 Observations**
Amphibian	*Acris crepitans*	Northern cricket frog	X	
Amphibian	*Bufo woodhousei fowleri*	Fowler's toad	X	
Amphibian	*Desmognathus fuscus*	Dusky salamander	X	
Amphibian	*Eurycea cirrigera*	Southern two-lined salamander	X	
Amphibian	*Hyla chrysoscelis*	Cope's gray treefrog	X	
Amphibian	*Rana clamitans*	Green frog	X	X
Bird	*Accipiter cooperii*	Cooper's hawk		X
Bird	*Archilochus colubris*	Ruby-throated hummingbird	X	X
Bird	*Bombycilla cedrorum*	Cedar waxwing		X
Bird	*Branta canadensis*	Canada goose		X
Bird	*Buteo jamaicensis*	Red-tailed hawk		X
Bird	*Buteo lineatus*	Red-shouldered hawk	X	
Bird	*Buteo platypterus*	Broad-winged hawk	X	
Bird	*Caprimulgus carolinensis*	Chuck-will's-widow		X
Bird	*Caprimulgus vociferus*	Whip-poor-will		X
Bird	*Cardinalis cardinalis*	Northern cardinal	X	X
Bird	*Carduelis tristis*	American goldfinch	X	X
Bird	*Cathartes aura*	Turkey vulture		X
Bird	*Ceryle alcyon*	Belted kingfisher	X	X
Bird	*Chaetura pelagica*	Chimney swift		X
Bird	*Coccyzus americanus*	Yellow-billed cuckoo	X	X
Bird	*Colaptes auratus*	Northern flicker	X	X
Bird	*Colinus virginianus*	Northern bobwhite		X
Bird	*Contopus virens*	Eastern wood pewee		X
Bird	*Coragyps atratus*	Black vulture		X
Bird	*Corvus brachyrhynchos*	American crow	X	X
Bird	*Corvus ossifragus*	Fish crow		X
Bird	*Cyanocitta cristata*	Blue jay	X	X
Bird	*Dendroica discolor*	Prairie warbler	X	X
Bird	*Dendroica pinus*	Pine warbler	X	X
Bird	*Dryocopus pileatus*	Pileated woodpecker	X	X
Bird	*Empidonax virescens*	Acadian flycatcher	X	X
Bird	*Geothlypis trichas*	Common yellowthroat		X
Bird	*Hylocichla mustelina*	Wood thrush		X
Bird	*Icteria virens*	Yellow-breasted chat		X
Bird	*Melanerpes carolinus*	Red-bellied woodpecker	X	X
Bird	*Meleagris gallopavo*	Wild turkey	X	X
Bird	*Mimus polyglottos*	Northern mockingbird		X
Bird	*Molothrus ater*	Brown-headed cowbird	X	X
Bird	*Myiarchus crinitus*	Great crested flycatcher		X
Bird	*Oporornis formosus*	Kentucky warbler		X
Bird	*Parula americana*	Northern parula	X	X
Bird	*Parus bicolor*	Tufted titmouse	X	X
Bird	*Parus carolinensis*	Carolina chickadee	X	X

Vertebrates Observed During Non-Comprehensive Surveys of CBTS				
Group	**Scientific Name**	**Common Name**	**NCNHP 1994 Observations**	**CBTS 1998-2000 Observations**
Bird	*Passerina cyanea*	Indigo bunting	X	X
Bird	*Picoides pubescens*	Downy woodpecker	X	X
Bird	*Picoides villosus*	Hairy woodpecker		X
Bird	*Pipilo erythrophthalmus*	Eastern towhee	X	X
Bird	*Piranga olivacea*	Scarlet tanager	X	X
Bird	*Piranga rubra*	Summer tanager	X	X
Bird	*Polioptila caerulea*	Blue-gray gnatcatcher	X	X
Bird	*Quiscalus quiscula*	Common grackle		X
Bird	*Sayornis phoebe*	Eastern phoebe	X	X
Bird	*Seiurus aurocapillus*	Ovenbird	X	X
Bird	*Seiurus motacilla*	Louisiana waterthrush	X	
Bird	*Sialia sialis*	Eastern bluebird		X
Bird	*Sitta carolinensis*	White-breasted nuthatch		X
Bird	*Spizella passerina*	Chipping sparrow		X
Bird	*Spizella pusilla*	Field sparrow	X	X
Bird	*Strix varia*	Barred owl	X	
Bird	*Thyothorus ludovicianus*	Carolina wren	X	X
Bird	*Toxostoma rufum*	Brown thrasher		X
Bird	*Tyrannus tyrannus*	Eastern kingbird		X
Bird	*Vireo flavifrons*	Yellow-throated vireo	X	X
Bird	*Vireo griseus*	White-eyed vireo		X
Bird	*Vireo olivaceus*	Red-eyed vireo	X	X
Bird	*Vireo solitarius*	Blue-headed vireo	X	
Bird	*Wilsonia citrina*	Hooded warbler	X	X
Bird	*Zenaida macroura*	Mourning dove		X
Mammal	*Didelphis virginiana*	Virginia opossum	X	
Mammal	*Glaucomys volans*	Southern flying squirrel		X
Mammal	*Lutra canadensis*	River otter	X	
Mammal	*Odocoileus virginianus*	White tailed deer	X	X
Mammal	*Peromyscus oeucopus*	White-footed mouse		X
Mammal	*Procyon lotor*	Raccoon	X	
Mammal	*Scalopus aquaticus*	Eastern mole	X	
Mammal	*Sciurus carolinensis*	Gray squirrel	X	X
Mammal	*Sigmodon hispidus*	Hispid cotton rat		X
Mammal	*Sylvilagus floridanus*	Eastern cottontail	X	X
Mammal	*Tamias striatus*	Eastern chipmunk		X
Mammal	*Urocyon cinereoargenteus*	Gray fox	X	
Reptile	*Chelydra serpentina*	Snapping turtle	X	
Reptile	*Crotalus horridus*	Timber rattlesnake	X	
Reptile	*Nerodia sipedon*	Northern water snake	X	
Reptile	*Sceloporus undulatus*	Eastern fence lizard	X	X
Reptile	*Terrapene carolina*	Eastern box turtle	X	X

Invertebrate Species Observed During the 1994 NCNHP Non-Comprehensive Survey (NCNHP 1995)		
Group	**Scientific Name**	**Common Name**
Dragonfly	*Celithemis elisa*	Calico pennant
Dragonfly	*Cordulegaster obliqua*	Arrowhead spiketail
Dragonfly	*Epiaeschna heros*	Swamp darner
Dragonfly	*Erythemis simplicicollis*	Eastern pondhawk
Dragonfly	*Gomphus exilis*	Lancet clubtail
Dragonfly	*Libellula luctuosa*	Widow skimmer
Dragonfly	*Libellula vibrans*	Great blue skimmer
Dragonfly	*Perithemis tenera*	Eastern amberwing
Dragonfly	*Tachopteryx thoreyi*	Gray petaltail
Butterfly	*Achalarus lyciades*	Hoary edge
Butterfly	*Ancyloxypha numitor*	Least skipper
Butterfly	*Cleastrina ladon*	Spring azure
Butterfly	*Enodia portlandia*	Southern pearly eye
Butterfly	*Epargyreus clarus*	Silver-spotted skipper
Butterfly	*Everes comyntas*	Eastern tailed blue
Butterfly	*Hermeuptychia sosybius*	Carolina satyr
Butterfly	*Incisalia niphon*	Eastern pine elfin
Butterfly	*Junonia coenia*	Common buckeye
Butterfly	*Lerema accius*	Clouded skipper
Butterfly	*Limenitis arthemis*	Red-spotted purple
Butterfly	*Megisto cymela*	Little wood satyr
Butterfly	*Papilio glaucus*	Eastern tiger swallowtail
Butterfly	*Papilio polyxenes*	Black swallowtail
Butterfly	*Papilio troilus*	Spicebush swallowtail
Butterfly	*Phyciodes tharos*	Pearl Crescent
Butterfly	*Poanes zabulon*	Zabulon skipper
Butterfly	*Polygonia interrogationis*	Question mark
Butterfly	*Strymon melinus*	Gray hairstreak
Butterfly	*Thorybes pylades*	Northern cloudywing

BIRDS PROTECTED BY THE MIGRATORY BIRD TREATY ACT
List of Migratory Birds

Taxonomic List (from United States Fish and Wildlife Service)

Family GAVIIDAE (Loons)

Gavia stellata, Red-throated Loon
arctica, Arctic Loon
pacifica (=arctica), Pacific (=Arctic) Loon
immer, Common Loon
adamsii, Yellow-billed Loon

Family PODICIPEDIDAE (Grebes)

Tachybaptus dominicus, Least Grebe
Podilymbus podiceps, Pied-billed Grebe
Podiceps auritus, Horned Grebe
grisegena, Red-necked Grebe
nigricollis, Eared Grebe
Aechmophorus occidentallis, Western Grebe
clarkii (=occidentallis), Clark's (=Western) Grebe

Family DIOMEDEIDAE (Albatrosses)

Diomedea albatrus, Short-tailed Albatross
nigripes, Black-footed Albatross
immutabilis, Laysan Albatross
chlororhynchos, Yellow-nosed Albatross

Family PROCELLARIIDAE (Shearwaters and Petrels)

Fulmarus glacialis, Northern Fulmar
Pterodroma hasitata, Black-capped Petrel
phaeopygia, Dark-rumped Petrel externa,
Juan Fernandez (=White-necked) Petrel
cervicalis (=externa), White-necked Petrel
inexpectata, Mottled Petrel
ultima, Murphy's Petrel
neglecta, Kermadec Petrel
arminjoniana, Herald Petrel
cookii, Cook's Petrel
hypoleuca, Bonin Petrel
Bulweria bulwerii, Bulwer's Petrel
diomedea, Cory's Shearwater
Puffinus creatopus, Pink-footed Shearwater
carneipes, Flesh-footed Shearwater
gravis, Greater Shearwater
pacificus, Wedge-tailed Shearwater
bulleri, Buller's Shearwater griseus,
Sooty Shearwater
tenuirostris, Short-tailed Shearwater
nativitatis, Christmas Shearwater
puffinus, Manx Shearwater
opisthomelas, Black-vented Shearwater
auricularis, Townsend's Shearwater
assimilis, Little Shearwater
lherminieri, Audubon's Shearwater

Family HYDROBATIDAE (Storm-Petrels)
Oceanites oceanicus, Wilson's Storm-Petrel
Pelagodroma marina, White-faced Storm-Petrel
Oceanodroma furcata, Fork-tailed Storm-Petrel
leucorhoa, Leach's Storm-Petrel
homochroa, Ashy Storm-Petrel
castro, Band-rumped Storm-Petrel
tethys, Wedge-rumped Storm-Petrel
melania, Black Storm-Petrel
tristrami, Tristram's (=Sooty) Storm-Petrel
microsoma, Least Storm-Petrel

Family PHAETHONTIDAE (Tropicbirds)
Phaethon lepturus, White-tailed Tropicbird
aethereus, Red-billed Tropicbird
rubricauda, Red-tailed Tropicbird

Family SULIDAE (Boobies and Gannets)
Sula dactylatra, Masked Booby
nebouxii, Blue-footed Booby
leucogaster, Brown Booby
sula, Red-footed Booby
Morus (=Sula) bassanus, Northern Gannet (=Gannet)

Family PELECANIDAE (Pelicans)
Pelecanus erythrorhynchos, American White Pelican
occidentalis, Brown Pelican

Family PHALACROCORACIDAE (Cormorants)
Phalacrocorax carbo, Great Cormorant
auritus, Double-crested Cormorant
brasilianus (=olivaceus), Neotropic (=Olivaceous) Cormorant
penicillatus, Brandt's Cormorant
pelagicus, Pelagic Cormorant
urile, Red-faced Cormorant

Family ANHINGIDAE (Anhingas)
Anhinga anhinga, Anhinga

Family FREGATIDAE (Frigatebirds)
Fregata minor, Great Frigatebird
magnificens, Magnificent Frigatebird
ariel, Lesser Frigatebird

Family ARDEIDAE (Bitterns and Herons)
Botaurus lentiginosus, American Bittern
Ixobrychus exilis, Least Bittern
sinensis, Yellow (=Chinese) Bittern
eurhythmus, Schrenk's Bittern
Ardea herodias, Great Blue Heron
alba (=albus), Great Egret
Mesophoyx (=Egretta) intermedia, Intermediate (=Plumed) Egret
Egretta eulophotes, Chinese Egret
sacra, Pacific Reef Heron
thula, Snowy Egret

caerulea, Little Blue Heron
tricolor, Tricolored Heron
rufescens, Reddish Egret
Bubulcus ibis, Cattle Egret
Butorides virescens (=striatus), Green (=Green-backed) Heron
Nycticorax nycticorax, Black-crowned Night-Heron
melanolophus, Malay Night-Heron
goisagi, Japanese Night-Heron
Nyctanassa (=Nycticorax) violacea (=violaceus), Yellow-crowned Night-Heron

Family THRESKIORNITHIDAE (Ibises and Spoonbills)
Eudocimus albus, White Ibis
ruber, Scarlet Ibis
Plegadis falcinellus, Glossy Ibis
chihi, White-faced Ibis
Ajaia ajaja, Roseate Spoonbill

Family CICONIIDAE (Storks)
Jabiru mycteria, Jabiru
Mycteria americana, Wood Stork

Family PHOENICOPTERIDAE (Flamingos)
Phoenicopterus ruber, Greater Flamingo

Family ANATIDAE (Swans, Geese, and Ducks)
Dendrocygna bicolor, Fulvous Whistling-Duck
autumnalis, Black-bellied Whistling-Duck
arborea, West Indian Whistling-Duck
Cygnus columbianus, Tundra Swan
cygnus, Whooper Swan
buccinator, Trumpeter Swan
Anser fabalis, Bean Goose
albifrons, Greater White-fronted Goose
Chen caerulescens, Snow Goose
rossii, Ross' Goose
canagica, Emperor Goose
Branta bernicla, Brant
leucopsis, Barnacle Goose
canadensis, Canada Goose
(=Nesochen) sandvicensis, Hawaiian Goose
Aix sponsa, Wood Duck
Anas crecca, Green-winged Teal
formosa, Baikal Teal
falcata, Falcated Teal
rubripes, American Black Duck
fulvigula, Mottled Duck
platyrhynchos, Mallard
wyvilliana, Hawaiian Duck
laysanensis, Laysan Duck
bahamensis, White-cheeked Pintail
acuta, Northern Pintail
querquedula, Garganey discors,
Blue-winged Teal
cyanoptera, Cinnamon Teal
clypeata, Northern Shoveler
strepera, Gadwall

penelope, Eurasian Wigeon
americana, American Wigeon
Aythya ferina, Common Pochard
valisneria, Canvasback
americana, Redhead
baeri, Baer's Pochard
collaris, Ring-necked Duck
fuligula, Tufted Duck
marila, Greater Scaup
affinis, Lesser Scaup
Somateria mollissima, Common Eider
spectabilis, King Eider
fischeri, Spectacled Eider
Polysticta stelleri, Steller's Eider
Histrionicus histrionicus, Harlequin Duck
Clangula hyemalis, Oldsquaw
Melanitta nigra, Black Scoter
perspicillata, Surf Scoter
fusca, White-winged Scoter
Bucephala clangula, Common Goldeneye
islandica, Barrow's Goldeneye
albeola, Bufflehead
Mergellus albellus, Smew
Lophodytes cucullatus, Hooded Merganser
Mergus merganser, Common Merganser
serrator, Red-breasted Merganser
Oxyura jamaicensis, Ruddy Duck
dominica, Masked Duck

Family CATHARTIDAE (American Vultures)

Coragyps atratus, Black Vulture
Cathartes aura, Turkey Vulture
Gymnogyps californianus, California Condor

Family ACCIPITRIDAE (Kites, Eagles, Hawks, and Allies)

Pandion haliaetus, Osprey
Chondrohierax uncinatus, Hook-billed Kite
Elanoides forficatus, Swallow-tailed (=American Swallow-tailed) Kite
Elanus leucurus (=caeruleus), White-tailed (=Black-shouldered) Kite
Rostrhamus sociabilis, Snail Kite
Ictinia mississippiensis, Mississippi Kite
Milvus migrans, Black Kite
Haliaeetus leucocephalus, Bald Eagle
albicilla, White-tailed Eagle
pelagicus, Steller's Sea-Eagle
Circus cyaneus, Northern Harrier
Accipiter gularis, Asiatic Sparrow Hawk
striatus, Sharp-shinned Hawk
cooperii, Cooper's Hawk
gentilis, Northern Goshawk
Buteogallus anthracinus, Common Black-Hawk
Parabuteo unicinctus, Harris' Hawk
Buteo nitidus, Gray Hawk
lineatus, Red-shouldered Hawk
platypterus, Broad-winged Hawk
brachyurus, Short-tailed Hawk

swainsoni, Swainson's Hawk
albicaudatus, White-tailed Hawk
albonotatus, Zone-tailed Hawk
solitarius, Hawaiian Hawk
jamaicensis, Red-tailed Hawk
regalis, Ferruginous Hawk
lagopus, Rough-legged HawkAquila chrysaetos, Golden Eagle

Family FALCONIDAE (Caracaras and Falcons)

Caracara (=Polyborus) plancus, Crested Caracara
Falco tinnunculus, Eurasian Kestrel
sparverius, American Kestrel
columbarius, Merlin
femoralis, Aplomado Falcon
peregrinus, Peregrine Falcon
rusticolus, Gyrfalcon
mexicanus, Prairie Falcon

Family RALLIDAE (Rails, Gallinules, and Coots)

Coturnicops noveboracensis, Yellow Rail
Laterallus jamaicensis, Black Rail
Crex crex, Corn Crake
Rallus longirostris, Clapper Rail
elegans, King Rail
limicola, Virginia Rail
Porzana carolina, Sora
flaviventer, Yellow-breasted Crake
Porphyrula martinica, Purple Gallinule
Gallinula chloropus, Common Moorhen
Fulica atra, Eurasian Coot
alai (=americana), Hawaiian (=American) Coot
americana, American Coot
caribaea, Caribean Coot

Family ARAMIDAE (Limpkins)

Aramus guarauna, Limpkin

Family GRUIDAE (Cranes)

Grus canadensis, Sandhill Crane
grus, Common Crane
americana, Whooping Crane

Family CHARADRIIDAE (Plovers and Lapwings)

Vanellus vanellus, Northern Lapwing
Pluvialis squatarola, Black-bellied Plover
dominicus (=dominica), American (=Lesser) Golden-Plover
fulva (=dominica), Pacific (=Lesser) Golden-Plover
Charadrius mongolus, Mongolian Plover
leschensultii, Great Sand Plover
alexandrinus, Snowy Plover
wilsonia, Wilson's Plover
hiaticula, Common Ringed Plover
semipalmatus, Semipalmated Plover
melodus, Piping Plover
dubius, Little Ringed Plover
vociferus, Killdeer

montanus, Mountain Plover
morinellus, Eurasian Dotterel

Family HAEMATOPODIDAE (Oystercatchers)

Haematopus palliatus, American Oystercatcher
bachmani, Black Oystercatcher

Family RECURVIROSTRIDAE (Stilts and Avocets)

Himantopus mexicanus, Black-necked Stilt
Recurvirostra americana, American Avocet

Family JACANIDAE (Jacanas)

Jacana spinosa, Northern Jacana

Family SCOLOPACIDAE (Sandpipers, Phalaropes, and Allies)

Tringa nebularia, Common Greenshank
melanoleuca, Greater Yellowlegs
flavipes, Lesser Yellowlegs
stagnatilis, Marsh Sandpiper
erythropus, Spotted Redshank
glareola, Wood Sandpiper
solitaria, Solitary Sandpiper
Catoptrophorus semipalmatus, Willet
Heteroscelus incanus, Wandering Tattler
brevipes, Gray-tailed Tattler
Actitis hypoleucos, Common Sandpiper
macularia, Spotted Sandpiper
Xenus cinereus, Terek Sandpiper
Bartramia longicauda, Upland Sandpiper
Numenius minutus, Little (=Least) Curlew
borealis, Eskimo Curlew
phaeopus, Whimbrel
tahitiensis, Bristle-thighed Curlew
madagascariensis, Far Eastern Curlew
americanus, Long-billed Curlew
Limosa limosa, Black-tailed Godwit
haemastica, Hudsonian Godwit
lapponica, Bar-tailed Godwit
fedoa, Marbled Godwit
Arenaria interpres, Ruddy Turnstone
melanocephala, Black Turnstone
Aphriza virgata, Surfbird
Calidris tenuirostris, Great Knot
canutus, Red Knot
alba, Sanderling
pusilla, Semipalmated Sandpiper
mauri, Western Sandpiper
ruficollis, Red-necked (=Rufous-necked) Stint
minuta, Little Stint
temminckii, Temminck's Stint
subminuta, Long-toed Stint
minutilla, Least Sandpiper
fuscicollis, White-rumped Sandpiper
bairdii, Baird's Sandpiper
melanotos, Pectoral Sandpiper
acuminata, Sharp-tailed Sandpiper

maritima, Purple Sandpiper
ptilocnemis, Rock Sandpiper
alpina, Dunlin
ferruginea, Curlew Sandpiper
himantopus, Stilt Sandpiper
Eurynorhynchus pygmeus, Spoonbill Sandpiper
Limicola falcinellus, Broad-billed Sandpiper
Tryngites subruficollis, Buff-breasted Sandpiper
Philomachus pugnax, Ruff
Limnodromus griseus, Short-billed Dowitcher
scolopaceus, Long-billed Dowitcher
Lymnocryptes minimus, Jack Snipe
Gallinago gallinago, Common Snipe
stenura, Pin-tailed Snipe
megala, Swinhoe's Snipe
Scolopax rusticola, Eurasian Woodcock
minor, American Woodcock
Phalaropus tricolor, Wilson's Phalarope
lobatus, Red-necked Phalarope
fulicaria, Red Phalarope

Family LARIDAE (Skuas, Gulls, Terns, and Skimmers)

Stercorarius pomarinus, Pomarine Jaeger
parasiticus, Parasitic Jaeger
longicaudus, Long-tailed Jaeger
Catharacta skua, Great Skua
maccormicki, South Polar Skua
Larus atricilla, Laughing Gull
pipixcan, Franklin's Gull
minutus, Little Gull
ridibundus, Black-headed (=Common Black-headed) Gull
philadelphia, Bonaparte's Gull
heermanni, Heermann's Gull
canus, Mew Gull
delawarensis, Ring-billed Gull
californicus, California Gull
argentatus, Herring Gull
thayeri, Thayer's Gull
glaucoides, Iceland Gull
fuscus, Lesser Black-backed Gull
schistisagus, Slaty-backed Gull
livens, Yellow-footed Gull
occidentalis, Western Gull
glaucescens, Glaucous-winged Gull
hyperboreus, Glaucous Gull
marinus, Great Black-backed Gull
Rissa tridactyla, Black-legged Kittiwake
brevirostris, Red-legged Kittiwake
Rhodostethia rosea, Ross' Gull
Xema sabini, Sabine's Gull
Pagophila eburnea, Ivory Gull
Sterna nilotica, Gull-billed Tern
caspia, Caspian Tern
maxima, Royal Tern elegans,
Elegant Tern
sandvicensis, Sandwich Tern

dougallii, Roseate Tern
hirundo, Common Tern
paradisaea, Arctic Tern
aleutica, Aleutian Tern
forsteri, Forster's Tern
antillarum, Least Tern
albifrons, Little Tern
sumatrana, Black-naped Tern
lunata, Gray-backed Tern
anaethetus, Bridled Tern
fuscata, Sooty Tern
Chlidonias leucopterus, White-winged Tern
niger, Black Tern
Anous stolidus, Brown Noddy
minutus, Black Noddy
tenuirostris, Lesser Noddy
Procelsterna cerulea, Blue-gray Noddy
Gygis alba, White Tern
Rynchops niger, Black Skimmer

Family ALCIDAE (Auks, Murres, and Puffins)

Alle alle, Dovekie
Uria aalge, Common Murre
lomvia, Thick-billed Murre
Alca torda, Razorbill
Cepphus grylle, Black Guillemot
columba, Pigeon Guillemot
Brachyramphus marmoratus, Marbled Murrelet
brevirostris, Kittlitz's Murrelet
Synthliboramphus hypoleucus, Xantus' Murrelet
craveri, Craveri's Murrelet
antiquus, Ancient Murrelet
Ptychoramphus aleuticus, Cassin's Auklet
Cyclorrhynchus psittaculus, Parakeet Auklet
Aethia pusilla, Least Auklet
pygmaea, Whiskered Auklet
cristatella, Crested Auklet
Cerorhinca monocerata, Rhinoceros Auklet
Fratercula cirrhata, Tufted Puffin
arctica, Atlantic Puffin
corniculata, Horned Puffin

Family COLUMBIDAE (Pigeons and Doves)

Columba squamosa, Scaly-naped Pigeon
leucocephala, White-crowned Pigeon
flavirostris, Red-billed Pigeon
inornata, Plain Pigeon
fasciata, Band-tailed Pigeon
Zenaida asiatica, White-winged Dove
aurita, Zenaida Dove
macroura, Mourning Dove
Columbina inca, Inca Dove
passerina, Common Ground-Dove
talpacoti, Ruddy Ground-Dove
Leptotila verreauxi, White-tipped Dove
Geotrygon chrysia, Key West Quail-Dove

mystacea, Bridled Quail-Dove
montana, Ruddy Quail-Dove

Family CUCULIDAE (Cuckoos, Roadrunners, and Anis)

Cuculus canorus, Common Cuckoo
saturatus, Oriental Cuckoo
fugax, Hodgson's Hawk-Cuckoo
Coccyzus erythropthalmus, Black-billed Cuckoo
americanus, Yellow-billed Cuckoominor, Mangrove Cuckoo
Geococcyx californianus, Greater Roadrunner
Saurothera vieilloti, Puerto Rican Lizard-Cuckoo
Crotophaga ani, Smooth-billed Ani
sulcirostris, Groove-billed Ani

Family TYTONIDAE (Barn Owls)

Tyto alba, Barn Owl (=Common Barn-Owl)

Family STRIGIDAE (Typical Owls)

Otus flammeolus, Flammulated Owl
asio, Eastern Screech-Owl
kennicottii, Western Screech-Owl
trichopsis, Whiskered Screech-Owl
nudipes, Puerto Rican Screech-Owl
Bubo virginianus, Great Horned Owl
Nyctea scandiaca, Snowy Owl
Surnia ulula, Hawk Owl (=Northern Hawk-Owl)
Glaucidium gnoma, Northern Pygmy-Owl
brasilianum, Ferruginous Pygmy-Owl
Micrathene whitneyi, Elf Owl
Speotyto (=Athene) cunicularia, Burrowing Owl
Strix occidentalis, Spotted Owl
varia, Barred Owl
nebulosa, Great Gray Owl
Asio otus, Long-eared Owl
flammeus, Short-eared Owl
Aegolius funereus, Boreal Owl
acadicus, Northern Saw-whet Owl

Family CAPRIMULGIDAE (Goatsuckers)

Chordeiles acutipennis, Lesser Nighthawk
minor, Common Nighthawk
gundlachii, Antillean Nighthawk
Nyctidromus albicollis, Pauraque (=Common Pauraque)
Phalaenoptilus nuttallii, Common Poorwill Caprimulgus
carolinensis, Chuck-will's-widow
ridgwayi, Buff-collared Nightjar
vociferus, Whip-poor-will
noctitherus, Puerto Rican Nightjar
indicus, Jungle Nightjar

Family APODIDAE (Swifts)

Crypseloides niger, Black Swift
Streptoprocne zonaris, White-collared Swift
Chaetura pelagica, Chimney Swift
vauxi, Vaux's Swift
Hirundapus caudacutus, White-throated Needletail

Apus apus, Common Swift
pacificus, Fork-tailed Swift
Aeronautes saxatalis, White-throated Swift
Tachornis phoenicobia, Antillean Palm Swift

Family TROCHILIDAE (Hummingbirds)
Colibri thalassinus, Green Violet-ear
Anthracothorax dominicus, Antillean Mango
viridis, Green Mango
Eulampis holosericeus, Green-throated Carib
Orthorhynchus cristatus, Antillean Crested Hummingbird
Chlorostilbon maugaeus, Puerto Rican Emerald
Cynanthus latirostris, Broad-billed Hummingbird
Hylocharis leucotis, White-eared Hummingbrd
Amazilia beryllina, Berylline Hummingbird
yucatanensis, Buff-bellied Hummingbird
violiceps, Violet-crowned Hummingbird
Lampornis clemenciae, Blue-throated Hummingbird
Eugenes fulgens, Magnificent Hummingbird
Heliomaster constantii, Plain-capped Starthroat
Calliphlox evelynae, Bahama Woodstar
Calothorax lucifer, Lucifer Hummingbird
Archilochus colubris, Ruby-throated Hummingbird
alexandri, Black-chinned Hummingbird
Calypte anna, Anna's Hummingbird
costae, Costa's Hummingbird
Stellula calliope, Calliope Hummingbird
Selasphorus platycercus, Broad-tailed Hummingbird
rufus, Rufous Hummingbird
sasin, Allen's Hummingbird

Family TROGONIDAE (Trogons)
Trogon elegans, Elegant Trogon
Euptilotus neoxenus, Eared Trogon

Family UPUPIDAE (Hoopoes)
Upupa epops, Hoopoe

Family ALCEDINIDAE (Kingfishers)
Ceryle torquata, Ringed Kingfisher
alcyon, Belted Kingfisher
Chloroceryle americana, Green Kingfisher

Family PICIDAE (Woodpeckers and Allies)
Jynx torquilla, Eurasian Wryneck
Melanerpes lewis, Lewis' Woodpecker
erythrocephalus, Red-headed Woodpecker
formicivorus, Acorn Woodpecker
uropygialis, Gila Woodpecker
aurifrons, Golden-fronted Woodpecker
carolinus, Red-bellied Woodpecker
portoricensis, Puerto Rican Woodpecker
Sphyrapicus varius, Yellow-bellied Sapsucker
nuchalis (=varius), Red-naped (=Yellow-bellied) Sapsucker
ruber, Red-breasted Sapsucker
thyroideus, Williamson's Sapsucker

Picoides scalaris, Ladder-backed Woodpecker
nuttallii, Nuttall's Woodpecker
pubescens, Downy Woodpecker
villosus, Hairy Woodpecker
stricklandi, Strickland's Woodpecker
borealis, Red-cockaded Woodpecker
albolarvatus, White-headed Woodpecker
tridactylus, Three-toed Woodpecker
arcticus, Black-backed Woodpecker
Colaptes auratus, Northern Flicker
chrysoides (=auratus), Gilded (=Northern) Flicker
Dryocopus pileatus, Pileated Woodpecker
Campephilus principalis, Ivory-billed Woodpecker

Family TYRANNIDAE (Tyrant Flycatchers)

Elaenia martinica, Caribbean Elaenia
Camptostoma imberbe, Northern Beardless-Tyrannulet
Contopus borealis, Olive-sided Flycatcher
pertinax, Greater Pewee
sordidulus, Western Wood-Pewee
virens, Eastern Wood-Pewee
latirostris, Lesser Antillean Pewee
Empidonax flaviventris, Yellow-bellied Flycatcher
virescens, Acadian Flycatcher
alnorum, Alder Flycatcher
traillii, Willow Flycatcher minimus,
Least Flycatcher
hammondii, Hammond's Flycatcher
oberholseri, Dusky Flycatcher
wrightii, Gray Flycatcher
difficilis, Pacific-slope (=Western) Flycatcher
occidentalis (=difficilis), Cordilleran (=Western) Flycatcher
fulvifrons, Buff-breasted Flycatcher
Sayornis nigricans, Black Phoebe
phoebe, Eastern Phoebe
saya, Say's Phoebe
Pyrocephalus rubinus, Vermilion Flycatcher
Myiarchus tuberculifer, Dusky-capped Flycatcher
cinerascens, Ash-throated Flycatcher
nuttingi, Nutting's Flycatcher crinitus,
Great Crested Flycatcher
tyrannulus, Brown-crested Flycatcher
antillarum, Puerto Rican Flycatcher
Pitangus sulphuratus, Great Kiskadee
Myiodynastes luteiventris, Sulphur-bellied Flycatcher
Tyrannus melancholicus, Tropical Kingbird
couchii, Couch's Kingbird
vociferans, Cassin's Kingbird
crassirostris, Thick-billed Kingbird
verticalis, Western Kingbird
tyrannus, Eastern Kingbird
dominicensis, Gray Kingbird
caudifasciatus, Loggerhead Kingbird
forficatus, Scissor-tailed Flycatcher
savana, Fork-tailed Flycatcher

Pachyramphus aglaiae, Rose-throated Becard

Family ALAUDIDAE (Larks)

Alauda arvensis, Sky (=Eurasian) Lark (=Skylark)
Eremophila alpestris, Horned Lark

Family HIRUNDINIDAE (Swallows)

Progne subis, Purple Martin
cryptoleuca, Cuban Martin
dominicensis, Caribbean Martin
chalybea, Gray-breasted Martin
Tachycineta bicolor, Tree Swallow
thalassina, Violet-green Swallow
cyaneoviridis, Bahama Swallow
Stelgidopteryx serripennis, Northern Rough-winged Swallow
Riparia riparia, Bank Swallow
Hirundo pyrrhonota, Cliff Swallow
fulva, Cave Swallow
rustica, Barn Swallow
Delichon urbica, Common House-Martin

Family CORVIDAE (Jays, Magpies, and Crows)

Perisoreus canadensis, Gray Jay
Cyanocitta stelleri, Steller's Jay
cristata, Blue Jay
Cyanocorax yncas, Green Jay
morio, Brown Jay
Aphelocoma coerulescens, Florida (=Scrub) Scrub-Jay (=Jay)
insularis, Island (=Scrub) Scrub-Jay (=Jay)
californica, Western (=Scrub) Scrub-Jay (=Jay)
ultramarina, Mexican (=Gray-breasted) Jay
Gymnorhinus cyanocephalus, Pinyon Jay
Nucifraga columbiana, Clark's Nutcracker
Pica pica, Black-billed Magpie
nuttalli, Yellow-billed Magpie
Corvus brachyrhynchos, American Crow
caurinus, Northwestern Crow
leucognaphalus, White-necked Crow
imparatus, Mexican Crow
ossifragus, Fish Crow
hawaiiensis, Hawaiian Crow
cryptoleucus, Chihuahuan Raven
corax, Common Raven

Family PARIDAE (Titmice)

Parus atricapillus, Black-capped Chickadee
carolinensis, Carolina Chickadee
sclateri, Mexican Chickadee
gambeli, Mountain Chickadee
cinctus, Siberian Tit
hudsonicus, Boreal Chickadee
rufescens, Chestnut-backed Chickadee
wollweberi, Bridled Titmouse
inornatus, Plain Titmouse bicolor,
Tufted Titmouse

Family REMIZIDAE (Verdins)

Auriparus flaviceps, Verdin

Family AEGITHALIDAE (Bushtits)

Psaltriparus minimus, Bushtit

Family SITTIDAE (Nuthatches)

Sitta canadensis, Red-breasted Nuthatch
carolinensis, White-breasted Nuthatch
pygmaea, Pygmy Nuthatch
pusilla, Brown-headed Nuthatch

Family CERTHIIDAE (Creepers)

Certhia americana, Brown Creeper

Family TROGLODYTIDAE (Wrens)

Campylorhynchus brunneicapillus, Cactus Wren
Salpinctes obsoletus, Rock Wren
Catherpes mexicanus, Canyon Wren
Thryothorus ludovicianus, Carolina Wren
bewickii, Bewick's Wren
Troglodytes aedon, House Wren
troglodytes, Winter Wren
Cistothorus platensis, Sedge Wren
palustris, Marsh Wren

Family CINCLIDAE (Dippers)

Cinclus mexicanus, American Dipper

Family MUSCICAPIDAE (Kinglets, Gnatcatchers, Thrushes, and Allies)

Locustella ochotensis, Middendorff's Grasshopper-Warbler
Phylloscopus borealis, Arctic Warbler
trochilus, Willow Warbler
Regulus satrapa, Golden-crowned Kinglet
calendula, Ruby-crowned Kinglet
Polioptila caerulea, Blue-gray Gnatcatcher
melanura, Black-tailed Gnatcatcher
californica (=melanura), California (=Black-tailed) Gnatcatcher
nigriceps, Black-capped Gnatcatcher
Muscicapa griseisticta, Gray-spotted Flycatcher
narcissina, Narcissus Flycatcher
Luscinia calliope, Siberian Rubythroat
svecica, Bluethroat
Monticola solitarius, Blue Rock Thrush
Oenanthe oenanthe, Northern Wheatear
Sialia sialis, Eastern Bluebird
mexicana, Western Bluebird
currucoides, Mountain Bluebird
Myadestes townsendi, Townsend's Solitaire
(=Phaeornis) myadestinus (=obscurus), Kamao (=Hawaiian Thrush)
(=Phaeornis) lanaiensis, (=obscurus), Olomao (=Hawaiian Thrush)
(=Phaeornis) obscurus, Omao (=Hawaiian Thrush)
(=Phaeornis) palmeri, Puaiohi (=Small Hawaiian Thrush)
Catharus fuscescens, Veery
minimus, Gray-cheeked Thrush
bicknelli (=minimus), Bicknell's (=Gray-cheeked) Thrush

ustulatus, Swainson's Thrush
guttatus, Hermit Thrush
Hylocichla mustelina, Wood Thrush
Turdus plumbeus, Red-legged Thrush
obscurus, Eyebrowed (=Eye-browed) Thrush
naumanni, Dusky Thrush
pilaris, Fieldfare
grayi, Clay-colored Robin
rufopalliatus, Rufous-backed Robin
migratorius, American Robin
Ixoreus naevius, Varied Thrush
Ridgwayia pinicola, Aztec Thrush

Family MIMIDAE (Mockingbirds, Thrashers, and Allies)
Dumetella carolinensis, Gray Catbird
Mimus polyglottos, Northern Mockingbird
Oreoscoptes montanus, Sage Thrasher
Toxostoma rufum, Brown Thrasher
longirostre, Long-billed Thrasher
bendirei, Bendire's Thrasher
redivivum, California Thrasher
crissale, Crissal Thrasher
lecontei, Le Conte's Thrasher
Margarops fuscatus, Pearly-eyed Thrasher

Family PRUNELLIDAE (Accentors)
Prunella montanella, Siberian Accentor

Family MOTACILLIDAE (Wagtails and Pipits)
Motacilla flava, Yellow Wagtail
cinerea, Gray Wagtail
alba, White Wagtail
lugens, Black-backed Wagtail
Anthus hodgsoni, Olive-backed (=Olive) Pipit (=Tree-Pipit)
gustavi, Pechora Pipit
cervinus, Red-throated Pipit
rubescens (=spinoletta), American (=Water) Pipit
spragueii, Sprague's Pipit

Family BOMBYCILLIDAE (Waxwings)
Bombycilla garrulus, Bohemian Waxwing
cedrorum, Cedar Waxwing

Family PTILOGONATIDAE (Silky-flycatchers)
Phainopepla nitens, Phainopepla

Family LANIIDAE (Shrikes)
Lanius excubitor, Northern Shrike
ludovicianus, Loggerhead Shrike

Family STURNIDAE (Starlings)
Sturnus philippensis, Violet-backed Starling

cineraceus, Ashy Starling

Family VIREONIDAE (Vireos)

Vireo griseus, White-eyed Vireo
latimeri, Puerto Rican Vireo
bellii, Bell's Vireo
atricapillus, Black-capped Vireo
vicinior, Gray Vireo
solitarius, Solitary Vireo
flavifrons, Yellow-throated Vireo
huttoni, Hutton's Vireo
gilvus, Warbling Vireo
philadelphicus, Philadelphia Vireo
olivaceus, Red-eyed Vireo
flavoviridis (=olivaceus), Yellow-green (=Red-eyed) Vireo
altiloquus, Black-whiskered Vireo

Family EMBERIZIDAE (Emberizids)
Subfamily PARULINAE (Wood-Warblers)

Vermivora bachmanii, Bachman's Warbler
pinus, Blue-winged Warbler
chrysoptera, Golden-winged Warbler
peregrina, Tennessee Warbler
celata, Orange-crowned Warbler
ruficapilla, Nashville Warbler
virginiae, Virginia's Warbler
crissalis, Colima Warbler
luciae, Lucy's Warbler
Parula americana, Northern Parula
pitiayumi, Tropical Parula
Dendroica petechia, Yellow Warbler
pensylvanica, Chestnut-sided Warbler
magnolia, Magnolia Warbler tigrina,
Cape May Warbler
caerulescens, Black-throated Blue Warbler
coronata, Yellow-rumped Warbler
nigrescens, Black-throated Gray Warbler
townsendi, Townsend's Warbler
occidentalis, Hermit Warbler
virens, Black-throated Green Warbler
chrysoparia, Golden-cheeked Warbler
fusca, Blackburnian Warbler
dominica, Yellow-throated Warbler
graciae, Grace's Warbler
adelaidae, Adelaide's Warbler
pinus, Pine Warbler
kirtlandii, Kirtland's Warbler
discolor, Prairie Warbler
palmarum, Palm Warbler
castanea, Bay-breasted Warbler
striata, Blackpoll Warbler
cerulea, Cerulean Warbler
angelae, Elfin Woods Warbler
varia, Black-and-white Warbler
Setophaga ruticilla, American Redstart
Protonotaria citrea, Prothonotary Warbler

Helmitheros vermivorus, Worm-eating Warbler
Limnothlypis swainsonii, Swainson's Warbler
Seiurus aurocapillus, Ovenbird
noveboracensis, Northern Waterthrush
motacilla, Louisiana Waterthrush
Oporornis formosus, Kentucky Warbler
agilis, Connecticut Warbler
philadelphia, Mourning Warbler
tolmiei, MacGillivray's Warbler
Geothlypis trichas, Common Yellowthroat
poliocephala, Gray-crowned Yellowthroat
Wilsonia citrina, Hooded Warbler
pusilla, Wilson's Warbler
canadensis, Canada Warbler
Cardellina rubrifrons, Red-faced Warbler
Myioborus pictus, Painted Redstart
miniatus, Slate-throated Redstart
Basileuterus culicivorus, Golden-crowned Warbler
rufifrons, Rufous-capped Warbler
Icteria virens, Yellow-breasted Chat
Peucedramus taeniatus, Olive Warbler

Subfamily THRAUPINAE (Tanagers)

Spindalis zena, Stripe-headed Tanager
Neospingus speculiferus, Puerto Rican Tanager
Piranga flava, Hepatic Tanager
rubra, Summer Tanager
olivacea, Scarlet Tanager
ludoviciana, Western Tanager
Euphonia musica, Antillean Euphonia

Subfamily CARDINALINAE (Cardinals, Grosbeaks, and Allies)

Rhodothraupis celaeno, Crimson-collared Grosbeak
Cardinalis cardinalis, Northern Cardinal
sinuatus, Pyrrhuloxia
Pheucticus chrysopeplus, Yellow Grosbeak
ludovicianus, Rose-breasted Grosbeak
malanocephalus, Black-headed Grosbeak
Guiraca caerulea, Blue Grosbeak
Passerina amoena, Lazuli Bunting
cyanea, Indigo Bunting
versicolor, Varied Bunting
ciris, Painted Bunting
Spiza americana, Dickcissel

Subfamily EMBERIZINAE (Sparrows and Allies)

Arremonops rufivirgatus, Olive Sparrow
Pipilo chlorurus, Green-tailed Towhee
erythrophthalmus, Eastern (=Rufous-sided) Towhee
maculatus (=erythrophthalmus), Spotted (=Rufous-sided) Towhee
fuscus, Canyon (=Brown) Towhee
crissalis (=fuscus), California (=Brown) Towhee
aberti, Abert's Towhee
Sporophila torqueola, White-collared Seedeater
Tiaris olivacea, Yellow-faced Grassquit
bicolor, Black-faced Grassquit
Loxigilla portoricensis, Puerto Rican Bullfinch
Aimophila aestivalis, Bachman's Sparrow
botterii, Botteri's Sparrow

cassinii, Cassin's Sparrow
carpalis, Rufous-winged Sparrow
ruficeps, Rufous-crowned Sparrow
Spizella arborea, American Tree Sparrow
passerina, Chipping Sparrow
pallida, Clay-colored Sparrow
breweri, Brewer's Sparrow
pusilla, Field Sparrow
wortheni, Worthen's Sparrow
atrogularis, Black-chinned Sparrow
Pooecetes gramineus, Vesper Sparrow
Chondestes grammacus, Lark Sparrow
Amphispiza bilineata, Black-throated Sparrow
belli, Sage Sparrow
quinquestriata, Five-striped Sparrow
Calamospiza melanocorys, Lark Bunting
Passerculus sandwichensis, Savannah Sparrow
Ammodramus bairdii, Baird's Sparrow
savannarum, Grasshopper Sparrow
henslowii, Henslow's Sparrow
leconteii, Le Conte's Sparrow
caudacutus, Saltmarsh Sharp-tailed (=Sharp-tailed) Sparrow
nelsoni (=caudacutus), Nelson's Sharp-tailed (=Sharp-tailed) Sparrow
maritimus, Seaside Sparrow
Passerella iliaca, Fox Sparrow
Melospiza melodia, Song Sparrow
lincolnii, Lincoln's Sparrow
georgiana, Swamp Sparrow
Zonotrichia albicollis, White-throated Sparrow
atricapilla, Golden-crowned Sparrow
leucophrys, White-crowned Sparrow
querula, Harris' Sparrow
Junco hyemalis, Dark-eyed Junco
phaeonotus, Yellow-eyed Junco
Emberiza rustica, Rustic Bunting
pallasi, Pallas' Bunting (=Reed-Bunting)
schoeniculus, Reed (=Common) Bunting (=Reed-Bunting)
Calcarius mccownii, McCown's Longspur
lapponicus, Lapland Longspur
pictus, Smith's Longspur
ornatus, Chestnut-collared Longspur
Plectrophenax nivalis, Snow Bunting
hyperboreus, McKay's Bunting

Subfamily ICTERIDAE (Blackbirds and Allies)

Dolichonyx oryzivorus, Boblink
Agelaius phoeniceus, Red-winged Blackbird
tricolor, Tricolored Blackbird
humeralis, Tawny-shouldered Blackbird
xanthomus, Yellow-shouldered Blackbird
Sturnella magna, Eastern Meadowlark
neglecta, Western Meadowlark
Xanthocephalus xanthocephalus, Yellow-headed Blackbird
Euphagus carolinus, Rusty Blackbird
cyanocephalus, Brewer's Blackbird
Quiscalus mexicanus, Great-tailed Grackle
major, Boat-tailed Grackle

quiscula, Common Grackle
niger, Greater Antillean Grackle
Molothrus bonariensis, Shiny Cowbird
aeneus, Bronzed Cowbird
ater, Brown-headed Cowbird
Icterus dominicensis, Black-cowled Oriole
wagleri, Black-vented Oriole
spurius, Orchard Oriole
cucullatus, Hooded Oriole
pustulatus, Streak-backed Oriole
gularis, Altamira Oriole
graduacauda, Audubon's Oriole
galbula, Baltimore (=Northern) Oriole
bullockii (=galbula), Bullock's (=Northern) Oriole
parisorum, Scott's Oriole

Family FRINGILLIDAE (Finches)

Fringilla montifringilla, Brambling
Leucosticte atrata (=arctoa), Black (=Rosy) Rosy-Finch (=Finch)
australis (=arctoa), Brown-capped (=Rosy) Rosy-Finch (=Finch)
tephrocotis (=arctoa), Gray-crowned (=Rosy) Rosy-Finch (=Finch)
Pinicola enucleator, Pine Grosbeak
Carpodacus erythrinus, Common Rosefinch
purpureus, Purple Finch
cassinii, Cassin's Finch
mexicanus, House Finch
Loxia curvirostra, Red Crossbill
leucoptera, White-winged Crossbill
Carduelis flammea, Common Redpoll
hornemanni, Hoary Redpoll
pinus, Pine Siskin
psaltria, Lesser Goldfinch
lawrencei, Lawrence's Goldfinch
tristis, American Goldfinch
sinica, Oriental Greenfinch
Pyrrhula pyrrhula, Eurasian Bullfinch
Coccothraustes vespertinus, Evening Grosbeak
coccothraustes, Hawfinch

APPENDIX G

LAWS, REGULATIONS, POLICIES AND EXECUTIVE ORDERS

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CONTENTS

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LAWS, REGULATIONS, POLICIES, AND EXECUTIVE ORDERS

Federal

American Indian Religious Freedom Act (42 USC §1196) – requires the U.S. to protect and preserve religious rights of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

Animal Damage Control Act (7 USC §426 *et seq*.) – provides broad authority for investigation, demonstrations and control of mammalian predators, rodents and birds.

Environmental Safeguard for Activities for Animal Damage Control on Federal Lands (EO 11870) - restricts the use of chemical toxicants for mammal and bird control.

American Antiquities Act of 1906 (16 USC §431-433) – provides for the protection of items of archeological significance, both historic and prehistoric.

Archeological and Historical Preservation Act of 1974 (16 U.S.C 469 *et seq*.) – provides for the preservation of historical and archeological data (including relics and specimens).

Archeological Resources Protection Act of 1979 (16 USC §470 *et seq*.) – prohibits the excavation or removal from Federal or Indian lands any archeological resources without a permit from the land manager.

Bald Eagle Protection Act (16 USC §668a-d) – prohibits taking or harming bald or golden eagles, their eggs, nests, or young without appropriate permit.

Clean Air Act, as amended (42 USC §7401 *et seq*.) – regulates air emissions from area, stationary, and mobile sources. This law authorizes the USEPA to establish NAAQS to protect public health and the environment.

Clean Water Act (CWA): Section 401 Water Quality Certification, 1986, 33 USC §1341 – requires state certification of federal permits that result in actions that discharge into navigable waters. Under Section 401, states have authority to review federal permits that may result in a discharge to wetlands or water bodies under state jurisdiction.

Clean Water Act (CWA): Section 404, Permits for Dredged or Fill Material, 1977, 33 USC §1344 – establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404regulation (e.g. certain farming and forestry activities.

Endangered Species Act of 1973, as amended (16 USC §1531 *et seq.*) – provides for the identification and protection of threatened and endangered plants and animals and their critical habitats. Requires federal agencies to conserve T/E species and cooperate with State and local authorities to resolve water resources issues in concert with the conservation of T&E species.

Federal Insecticide, Fungicide, and Rodenticide Act (7 USC §136) – Governs the use and application of pesticides in natural resource management programs.

Federal Land Policy and Management Act (43 USC §1701) – Establishes public land policy and guidelines for its administration and provides for the management, protection, development, and enhancement of the public lands.

Federal Noxious Weed Act of 1974 (7 USC §2801 *et seq*.) – Establishes control and eradication of noxious weeds and regulates them in interstate and foreign commerce.

Federal Water Pollution Control Act as amended by the CWA of 1977 (33 USC §1251) – Regulates dredging and filling of wetlands and waterbodies and establishes procedures for identifying and regulating non-point sources of pollutants, including turbidity, into waterways.

Federal Water Pollution Control Act: Section 404, as amended by the CWA of 1977 (33 USC §1251) – Prohibits the discharge of dredged or filled materials into waters of the United States, including wetlands, without first obtaining a permit from USACE. Activities in wetlands that require federal permits include, but are not limited to: placement of fill material; ditching activities when the excavated material is sidecast, mechanized land clearing; land leveling; and most road construction.

Fish and Wildlife Conservation Act (16 USC §2901) – Provides for the protection of non-game fish and wildlife.

Fish and Wildlife Coordination Act (16 USC §661 *et seq*.) – Provides mechanism for wildlife conservation to receive equal consideration and be coordinated with water-resource development programs.

Floodplain Management (EO 11988) – Requires agencies to assess the effects that their actions may have on floodplains and to consider alternatives to avoid adverse effects and incompatible development on floodplains.

Forest and Rangeland Renewable Resources Planning Act (16 USC §1601 *et seq*.) – Requires and inventory of potential renewable resources and an evaluation of opportunities for improving their yield on goods and services. Agencies must provide an opportunity for public involvement and consultation with other agencies in establishing policies for multiple use and sustained yield.

Greening the Government through Leadership in Environmental Management (EO 13148) – This EO (Section 207, Environmentally and Economically Beneficial Landscaping) states that "each agency shall strive to promote the sustainable management of Federal facility lands through the implementation of cost-effective, environmentally sound landscaping practices, and programs to reduce adverse impacts to the natural environment."

Hunting and Fishing on Federal Lands (10 USC §2671 *et seq*.) – establishes requirements for regulating hunting, fishing, and trapping on military lands.

Indian Sacred Sites (EO 13007) – Provides for the protection of and access to Indian sacred sites.

Invasive Species (EO 13112) – Requires Federal agencies to: "prevent the introduction of invasive species"; "detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner"; "monitor invasive species populations accurately and reliably, provide for restoration of native species and habitat conditions in ecosystems that have been invaded"; "conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species"; and "promote public education on invasive species and the means to address them."

Land and Water Conservation Act of 1965 (16 USC §4601 *et seq*.) – assists in preserving, developing, and assuring accessibility to outdoor recreation resources.

Legacy Resource Protection Program Act (P.L. 101-511) – established a program for the stewardship of biological, geophysical, cultural and historic resources on DoD lands.

Migratory Bird Conservation Act (16 USC §715 *et seq*.) – Establishes a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds.

Migratory Bird Treaty Act, as amended (16 USC §703-712) – Prohibits the taking or harming of a migratory bird, its eggs, nests, or young without the appropriate permit.

National Environmental Policy Act of 1969, as amended (42 USC §4321) – Provides a national charter for protection of the environment and requires Federal agencies to prepare a statement of environmental impact in advance of each major action that may significantly affect the quality of the human environment.

National Historic Preservation Act of 1966 (16 USC §470 *et seq*.) – provides for the preservation of historic properties throughout the U.S.

Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended (16 U.S.C 4701 *et seq*.) – established a program to prevent the introduction of and to control the spread of introduced aquatic nuisance species and the brown tree snake.

Off Road Vehicle Use on Public Lands (EO 11989) – limits the use of off-road vehicles on federal lands soil, water, or natural resources could be adversely affected.

Oil Pollution Prevention Act of 1990, Public Law 101-380 – Redefines the requirements of the National Contingency Plan to include planning for, rescue of, minimization of injury to, and assessment of damages for injury to fish and wildlife resources.

Outleasing for Grazing and Agriculture on Military Lands (10 USC §2667) – provides for the outleasing of public lands.

Protection and Enhancement of Environmental Quality (EO 11514) – provides for environmental protection of federal lands and enforces requirements of NEPA.

Protection and Enhancement of the Cultural Environment (EO 11593) – supports previous laws and provides for additional protection of cultural resources.

Protection of Wetlands (EO 11990) – requires agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands.

Recreational Fisheries (EO 12962) – requires Federal agencies, to the extent practicable and where permitted by law, "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities".

Sale of Certain Interests in Land, Logs (10 USC §2665) – Authorizes the sale of forest products and the reimbursement of the costs of managing forest resources for timber production.

Sikes Act "Conservation Programs on Military Reservations" (16 USC §670a *et seq*.) – Requires Federal military installations with adequate wildlife habitat to implement cooperative agreements with other agencies and develop long-range integrated natural resources management plans. Thereby, it is appropriate to manage natural resources for multipurpose uses and provide the public access to those uses to the extent consistent with the military mission. The act also sets guidelines for the collection of fees for the use of natural resources such as hunting and fishing.

Soil Conservation Act (16 USC §590a *et seq*.) – provides for soil conservation practices on Federal lands.

State

Endangered and Threatened Wildlife and Wildlife Species of Special Concern (Article 25 NCGS Annotated § 113-331 – 377). This North Carolina statutory section comprises the state's endangered species provisions. Endangered species is defined as any native or once-native species of wild animal whose continued existence as a viable component of the State's fauna is determined by the Wildlife Resources Commission to be in jeopardy or any species of wild animal determined to be an "endangered species" pursuant to the Endangered Species Act. The statute empowers the Wildlife Resources Commission to list species and also outlines the criteria for listing. Under the act, it is unlawful to take, possess, transport, sell, barter, trade, exchange, export, or offer for sale, barter, trade, exchange or export, or give away for any purpose including advertising or other promotional purpose any animal on a protected wild animal list.

North Carolina Prescribed Burning Act (Article 4E of NCGS § 113-60.40 to 60.45). The General Assembly finds that prescribed burning of forestlands is a management tool that is beneficial to North Carolina's public safety, forest and wildlife resources, environment, and economy. **NCGS § 113-60.43** outlines the requirements for prescribed burning as follows:

(a) Prior to conducting a prescribed burning, the landowner shall obtain a prescription for the prescribed burning prepared by a certified prescribed burner and filed with the Division of Forest Resources, Department of Environment and Natural Resources. A copy of the prescription shall be provided to the landowner. A copy of this prescription shall be in the possession of the responsible burner on site throughout the duration of the prescribed burning. The prescription shall include:

(1) The landowner's name and address.
(2) A description of the area to be burned.
(3) A map of the area to be burned.
(4) An estimate in tons of the fuel located on the area.
(5) The objectives of the prescribed burning.
(6)) A list of the acceptable weather conditions and parameters for the prescribed burning sufficient to minimize the likelihood of smoke damage and fire escaping onto adjacent areas.
(7) The name of the certified prescribed burner responsible for conducting the prescribed burning.
(8) A summary of the methods that are adequate for the particular circumstances involved to be used to start, control, and extinguish the prescribed burning.
(9) Provision for reasonable notice of the prescribed burning to be provided to nearby homes and businesses to avoid effects on health and property.

(b) The prescribed burning shall be conducted by a certified prescribed burner in accordance with a prescription that satisfies subsection (a) of this section. The certified prescribed burner shall be present on the site and shall be in charge of the burning throughout the period of the burning. A landowner may conduct a prescribed burning without being a certified prescribed burner if the landowner is burning a tract of forestland of 50 acres or less owned by that landowner and is following all conditions established in a prescription prepared by a certified prescribed burner.

(c) Prior to conducting a prescribed burning, the landowner or the landowner's agent shall obtain an open-burning permit under Article 4C of this Chapter from the Division of Forest Resources, Department of Environment and Natural Resources. This open-burning permit must remain in effect throughout the period of the prescribed burning. The prescribed burning shall be conducted in compliance with all the following:

(1) The terms and conditions of the open-burning permit under Article 4C of this Chapter.
(2) The State's air pollution control statutes under Article 21 and Article 21B of Chapter 143 of the General Statutes and any rules adopted pursuant to these statutes.
(3) Any applicable local ordinances relating to open burning.
(4) The voluntary smoke management guidelines adopted by the Division of Forest Resources, Department of Environment and Natural Resources.
(5) Any rules adopted by the Division of Forest Resources, Department of Environment and Natural Resources, to implement this Article. (1999-121, s. 1.)

Regulation of Open Fires (Article 4C of NCGS § 113-60.21 to 60.31). The purpose of this Article is to regulate certain open burning in order to protect the public from the hazards of forest fires and air pollution and to adapt such regulation to the needs and circumstances of the different areas of North Carolina. The General Assembly finds that open burning in proximity to woodlands must be regulated in all counties to protect against forest fires and air pollution. The General Assembly further finds that in certain counties a high percentage of the land area contains organic soils or forest types which may pose greater problems of forest fire and air pollution controls, and that in counties in which a great amount of land-clearing operations is taking place on these organic soils or these forest types, additional control of open burning is required. The counties subject to the need for additional control are classified as high hazard counties for purpose of this Article. High harzard communities include: Beaufort, Bladen, Camden, Carteret, Chowan, Craven, Currituck, Dare, Duplin, Gates, Hyde, Jones, Onslow, Pamlico, Pasquotank, Perquimans, Tyrrell, and Washington.

Plant Protection and Conservation Act (Article 19B of NCGS § 106-202.12-22). The General Assembly finds that the recreational needs of the people, the interests of science, and the economy of the State require that threatened and endangered species of plants and species of plants of special concern be protected and conserved, that their numbers should be enhanced and that propagative techniques be developed for them; however, nothing in this Article shall be construed to limit the rights of a property owner, without his consent, in the management of his lands for agriculture, forestry, development or any other lawful purpose.

North Carolina Plant Pest Law (Article 36 NCGS § 106-419). Any plant, plant product, object or article which has been, or which the Commissioner of Agriculture or his agents have reasonable grounds to believe has been exposed to a plant pest, may be treated as a plant pest for the purposes of this Article.

Aquatic Weed Control Act of 1991 (Article 15 of NCGS § 113A-220 *et seq)*. This act provides the Department of Agriculture with the authority to regulate the importation, sale, use, and distribution of noxious aquatic weeds. As implemented, the law and regulations provide the long-term mechanisms for protecting North Carolina agriculture and its citizens from the threat of terrestrial and aquatic noxious weeds. The Department works extensively with noxious weed pests such as witchweed, itchgrass, orobanche, purple loosestrife and musk thistle.

North Carolina Pesticide Law of 1971 (Article 52 of NCGS § 143-434, *et seq)*. The purpose of this Article is to regulate in the public interest the use, application, sale, disposal and registration of insecticides, fungicides, herbicides, defoliants, desiccants, plant growth regulators, nematicides, rodenticides, and any other pesticides designated by the North Carolina Pesticide Board.

Open Burning (15A NCAC 02D .1901 *et seq*). The purpose of this Section is to control air pollution resulting from the open burning of combustible materials and to protect the air quality in the immediate area of the open burning. This regulation provides information on what types of open burning are permissible without an air quality permit. Violations to the open burning rule (15A NCAC 2D.1900 et seq.) can be fined up to $25,000 per violation or more for serious cases.

Noxious Weeds (02 NCAC 48A .1701-1708). These regulations were adopted under the authority of the North Carolina Plant Pest Law. They permit the Department of Agriculture to aggressively prevent the entry and subsequent spread of noxious weeds into North Carolina and to address the movement of noxious weeds and regulated articles within the state. Within these regulations, the Department has established three classes of noxious weeds (Classes: A, B and C).

North Carolina Surface Water and Wetland Standards (15A NCAC 2B .0100 *et. seq.*). These regulations outline the procedures the Environmental Management Commission uses to classify water quality standards of surface waters and wetland in the State of North Carolina and how they are used.

North Carolina Section 401 Certification (15A NCAC 2H; 15A NCAC 2B). 401 Water Quality Certifications are required for all 401 Permits issued by the Corps as well as for other federal permits, such as Federal Energy Regulatory Commission permits. The procedures for applying for a 401 certification in North Carolina are outlined in 15A NCAC 2H .0500 and generally follow the 404(b)(1) guidelines (avoid, minimize, and then mitigate). The State has adopted a list of activities which are exempt from state wetland permitting in 15ANCAC 2B .0230 that are very similar to the 404 exemptions. The State has adopted comprehensive riparian buffer protection rules for the Neuse (15A NCAC 2B .0243). Finally, the State has adopted rules regulating the fill of isolated wetlands and isolated waters in 15A NCAC 2H .1300 based on the existing authority of the State to regulate impacts to state waters.

North Carolina Sedimentation Pollution Control Act of 1973 (Article 4 of GS 113A; 15A NCAC 4). It is the purpose of this Article to provide for the creation, administration, and enforcement of a program and for the adoption of minimal mandatory standards which will permit development of this State to continue with the least detrimental effects from pollution by sedimentation.

North Carolina Forest Practices Guidelines Related To Water Quality (FPG): (15A NCAC 01I .0100 - .0209). The FPGs are statewide, mandatory rule requirements that were developed to assure that forestry activities are conducted in a manner that protects our water quality. These regulations are administered as part of the North Carolina Sedimentation Pollution Control Act of 1973 (SPCA). All sections of the FPG must be in compliance for your forestry-related, land-disturbing activity if it is to remain exempt from the full requirements of the SPCA.

Forest Development Act (Article 11 of NCGS § 113A-176 et seq.). The purpose of this Article is to direct the Secretary to implement a forest development program to: (1) provide financial assistance to eligible landowners to increase the productivity of the privately owned forests of the State through the application of forest renewal practices and other practices that improve tree growth and overall forest health; (2) insure that forest operations in the State are conducted in a manner designed to protect the soil, air, and water resources, including but not limited to streams, lakes and estuaries through actions of landowners on lands for which assistance is sought under provisions in this Article; and (3) implement a program of voluntary landowner participation through the use of a forest development fund to meet the above goals.

DoD Regulations and Guidance

32 CFR 651	Environmental Effects of Army Actions
AR 200-1	Environmental Protection and Enhancement
AR 210-9	Use of Off-Road Vehicles on Army Lands
AR 405-80	Granting Use of Real Estate
AR 420-40	Historic Preservation
DoDI 4150.7M	DoD Pest Management Training and Certification
DoDI 4150.7P	DoD Plan for the Certification of Pesticide Applicators
DoDI 4715.3	Environmental Conservation Program
TC 25-1	Training Land
TM 5-630	Land Management
TM 5-631	Forest Management
TM 5-633	Fish and Wildlife Management

JFHQ – NC Regulation 215-2

Morale, Welfare and Recreation

Deer Hunting on Camp Butner Training Site (CBTS)

Joint Force Headquarters
North Carolina National Guard
Raleigh, NC Effective
Date October 2008

UNCLASSIFIED

SUMMARY OF CHANGES

JFHQ-NC Reg 215-2
Morale, Welfare, and Recreation – Deer Hunting on Camp Butner Training Site (CBTS)

This regulation provides updated information about the Subject Title, specifically –

- Regulation reformatted to comply with AR 25-30.
- Renamed in accordance with Office of the Adjutant General guidance

Joint Force Headquarters
North Carolina National Guard
Raleigh, NC
October 2008

*JFHQ-NC REGULATION 215-2

MORALE, WELFARE, AND RECREATION

DEER HUNTING ON CAMP BUTNER TRAINING SITE (CBTS)

By order of the Adjutant General:

WILLIAM E. INGRAM, JR.
Major General
Adjutant General
Official:

CHARLES E. JACKSON
Colonel, GS, NCARNG
Deputy Chief of Staff, Operations

History. This publication replaces OTAGNC Regulation 215-2 dated 15 August 2004. Changes are, for the most part, to comply with the publication format dictated by AR 25-30 and doctrinal changes are few.

Summary. This regulation provides policies and procedures relative to hunting on the North Carolina National Guard's Camp Butner Training Site (CBTS).

Applicability. This regulation applies to all military personnel and civilians hunting on Camp Butner Training Site.

Proponent and exception authority. The proponent of this regulation is the Deputy Chief of Staff, Operations, North Carolina National Guard. The proponent has the authority to approve exceptions or waivers to this regulation that are consistent with controlling law and regulations.

Army Management Control Process. This regulation does not contain management control provisions.

Supplementation. Local supplementation of this regulation is prohibited without prior approval of Deputy Chief of Staff, Operations.

Suggested Improvements. The proponent of this regulation is the Deputy Chief of Staff, Operations. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Office of the Adjutant General, ATTN: DCSOPS, 4105 Reedy Creek Road, Raleigh, North Carolina 27607-6410

Contents

Chapter 2

Chapter 1. Hunting - General Provisions

1-1. Purpose.
To establish a controlled and safe deer hunting program for Camp Butner Training Site, Stem, North Carolina.

1-2. References.
There are no required publications. Related publications are as listed in Appendix A, References.

1-3. Explanation of Abbreviations and Terms.
Abbreviations and special terms used in this regulation are explained in the glossary, Appendix B.

1-4. Responsibilities.
- The Adjutant General will establish policies and procedures for the operation and use of all facilities at Camp Butner Training Site.

- The Deputy Chief of Staff, Operations will implement the Adjutant General's policies and procedures.

- The Camp Butner Facility Manager will conduct the day-to-day operations, schedule training areas, supervise the full-time staff, enforce the rules and regulations, and supervise the maintenance of the facilities and administration.

- Butner Public Safety Officers, NC Dept. of Wildlife Officers and other law enforcement agencies will enforce the state and local laws, regulations and restrictions on Camp Butner Training Site and provide law enforcement support to the range staff.

1-5. Policies and Procedures
This regulation for hunting activities on the facility is essential to permitting concurrent use by the military, hunters and/or other authorized personnel without interference or threat to anyone's safety. Should conflicts arise, military operations take priority and hunters will be required to relocate to an alternate hunting area. Failure to abide by this regulation will result in suspension of hunting privileges on CBTS for the remainder of the hunting season.

Seasonal hunting periods for the State of North Carolina, Granville and Durham Counties will apply unless further limited by the facility. Hunting is authorized by permit and in designated areas only. Minors (under 16 years of age) must have a parent or legal guardian co-sign their request for hunting permit and release forms. They must be accompanied by a parent, legal guardian or other responsible adult when hunting on CBTS property. Refer to Chapter 3 (Requirements) and Chapter 4 (Camp Butner Hunting Areas Limitations).

Camp Butner range staff, law enforcement, and other duly authorized personnel have authority to:

- Limit, restrict, or deny access to permit holders as necessary due to prevailing requirements and/or conditions and/or previous experience with a specific permit holder.

- Revoke a hunting permit as appropriate to ensure the legal and safe operation of the facility and the safety and welfare of others. Reissue will require a new application. Appeals on revoked permits may be submitted to Camp Butner Training Site, 539 Roberts Chapel Road, Stem, North Carolina 27581-9549 within 15 days after the permit revocation date.

- Inspect a hunter's licenses and permit.

The loaning or transferring of a hunting permit is prohibited. A loaned or transferred hunting permit will be subject to revocation by authorized personnel.

Law enforcement personnel have arrest authority for violations committed on Camp Butner Training Site property.

1-6. Safety

It is the responsibility of everyone to ensure safety is a priority. Hunters should be aware of potential dangers at all times.

It is recommended that hunters have a noise producing device, such as a whistle, that can be used in the event that an injury occurs. This would be used to summon help and assist in identifying the location of the injured person.

Camp Butner Training Site is open to military training, horseback riding and hunting. It is imperative that personnel comply with the constraints and limitations that are issued from range headquarters. The first priority for use of Camp Butner Training Site is given to military small arms live fire training and other military training.

All hunters must wear HUNTER'S BLAZE ORANGE at all times while hunting on Camp Butner Training Site property.

Chapter 2
Facility Description and Boundaries

2-1. General.
CBTS is a former World War II training camp. Most of the area currently known as CBTS lies in what was once a major impact zone. Unexploded ammunition (UXO), also known as "DUDS", of all types are still being found. If a "DUD" is discovered, do not disturb it in any way and clearly mark the area if possible. Contact Range Headquarters and report the location. Range Headquarters will contact Explosive Ordnance Disposal, (EOD) at Fort Bragg, North Carolina for appropriate action. Do not in any way attempt to remove the object from its location. "DUDS" may explode causing injury and/or death.

Camp Butner Range Headquarters (Bldg 3400) is located at 539 Roberts Chapel Road, Stem, North Carolina 27581-9549, CML 919-620-5400. Hours of normal operation are 8:00 a.m. to 4:30 p.m. seven days a week. Range Headquarters may be closed during federal holidays. All closings will be posted at Range Headquarters. Camp Butner is patrolled 24 hours a day by Butner Public Safety Officers. Butner Public Safety can be reached at 919-575-6561 Extension 0, or by dialing 911.

2-2. BOUNDARIES Camp Butner Training Site is NOT an open range. Anyone caught damaging a gate or gate lock will have their privilege of hunting on CBTS permanently revoked and will be prosecuted to the fullest extent of the law. Damage to a gate along the impact area perimeter or on the north boundary could result in someone walking or driving into the impact area during a live fire exercise possibly causing serious injury or death. See Figure 2 for a copy of the facility map overprinted to show the hunting area.

Chapter 3. Requirements

3-1. Permit Requirement ALL HUNTERS ENTERING CAMP BUTNER PROPERTY MUST HAVE A PERMIT. Minors, under age 16 years of age, must be co-signed by a parent or legal guardian.

3-2. License Requirements.

- A valid North Carolina State Wildlife Hunting License (Age 16 years and older).
- A properly completed application form.

3-3. Fees. A fee, per applicant, per one-week hunting period must be paid at the time the application is submitted. Fees must be paid to Camp Butner Training Site. This fee is non refundable in the event of a permit revocation. The hunting permit fee for each one-week hunting period is $50.00 per person. All hunting permit fees collected will be deposited into the CBTS Unit Fund account.

3-4. Hunting Coordination Requirements.
All hunters must have the appropriate licenses and permits in their possession while on Camp Butner Training Site property. Hunters should ensure they do not hunt on or cross private property adjoining Camp Butner Training Site without the specific land owner's permission. Failure to do so may constitute trespassing by the property owner. Applications will be distributed from and accepted at Range Headquarters, Bldg 3400. Permits will be issued at the above location throughout the hunting season, Monday through Sunday from 9:00 a.m. until 3:00 p.m. Permits are valid only during the one-week period for which they are issued.

3-5. Rules of Conduct.

- Open fires are prohibited unless authorized in writing by Range Headquarters. Any hunter observing an uncontrolled fire will immediately leave the area and notify Range Headquarters or Butner Public Safety. Telephone number for Range Headquarters is (9l9) 620-5400 and Butner Public Safety (919) 575-5761 then press 0.
- There will be NO dumping of trash on CBTS property. Trash will be taken off the facility for disposal. Anyone caught littering on the facility will have their permit revoked for the remainder of the hunting season.
- No digging is allowed on the facility.
- No alcoholic beverages are allowed on the facility.

- Hunters may not enter onto the facility more than 60 minutes prior to official hunting start time as prescribed by the N C Wildlife Hunting Regulation. **(Official hunting time is dawn to dusk).**

- Removal or damage of trees, shrubs, bushes, or plants is prohibited.

- Privately owned vehicles (POV) are prohibited from entering Camp Butner Training Site property except in designated parking areas. This includes any motorized form of transportation. **Do not park any POV in front of or near any CBTS yellow or cable gates.**

- Entry onto CBTS property other than during authorized hunting periods is prohibited.

- Access to Holt Lake from within the facility boundary and/or fishing from within the boundary is prohibited.

- Construction and/or use of any tree-stand, platform, or other device attached by nails, screws, bolts, or wire, is prohibited.

- The use of dogs for hunting is prohibited. Dogs found on the property are subject to capture. At such time, they will be turned over to the appropriate agency. Violators are subject to the provisions of paragraph 1-5 of this regulation.

- Any hunter observing another hunter acting in an unsafe manner should report the incident to Range Headquarters.

- At no time shall any hunter aim a weapon, loaded or unloaded, towards any building, vehicle or another person.

- Anyone caught shooting at signs or other CBTS property will have his/her permit revoked and will be liable for the cost of repairs to the damaged property.

- Loaded weapons are allowed in appropriate hunting areas only. Guns (loaded or unloaded) are only allowed in gun hunting area during gun hunting periods.

Chapter 4. Camp Butner Deer Hunting Areas and Limitations

4-1. Authorization. Range Headquarters will authorize hunting in hunting area designations as shown in paragraph 4-2 and Figure 2. Hunters will be restricted to those assigned areas

4-2. Hunting Areas. Hunting is authorized in the areas listed below with the type hunting allowed noted: See map at Figure 2

4-3. Access to Hunting Areas is allowed only from exterior gates or public roads. Entry into a hunting area via adjoining landowners' private property without permission is prohibited and subject to prosecution by the property owner for trespassing.

4-4. Buffer A fifty foot (50') buffer must be maintained from CBTS's outer boundaries. No hunting is allowed in these buffer areas.

4-5. Weapons and Ammunition.

Authorized weapons include:

- Shotguns 20 through 10 gauge firing buck shot, no slugs.
- Crossbows – Allowed as directed and permitted by NC Hunting Laws.
- Muzzle loading rifles .40 caliber and larger.

Unauthorized for hunting, or in the possession while hunting:

- Rifled slugs.

Appendix A
References

Section I
Required Publications

None

Section II
Related Publications

AR 200-1 (Environmental Protection and Enhancement)

AR 210-20 (Master Planning for Army Installations)

AR 210-21 (Ranges and Training Areas)

AR 385-30 (Safety Color Codes, Markings and Signs)

AR 385-63 and FORSCOM Supplement 1 (Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat)

OTAGNC Reg 350-7 (Camp Butner Range Operations and Administration)

Section III
Prescribed Forms

Application for Deer Hunting Permit and Liabilities Release Form (Adjusted annually)

Section IV
Referenced Forms

None

Appendix B
Glossary

Definitions

For the purpose of this regulation the following shall be interpreted to mean:

Authorize: Having obtained permission from the appropriate office, agency, person or persons to perform a certain act.

Cancellation: To render null and void.

DUDS: Any type of explosive ammunition that has failed to detonate since fired from its respective weapon, yet may remain in an explosive stage for years. Touching or disturbing a DUD in any way may cause it to explode.

Facility: All property owned by the North Carolina National Guard that is defined as Camp Butner Training Site.

Facility Manager, Camp Butner Training Site(CBTS): The full-time person authorized to act on behalf of the Adjutant General of the State North Carolina and is responsible for the day-to-day management and operation of the facility.

Impact Zone/Impact Area: An area down range from a live ammunition firing point where expended ammunition may travel and hit. The area is clearly identified by markers that read, "DANGER UNEXPLODED AMMUNITION, KEEP OUT, TRESPASSING ON OR REMOVAL OF ANY ITEM FROM RANGE IS PROHIBITED BY LAW".

Law Enforcement Personnel: Butner Public Safety Officers, North Carolina Wildlife Officers, County Sheriff's Deputies, and other duly sworn policing authority with jurisdiction on the facility.

Loaded Weapons: A weapon containing ammunition either in the chamber or magazine.

Privately Owned Vehicle (POV): Any vehicle being rented, owned or otherwise in the possession of an individual for private use. This includes any motorized form of transportation.

Staff: Personnel assigned to and responsible for the safe, legal and efficient operation of the facility.

Figure 1 (Established yearly as hunting periods are established for current years.)

☐ **Pd 1 Bow Only, xx-xx Oct XX**	**$50 per**	☐ **Pd 3 XX-XX Nov XX**
☐ **Pd 2 Bow Only, XX-XX Oct XX**	**Period**	☐ **Pd 4 XX-XX Dec XX**
		☐ **Pd 5 XX-XX Dec XX**

APPLICANT INFORMATION (PLEASE PRINT CLEARLY)
Applicants Name:

LAST: FIRST: MI:

STREET ADDRESS CITY STATE ZIP

DRIVERS LICENSE # STATE HOME PHONE/CELL PHONE

WILDLIFE LICENSES

HUNTING PERMIT # (SAME # AS DRIVERS LICENSE #)

LIFE HUNTING PERMIT #

RELEASE STATEMENT

KNOW ALL MEN BY THESE PRESENTS: In consideration of the privilege afforded me and/or my minor family member(s) or minor child(ren) under my supervision and sponsorship to utilize the facilities of Camp Butner Training Site, a North Carolina National Guard Training Facility, for the purpose of deer hunting, and as a condition precedent to the issuance of a permit and/or permission therefore I,_____, do hereby covenant not to sue or otherwise make claim upon, and do hereby release and agree to forever hold harmless the United States Government, the State of North Carolina, and the authorized agents and officials of the forenamed military installations from all claims, demands, actions, debts, liabilities, judgments, costs, attorney's fees, and all other expenses resulting from or incident to any loss or injury to myself and/or my family member(s) or minor family member(s) or minor child(ren) under my supervision and sponsorship, arising from any inherent or otherwise dangerous condition whether hidden or obvious, which might exist on, in, under, above, or near any hunting area whether or not any such inherent or otherwise dangerous condition is known to said United States Government, the State of North Carolina, or officials or agents thereof, and whether or not notice made known to the public or users of said facilities; also, for any loss or injury arising from hazardous conditions referred to herein include but are not limited to : DUDS, mines, barbed or concertina wire, falling into shell holes, emplacements, or the negligent acts of others. The provisions contained herein shall be binding upon my heirs, executors, administrators, guardians, representatives, and assigns.

This certifies that I have fully read and understand the provisions of this Release Statement and the Office of the Adjutant General or North Carolina Regulation (OTAGNCR 215-2), dated 1, March 2004 and accepted these as the terms and conditions under which the Camp Butner Training Site **Deer Hunting Permit** will be issued.

SIGNATURE OF APPLICANT **DATE**

SIGNATURE OF PARENT/LEGAL GUARDIAN **DATE**

SIGNATURE OF WITNESS **DATE**

****

CAMP BUTNER STAFF USE ONLY

PD 1 PERMIT # _____ **PD 2 PERMIT #** _____

PD 3 PERMIT # _____ **PD 4 PERMIT #** _____

200X

APPROVED BY: TITLE: DATE:

Figure 2

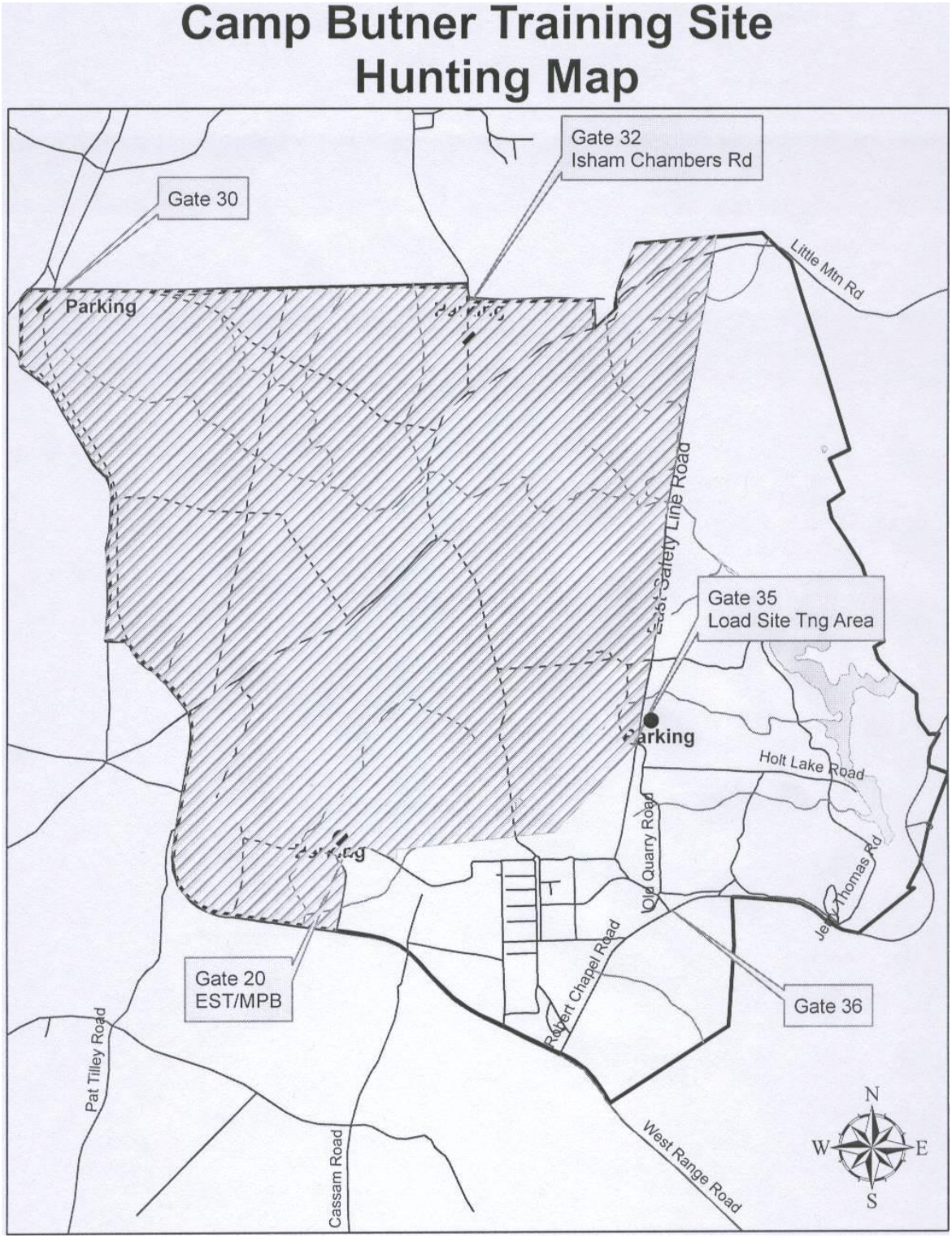
Camp Butner Training Site
Hunting Map
Gate 32
Isham Chambers Rd
Gate 30
Little Mtn Rd
Parking
East Safety Line Road
Gate 35
Load Site Tng Area
Parking
Holt Lake Road
Old Quarry Road
Jerry Thomas Rd
Robert Chapel Road
Gate 20
EST/MPB
Gate 36
Pat Tilley Road
Cassam Road
West Range Road
N
W
E
S

Figure 3

CAMP BUTNER HUNTING RULES - 200X

1. Camp Butner will have deer hunting this year in one week increments.

Bow Season Only	Bow/Muzzle/Pistol/Shotgun
xx-xx October 200x	xx-xx November 200x
xx-xx October 200x	xx-xx December 200x
	xx-xx December 200x

2. Application Process:

   a. Applications accepted beginning 1 August 200x.
   b. 50 hunter maximum per period
   c. $50 per period per person
   d. First come, first serve
   e. Money order only by mail. Cash accepted in person only.
   f. Address:

      CBTS
      Attn: Hunting Permit
      539 Roberts Chapel Road
      Stem, NC 27581-9549

   g. Telephone: (919) 620-5400

3. Requirements:

   a. All NC hunting laws apply.
   b. Valid NC Hunting License and applicable permits required.
   c. Picture ID required.
   d. NC State Hunting Laws regarding tagging and dressing apply.

4. Hunters will have access to all applicable gates.

5. Different colored passes will be issued for each period

6. Other Information:

   a. NO Rifles (except muzzle-loaders), no rifled slugs (buckshot only)
   b. NO ATVs
   c. Crossbows allowed as directed and permitted by State Law only.
   d. Two deer (either sex) limit per day
   e. Durham and Granville County laws apply
   f. Still hunting only
   g. **NO DOGS!**
   h. No dumping of deer parts/guts/carcasses anywhere on Camp Butner and adjacent roads.

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APPENDIX H

Camp Butner Training Site Invasive Species Management Plan

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Camp Butner Training Site

Stem, North Carolina

Invasive Species Management Plan

Final Report

Prepared for: North Carolina National Guard

Prepared by: AMEC Earth & Environmental, Inc.
4513 Creedmoor Road, Suite 400
Raleigh, NC 27612

Mission Statement: Provide ready forces to support Federal and State requirements; develop and participate in programs that add value to our members, families, employers, and communities.

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EXECUTIVE SUMMARY

This document is a product of contract between the North Carolina National Guard and AMEC Earth & Environmental, Inc (AMEC). The contract was established to identify and document invasive and exotic vegetation species occurring on Camp Butner Training Site (CBTS) and to produce an invasive species management plan that will provide an environmentally sound control of invasive and exotic vegetation species. The management of invasive and exotic species is required by several Federal regulations, including the Federal Noxious Weed Act of 1974 (7USC 2801 ct seq.) and Executive Order (EO) 13112.

Invasive species are found throughout the United States (US) and cause extensive damage to crops, rangelands, waterways, and other ecosystems. Annual cost of this damage is estimated in the billions of dollars. In addition to economic costs, invasive species can have a devastating effect on natural areas. The CBTS is charged to provide a variety of environmental conditions and ecosystems in which to train soldiers. This objective must be met in a way that provides for sustainable, healthy ecosystems, complies with all applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. The development of an Invasive Species Management Plan (ISMP) will aid installation commanders in managing natural resources more effectively and ensure that installation lands remain available and in good condition to support the installation's military mission.

The purpose of the ISMP is to identify and describe invasive exotic vegetation populations at CBTS. Maps of invasive populations are included to provide an inventory of invasive species populations. Taxonomic and biological characteristics of the established invasives are included as an educational tool for staff and management to aid in indentification and control of each species found at CBTS. Objectives of the investigation are to:

1) locate, map, and describe established populations of invasive plant species

2) estimate the area and density of invasive exotic plant populations

3) develop guidance for control and monitoring invaded areas

Invasive exotic vegetation were identified through field surveys. Man-made habitats or artificial areas, such as lawns, early successional areas, and recently cleared areas were areas of particular interest. CBTS rare natual communities were also a focus due to sensitivity of the habitats and ease of invasion by exotic species. Nine invasive species were found to have established populations at CBTS, and approximately six acres of Camp Butner is inhabited by invasive plant species.

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LIST OF APPENDICES

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ACRONYNMS AND ABBREVIATIONS

AFRC	Armed Forces Readiness Center
AMEC	AMEC Earth & Environmental, Inc.
CBTS	Camp Butner Training Site
GIS	Geographical Information Systems
GPS	Global Positioning System
EO	Executive Order
EPA	Environmental Protection Agency
ISMP	Invasive Species Management Plan
NC	North Carolina
NCDA&CS	North Carolina Department of Agriculture and Consumer Services
NCNG	North Carolina National Guard
US	United States
USDA	United States Department of Agriculture

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1.1 INTRODUCTION

Invasive species are found throughout the United States and cause extensive damage to crops, rangelands, waterways, and other ecosystems that is estimated in the billions of dollars annually. In addition to their economic costs, invasive species can have a devastating effect on natural areas. Many scientists believe that approximately 50% of the species on the threatened or endangered species list are at risk due to competition or predation from invasive species. After habitat loss, invasive species are the greatest threat to the survival of native flora and fuana. In addition to environmental effects invasive species have a direct affect on human health. West Nile, monkeypox, and SARS were all introduced through invasive species. The cumulative impacts of invasive species are only now being recognized and are currently regarded as one of the most serious threats of the twenty-first century.

CBTS is charged to provide a variety of environmental conditions and ecosystems in which to train soldiers. This objective must be met in a way that provides for sustainable, healthy ecosystems, complies with all applicable environmental laws and regulations, and provides for no net loss in the capability of military installation lands to support the military mission of the installation. Several Federal regulations, including the Federal Noxious Weed Act of 1974 (7 USC § 2801 *et seq*.) and Executive Order (EO) 13112, require Federal agencies to: "prevent the introduction of invasive species"; "detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner"; "monitor invasive species populations accurately and reliably, provide for restoration of native species and habitat conditions in ecosystems that have been invaded"; "conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species"; and "promote public education on invasive species and the means to address them.

Invasive species that gain a foothold on military installations impair military operations in numerous ways:

1. negate realistic conditions for training or testing operations and/or directly limit training activities.
2. exotic plants that ignite easily increase the frequency and severity of wildland fires
3. can block vision and compromise security around sensitive military facilities
4. over-run large areas of land required for training rendering it useless
5. require the diversion of funding from other natural resource or operation priorities.
6. act as one of the leading causes of habitat destruction and biodiversity loss, which can further reduce training land
7. pose a security risk and/or create potentially life-threatening situations.

With the main goal of providing troops with realistic training conditions in order to be prepared for missions, controlling invasive species becomes necessary and at the same time protects America's natural resources. An Invasive Species Managemnt Plan (ISMP) is a proactive tool to halt significant damage and gain advantage over invasive problems. It is an important tool that provides assistance to NCNG CBTS commanders to manage natural resources more effectively and ensures that installation lands remain available and in good condition to support the installation's military mission. ISMP objectives are the following:

1. To provide a formal inventory of invasive and exotic vegetation species (including noxious weeds) occurring on CBTS lands.
2. To provide taxonomic and ecological descriptions for existing populations of invasive exotic species established on CBTS.
3. To provide best management practices for invasive exotic species with guidance on the control and eradication of invasive species populations found at CBTS.

2.0 LOCATION DESCRIPTION

CBTS is approximately 4,880 acres in size, and is located in Durham and Granville Counties in the north central Piedmont section of North Carolina (Figure 1.1), approximately 35 miles northwest of Raleigh, 15 miles northeast of the city of Durham, and 4 miles northwest of the town of Butner and Interstate 85. The primary access to CBTS is provided by Range Road, approximately 2 miles north of its intersection with Old North Carolina Route 75. The Durham-Granville County line bisects CBTS, with the western portion of the installation included in Durham County and the eastern portion in Granville County. Holt Reservoir (historically Lake Butner), which is not a part of CBTS, separates a small southeastern section of CBTS property from the primary CBTS lands.

3.0 ISMP METHODS

AMEC conducted a review of existing data and a subsequent field investigation of the CBTS to identify and map invasive species populations. A description of the methods employed for the field investigation is provided below.

3.1 BACKGROUND DATA REVIEW

An "invasive species" is defined as a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and microorganisms. Because these new species are introduced to a new environment that has none of their natural enemies, they have the potential to persist, multiply, and spread very rapidly. Since invasive species are transported, either accidentally or intentionally, from one country to another, global trade and travel have significantly increased the number of invasions by harmful non-native species in every part of the world.

AMEC reviewed literature to determine new vegetative invasive fronts beginning to establish in the State of North Carolina (NC) and identified the existing list of invasive exotic species in NC. North Carolina Department of Agriculture & Consumer services (NCDA&CS) recognizes all class A Noxious Weeds on the Federal-listed species, as well as, fifteen additional species ranked from class A to class C on North Carolina's noxious weed list. Plant species were identified and mapped as invasive species at Camp Butner when the species occurred on the National and/or North Carolina Noxious Weed list.

3.2 FIELD INVESTIGATION

Surveying CBTS occurred over two growing seasons, in the fall of 2007 and the spring of 2008. The survey was conducted twice in order to more accurately describe and identify invasive species. The fall season aided the estimation of perennial cover and the spring sampling allowed for the greatest diversity of plants identification. Man-made habitats or artificial areas, such as lawns and other manicured sites, early successional areas, and recently clear areas were the primary focus of the survey. Secondary focus was on CBTS's rare plant communities and areas with potential rare plants. Tertiary focus was on well established vegetative communities those with the least risk for exotic invasion. Representative transects were planned to survey the established natural communities.

Vegetation stands with exotic species infestation varied by species type and percent cover. In order to accurately summarize an infestation, stands were chosen by isolating an area most representative of the typical condition of the stand. A reference frame was used for estimating percent cover. The reference frame was place on the ground forming 10 square meters in area. The frame provided a small focus area to estimate percent cover by the exotic vegetation in relation to native plants or bare ground.

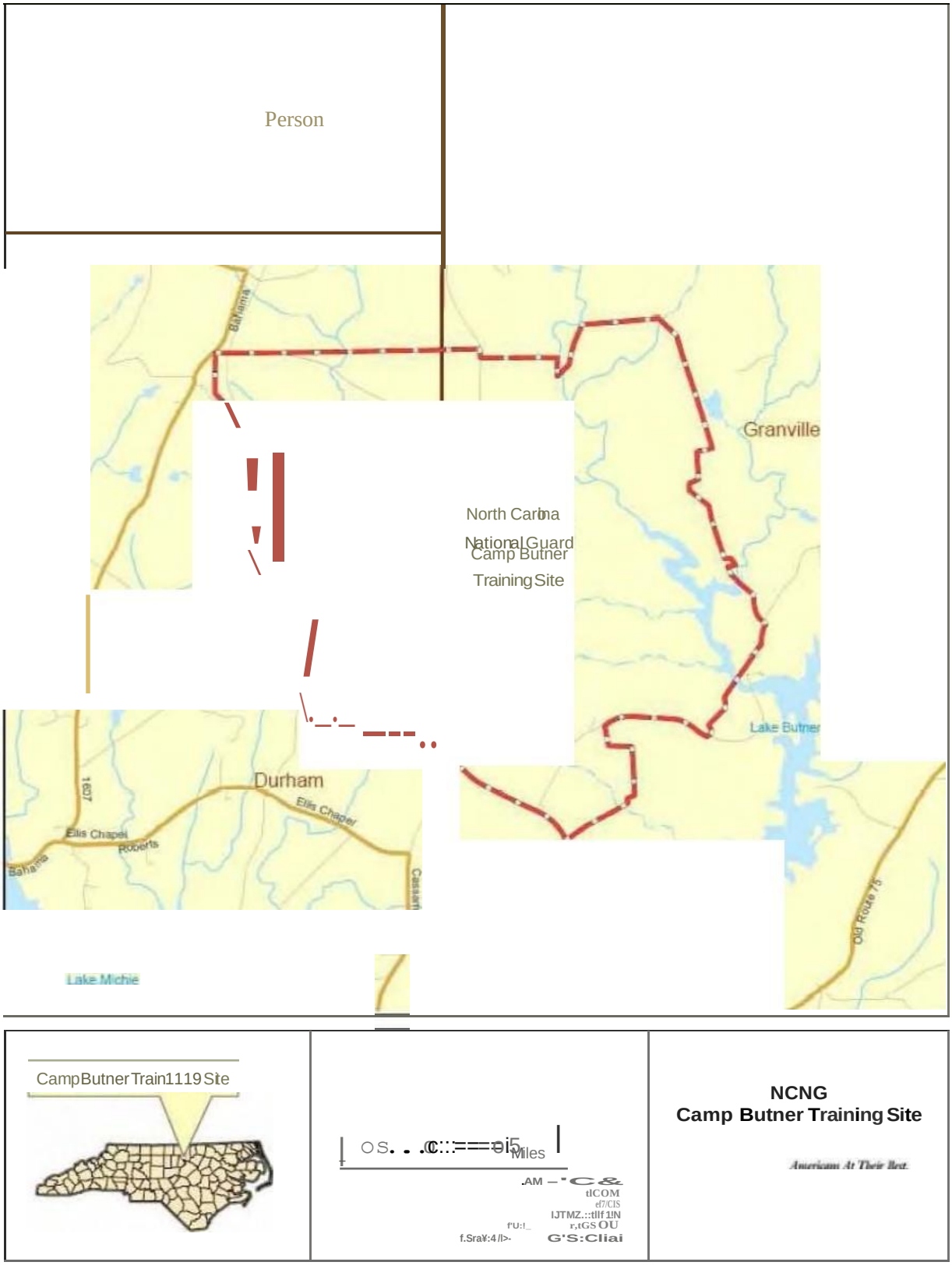


FIGURE 1· Site Vicinity Map

A GPS reading was taken for each reference frame and species composition, percent cover, area of the invasive population were recorded. If a population of invasive species was larger than 1 acre, the perimeter of the area was represented as a GIS polygon. Invasive species populations less than one acre in area were mapped as GIS points.

3.3 BIOLOGICAL DESCRIPTIONS, SPECIES MAP, AND BMP

A literature review was conducted to provide current taxonomic and biological characteristics of the established invasive vegeation on CBTS. For each species an indentification summary, plant ecology and pictures to aid in the identification were summarized. A map was created for each invasive species showing location and severity of individual populations found at CBTS.

In order to prioritize the management of invasive plant populations, a variety of factors were weighed. Factors included cost, time needed for eradication, area of population, and accessability. Plant populations were ranked into three categories represented by the colors green, yellow, and red. Green populations will take the least effort, money, and time to suppress or eradicate the population. Effort required to eradicate the invasives is greater as the color moves from green to yellow and from yellow to red. Red populations require the most effort, money, and time to control or eradicate the population. Each population mapped was characterized by representative color.

4.0 BMP FOR CONTROLLING NONNATIVE INVASIVE PLANTS

Defending against non-native plant invasions takes constant surveillance of right-of-ways, streambanks and internal roads and trails followed by effective control measures at the first appearance of the new species. Early detection and treatment will minimize efforts and costs that come with treating well-established plants or widespread infestations. More effort is required for successful eradication of established infestations, but it still can be accomplished with proper treatments, although costs may be prohibitive. In severe cases, conversion of the existing invasive exosystem back to a more native one is the only solution. Conversion involves eradication procedures and the reestablishment of native plants.

4.1 EFFECTIVE TREATMENTS

Once an invasive species infestation is spotted, then proper and aggressive eradication measures should be taken to avoid the inevitable spread. Continued treatment and retreatments will be necessary. Most nonnative invasive plants are perennials, having extensive tough roots and runners. This means that effective herbicide applications offer the best means of containment or eradication, because herbicide kills roots without baring soil for reinvasion or erosion. In order to be successful with herbicide treatments the following steps should be taken:

1. Use the most effective herbicide for the species.
2. Follow the application methods prescribed on the herbicide label.
3. Choose an optimum time period to apply treatments; for foliar-applied herbicides this is usually mid-summer to early fall and not later than a month before expected frost. Evergreens and semi-evergreens with leaves can be treated effectively in the winter.
4. Adhere to all label prohibitions, precautions, and Best Management Practices during herbicide transport, storage, mixing, and application.
5. Remember that some herbicides require up to a month or more before herbicidal activity is detectable as yellowing of foliage or leaves with dead spots or margins. Thus, after application, be patient; allow herbicides to work for several months before resorting to other treatment options.

4.2 SELECTIVE HERBICIDE APPLICATION METHODS

Although treating extensive inaccessible infestations may require broadcast treatments of herbicide sprays or pellets by helicopter or tractor mounted application systems, the best approach is usually selective applications of herbicides to target nonnative plants while avoiding or minimizing application to desirable plants. The selective methods described are directed foliar sprays, stem injection; cut-treat, basal sprays, and soil spots.

4.2.1 Directed Foliar Sprays

Directed foliar sprays are herbicide-water sprays aimed at target plant foliage to cover all leaves to the point of run off, usually applied with a backpack sprayer (using low pressure, drift retardants, and spray shields to avoid drift). Herbicide application by directed foliar spray is the most cost-effective method for treating most types of invasive plant species. To safeguard surrounding plants from damage by spray drift, suspend applications during windy conditions. A spray shield that attaches to the end of the wand can further minimize drift. Adding a drift retardant to the spray mixture can eliminate drift although effectiveness may be diminished.

Plants up to 6 feet tall can be treated with this equipment, while the additions of a commercially available wand extension can slightly increase height capabilities. To treat plants up to about 18 feet tall, use higher spray pressures with a straight-stream or narrow flat fan tip. Directed foliar sprays are also applied using wands on hoses attached to spraying systems mounted on all-terrain vehicles, trucks, or tractors. Also, a spray gun with a narrow flat fan tip can replace a wand for some applications. Another useful alternative for treating different sized woody plants is a spray gun with a swivel that holds two tips—narrow and wide-angled—that can be quickly changed during application.

4.2.2 Stem Injection

Stem injection (including hack-and-squirt) involves herbicide concentrate or herbicide-water mixtures applied into downward incision cuts spaced around woody stems made by an ax, hatchet, machete, brush ax, or tree injector. Tree injection, including the hack-and-squirt often used with a non-ionic surfactant, and applied to the foliage and growing tips of woody plants or to completely cover herbaceous plants.

Directed sprays are usually applied with a backpack sprayer and a spray wand equipped with a full cone, flat fan, or adjustable cone spray tip. These tips and spraying pressures of 20 to 30 pounds per square inch can ensure the hack-and-squirt technique, is a selective method of controlling larger trees and shrubs (more than 2 inches in diameter) with minimum damage to surrounding plants. It requires cuplike downward incisions spaced around the stem with a measured amount of herbicide applied into each of the incisions. Special tree injectors are available to perform this operation, or a narrow-bit ax, hatchet, or machete along with a spray bottle can be used in sequence to perform the hack-and-squirt method. Completely frilling the stem with edge-to-edge cuts or injections is required for very large stems or difficult-to-control species. The herbicide should remain in the injection cut to avoid wasting herbicide on the bark and to prevent damage of surrounding plants. All injected herbicides can be transferred to untreated plants by root grafts and uptake of root exudates. Herbicides with soil activity can damage nearby plants when washed from incisions into the soil by unexpected rainfall soon after application. Avoid injection treatments when rainfall is predicted within 48 hours.

Tree injection treatments are most effective when applied in late winter and throughout the summer. Heavy spring sap flow in spring can wash herbicide from incision cuts, making this an ineffective period.

4.2.3 Cut-treat

Cut-treat involves herbicide concentrates or herbicide-water mixtures applied to the outer circumference of freshly cut stumps or the entire top surface of cut stems, applied with a backpack sprayer, spray bottle, wick, or paint brush. Freshly cut stems and stumps of woody stems, including canes and bamboo, can be treated with herbicide mixtures to prevent resprouting and to kill roots. Cutting is usually by chainsaw or brush saw, but can be accomplished by handsaws or cutting blades. To minimize deactivation of the herbicide, remove sawdust from stumps before treatment. Treat stems and stumps as quickly as possible after cutting with a backpack sprayer or utility spray bottle for spray applications or a wick applicator, lab wash bottle, or paintbrush for small stems. Add a non-ionic surfactant to the mix to aid in penetration, if permitted by the label.

For stumps over 3 inches in diameter, completely wet the outer edge with the herbicide or herbicide mixture. Completely wet the tops of smaller stumps and all cut stems in a clump. Apply a basal spray mixture of herbicide, oil, and penetrant to stumps that have remained untreated for over 2 hours or use Pathfinder II and wet stump sides too.

The most effective time for the stump spray method is late winter and summer. Although winter treatments are slightly less effective than growing season applications, the absence of foliage on cut stems and branches produces some offsetting gains in application efficiency.

4.2.4 Basal Sprays

Basal sprays are herbicide-oil-penetrant mixtures sprayed or daubed onto the lower portion of woody stems, usually applied with a backpack sprayer or wick applicator. Full basal treatments require that the lower 12 to 20 inches of target woody stems be completely wetted on all sides with oil-based spray mixture. Application is to smooth juvenile bark. Full basal sprays are usually effective in controlling woody stems less than about 6 inches in diameter or larger diameters of susceptible species, before bark becomes thick, corky, and furrowed. The appropriate equipment for this treatment is a backpack sprayer with a wand or spray gun fitted with a narrow-angle flat fan, cone, or adjustable tip. A wick applicator can also be used. Herbicides that are soluble in oil (mainly Garlon 4) are mixed with a commercially available basal oil, vegetable oil, crop oil, diesel fuel, or kerosene often adding a special penetrant. Some herbicides, such as Pathfinder II and Vine-X, are sold ready-to-use with these ingredients.

A modified method, streamline basal sprays, is effective for many woody species up to 2 inches in diameter, as well as trees and shrubs up to 6 inches in diameter if the species is susceptible. Equipment for this treatment is a backpack sprayer with a spray gun and a low-flow straight-stream or narrow-angle spray tip. To prevent waste, maintain pressure below 30 pounds per square inch with a pressure regulator. At this pressure, an effective reach of 9 feet is possible while bark splash is minimized. To treat stems less than 2 inches in diameter, apply the stream of spray up-and down single stems for about 6 to 8 inches, or apply across multiple stems creating 2 to 3 inch-wide bands. This same multiple band treatment can be effective on larger stems. Direct the spray stream to smooth juvenile bark at a point about 4 to 18 inches from the ground. Stems that are thick barked or near 3 inches in diameter require treatment on all sides. Applications are usually in late winter and early spring, when leaves do not hinder spraying the stem. Summer applications are effective but more difficult. Avoid ester herbicide formulations on hot days to prevent vapor drift injury to nontarget plants.

4.3 SELECTING AN EFFECTIVE HERBICIDE

Only herbicides registered by the U.S. Environmental Protection Agency (EPA) for forestry use and noncroplands in the Southern States will be discussed here, although herbicides for other "land use areas," such as right-of-ways, pastures, and rangelands, may be just as effective or may contain the same active ingredient. The herbicides that will be identified by trade name (and common active-ingredient name) are:

Table 1. U.S. EPA registered Herbicides

Foliar Active Herbicides	Foliar and soil-active herbicides
Glyphosate herbicides (glyphosate) such as: Accord Concentrate, Gly-Flo Herbicide, and etc.	Aresenal AC (imazapyr)
Garlon 3A (triclopyr)	Escort XP (metsulfuron)
Garlon 4 (triclypyr)	Pathway (2,4-D + picloram)
Krenite S (fosamine)	Plateau (imazapic)
Pathfinder II (triclopyr)	Tordon 101 (2,4-D + picloram)
Milestone VM (aminopyralid)	Tordon K (picloram)
	Transline (clopyralid)
	Vanquish (dicamba)
	Velpar L (hexazinone)

Because nonnative invasive plants are usually difficult to control, selecting the most effective herbicide(s) is important. Often herbicides that have both soil and foliar activity are most effective with the least number of applications. However, applying herbicides with soil activity can damage desirable plants when their roots are present within the treatment zone or when herbicides move downhill to untreated areas following heavy rainfall. Wetland areas are particularly sensitive to herbicides due to the free flow of water. When treating aquatic areas extreme caution must be taken to avoid desirable plants. Each listed herbicide will make an herbicide variety that is safe for use in wet areas.

Garlon herbicides are mainly foliar active, but they have some soil activity at high rates or when mixed with oils. Garlon 4 and Vanquish can volatilize at high temperatures and their residues can move by air currents to affect surrounding plants; therefore, avoid applicant on days when temperatures exceed 80° F. If possible, also avoid applications when rainfall is anticipated within 8 hours, unless soil activation is needed, and during periods of severe drought as effectiveness can be reduced during these times. When possible, use selective herbicides that target specific nonnative species, such as Transline that controls mainly legumes and composites, and minimize damage to surrounding desirable plants even though they receive herbicide contact. Minimizing damage to desirable cohorts can also be achieved by making applications when the cohorts are dormant. For example, apply basal sprays to the bark of invasives in late winter before most other plants emerge, or foliar spray evergreen or semi-evergreen invasive after surrounding plants have entered dormancy. Remember that desirable woody plants can be damaged through transfer of herbicides by root exudates following stem injection and cut-treat treatments or when soil active herbicides wash off treated stems. Damage to surrounding native plants can be minimized with care and forethought during planning and application.

Read and thoroughly understand the herbicide label and its prohibitions before and during use. Many herbicides require the addition of a non-ionic surfactant to the spray tank. Always use clean water in an herbicide mixture and mix spray solutions thoroughly before applying. Do not mix in the sprayer but in a bucket with a stirring stick—stirring for several minutes or more—before transferring to the sprayer. Water that is highly basic (pH greater than 7) and contains high amounts of calcium and

magnesium interferes with glyphosate herbicide effectiveness, requiring the addition of ammonium sulfate or appropriate additives. When changing from a water based mix to an oil-based mix in a backpack sprayer, thoroughly evacuate the water from the pump and run a small amount of oil through the pumping system before filling with the oil-based mix, otherwise, a white sludge will clog the sprayer. And, always wear personal protective equipment prescribed on the label and in supplementary materials.

4.4 OTHER TREATMENTS FOR AN INTEGRATED APPROACH

Overgrazing is a way to reduce the vigor of palatable invasive plants like kudzu, but this rarely yields eradication and may spread seeds. Mechanical treatments and prescribed burning can assist eradication measures, but are limited in effectiveness. Prescribed burning cannot control root crowns or rhizomes of perennial plants and usually only deadens small aboveground shoots, providing only temporary aboveground control. In a similar way, cutting woody plants (by chainsaw and brush saw felling or brush mowing) and mowing vines and herbs without killing roots remove only aboveground plant parts. Mechanical root raking and discing can actually intensify and spread infestations of invasive plants with runners by chopping them into resprouting segments and transporting them on the equipment. Fire plows can also spread invasive plant rhizomes and roots.

However, root raking, piling, brush mowing, or burning may be the only way to start controlling dense infestations of multiple woody invasive plants. Small infestations may respond to hand pulling, grubbing with a stout hoe, or shrub pulling with newly introduced devices. Hand pulling or grubbing may be the quickest and easiest way to halt invaders when first spotted and stop them from gaining a foothold. String trimmers can reduce infestation on densities and injure thick waxy leaves to improve herbicide uptake and effectiveness.

Although ineffective by themselves to achieve eradication, both mechanical and burning treatments can give added kill of herbicide-weakened plants and have a place in an integrated pest management. The stumps and stems of nonnative trees, shrubs, and bamboos can be treated with herbicides immediately after cutting to kill roots. Resprouts of trees, shrubs, and vines that are topkilled by burning or brush mowing can be more easily treated with foliar sprays, often the most cost-effective way to use herbicides. Herbicide applications should be delayed after burning, discing, or mowing to permit adequate resprouting of target plants and, thereby maximizing herbicide uptake and effectiveness. Prescribed burning can also destroy invasive plant seeds and often stimulate germination for efficient herbicide control treatments.

Burning can prepare the site for effective herbicide applications by clearing debris and revealing application hazards, such as old wells and pits. Disking and root raking, if applied correctly, can dislodge herbicide-damaged woody roots and large runners, leaving them to dry and rot. With mechanical and burning treatments, take precautions, such as burning in late winter or spring leaf-out, to minimize the period of bare soil. The most effective time for controlling woody invasive plants and their germinants with fire is after plants have initiated growth in spring. An eradication program for infestations of invasive plants usually requires several years of treatment and many more years of surveillance to check for rhizome sprouts, root sprouts, seed germination, or new invasions. Following these steps in a planned manner and with persistence is the only successful strategy to safeguard land access, productivity, native plants, and suitable habitats for wildlife.

5.0 INVASIVE SPECIES AT CBTS

Nine species were identified to be established at CBTS as shown in Table 2.0. A map of the locations of invasive species unidentified in this survey is presented in Appendix A. The following section is a summary of the individual species' biological descriptions, species scientific name, common name

and ID, species population map and individual herbicide prescription summaries. Identification photographs were obtained from *Nonnative invasive plants of southern forests: a field guide for indetification and control,* published by the USDA in 2003.

The herbicide prescriptions have been assembled from published research results, unpublished trials, State reports, weed council manuals, magazines, and Web sites. Very few species-specific experiments have been reported that compare a full array of treatments for nonnative invasive plant species. Further specific understanding of each species is being studied but current knowledge and technology has been used in this report to address treatment options. Herbicides are mentioned in order of effectiveness or alphabetically when such information is lacking.

Table 2: Invasive Species Present at Camp Butner Training Site, Seth NC

Scientific Name	Common Name	Plant Type
Ailanthus altissima	Tree of heaven	Tree
Albizia julibrissin	Mimosa, Silk tree	Tree
Lonicera japonica	Japanese honeysuckle	Vine
Hedera helix	English Ivy	Vine
Lespedeza cuneata	Chinese lespedeza	Forb
Microstegium vimineum	Nepalese browntop, Japanese stilt-grass	Grass
Paulownia tomentosa	Princess tree	Tree
Pueraria montana var. *lobata*	Kudzu	Vine
Wisteria sinensis	Chinese wisteria	Vine

5.0

AILANTHUS ALTISSIMA, TREE-OF-HEAVEN BIOLOGICAL DESCRIPTION

Ailanthus altissima (P. M_ll.) Swingle **AIAL**
Synonyms: ailanthus, Chinese sumac, stinking sumac, paradise-tree, copal-tree

Plant. Deciduous tree to 80 feet (25 m) in height and 6 feet (1.8 m) in diameter, with long pinnately compound leaves and circular glands under lobes on leaflet bases. Strong odor from flowers and other parts, sometimes likened to peanuts or cashews.

Stem. Twigs stout, chestnut brown to reddish tan, and smooth-to-velvety with light dots (lenticels) and heart-shaped leaf scars. Buds finely hairy, dome-shaped, and partially hidden by the leaf base. Branches light gray to dark gray, smooth and glossy, with raised dots becoming fissures with age. Bark light gray and rough with areas of light-tan fissures.

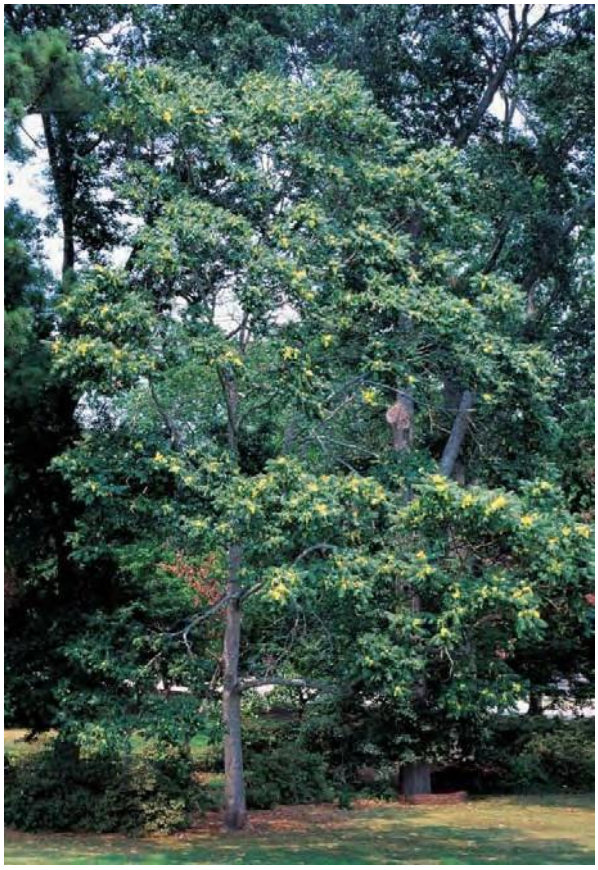
Leaves. Alternate, odd or even pinnately compound, 10 to 41 leaflets on 1-to 3-foot (30 to 90 cm) light-green to reddish-green stalks with swollen bases. Leaflets lanceolate and asymmetric and not always directly opposite, each 2 to 7 inches (5 to 18 cm) long and 1 to 2 inches (2.5 to 5 cm) wide. Long tapering tips and lobed bases with one or more glands beneath each lobe (round dots). Margins entire. Dark green with light-green veins above and whitish green beneath. Petioles 0.2 to 0.5 inch (5 to 12 mm) long.

Flowers. April to June. Large terminal clusters to 20 inches (50 cm) long of small, yellowish-green flowers, with five petals and five sepals. Male and female flower on separate trees.

Fruit and seeds. July to February. Persistent clusters of wing-shaped fruit with twisted tips on female trees, 1 inch (2.5 cm) long. Single seed. Green turning to tan then brown.

Ecology. Rapid growing, forming thickets and dense stands. Both shade and flood intolerant and allelopathic. Colonizes by root sprouts and spreads by prolific wind-and water-dispersed seeds. Viable seed can be produced by 2-and 3-year-old plants.

States with suspected infestations are shown in gray.



Tree-of-Heaven - July

resembles hickories, *Carya* spp., and sumacs, *Rhus* spp., but neither has glands at leaflet bases. Hickories distinguished by a braided bark, sumacs by shrub shape.

History and use. Introduced in 1784 from Europe, although originally from Eastern China. Ornamental.

July
February
July
August
October
August
August
September

5.1.1 Tree-of-heaven at CBTS

Several well established populations of *Ailanthus altissima* were identified at CBTS (Figure 2). An estimated .6 acres of land is inhabitant by *Ailanthus*. Most individuals of this species are seedlings and young trees. Only a few mature trees exist and most of the populations are near roadways and high traffic areas of the Camp. The observed colonies of Ailanthus at CBTS are numerous, but ease of access to their locations offer some oppourtun ities for control and eradication. This species tends to form dense thickets but can not tolerate low light situations preventing it from invading established forests. Open fields and cleared areas are of greatest concern at CBTS. Many of the man made berms surrounding firing ranges are infested with this species and thickets are starting to develop.

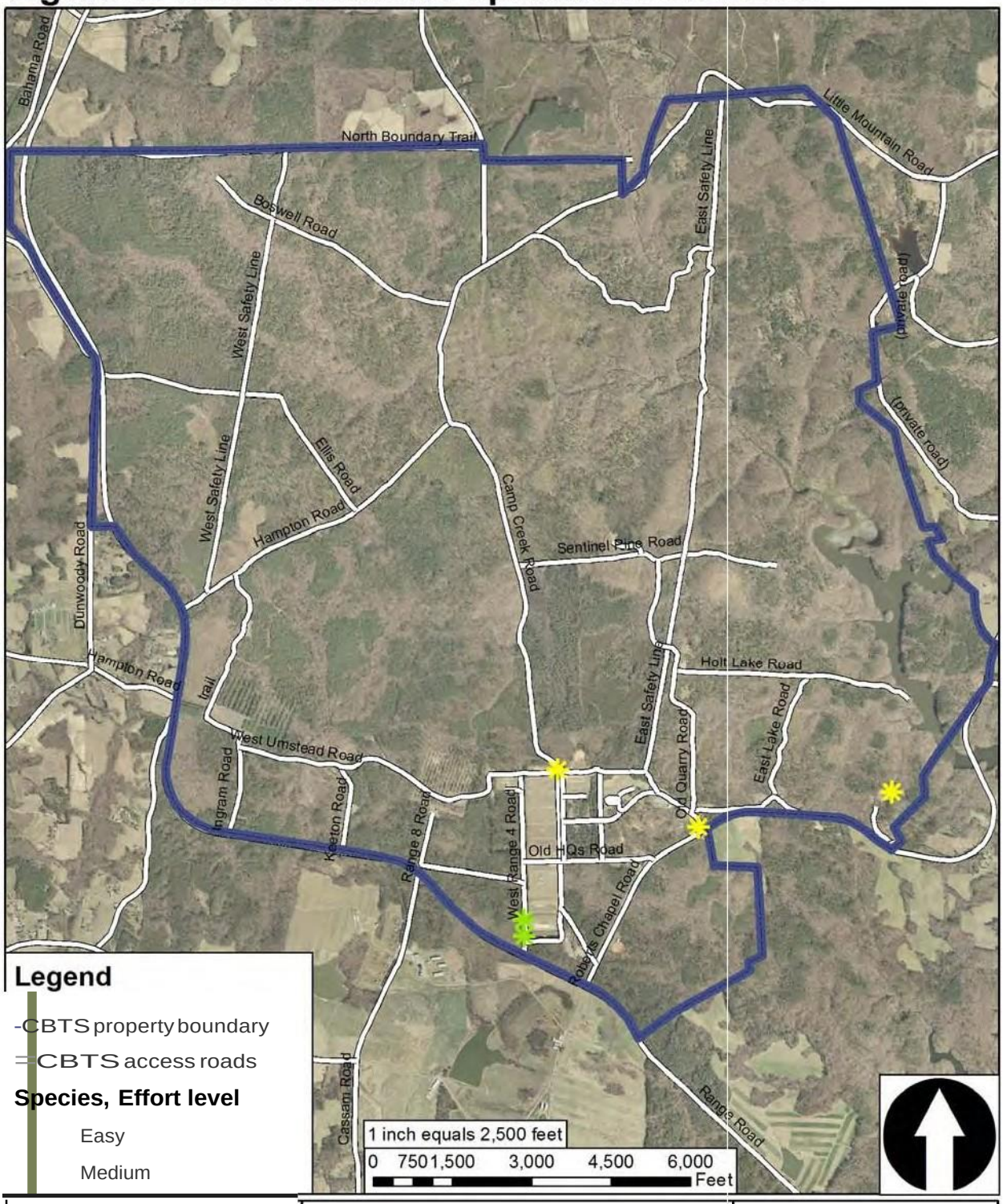
5.1.2 Recommended control procedures for Tree-of-heaven

Large Trees. Stem injections are suggested for this species along with the use of Garlon 3A, Pathway*, Pathfinder II, or Aresenal AC. Apply herbicide in dilution and space cut according to the herbicide label. Use technique in midsummer for best results or late winter for somewhat less effectiveness. Felling trees is also an accepted technique for *Ailanthus,* apply the herbicide to stem and stump tops immediately after cutting.

Saplings. Use Garlon 4 as a 20-percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II to young bark as a basal spray.

Seedlings and saplings. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October): Arsenal AC* as a 1-percent solution (4 ounces per 3-gallon mix), Krenite S as a 15-percent solution (3 pints per 3-gallon mis), Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix), or Escort XP* at 1 ounce per acre.

Figure 3. Tree-of-heaven Populations on CBTS



Site:

North Carolina National Guard
Camp Butner Training Site
Stem, North Carolina

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5.2 ALBIZIA JULIBRISSIN, SILK TREE - BIOLOGICAL DESCRIPTION

Albizia julibrissin Durazz. **ALJU** Synonym: silky acacia, mimosa

Plant. Deciduous leguminous tree 10 to 50 feet (3 to 15 m) in height with single or multiple tunks, smooth light-brown bark, feathery leaves, and showy pink blossoms that continually yield dangling flat pods during summer. Pods persistent during winter.

Stem. Twigs slender to stout, lime green turning shiny grayish brown with light dots (lenticels). No terminal bud. Bark glossy, thin, light brown turning gray with raised corky dots and dashes.

Leaves. Alternate, bipinnately compound 6 to 20 inches (15 to 50 cm) long with 8 to 24 pairs of branches and 20 to 60 leaflets per branch, feathery and fernlike. Leaflets asymmetric, 0.4 to 0.6 inch (1 to 1.5 cm) long, dark green, with midvein nearer and running parallel to one margin. Margins entire.

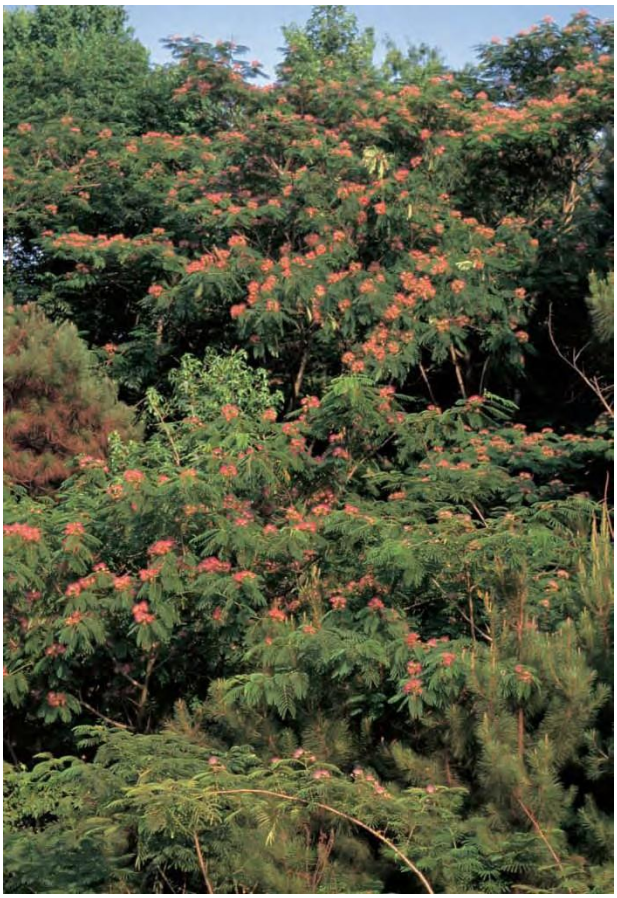
Flowers. May to July (and sporadically to November). Terminal clusters at the base of the current year's twigs, each with 15 to 25 sessile flowers 1.4 to 2 inches (3.5 to 5 cm) long. Pom-pom like with numerous filaments, bright-pink feathery tufts with white bases. Fragrant.

Fruits and seeds. June to February. Legume pods in clusters, flat with bulging seeds, each pod 3 to 7 inches (8 to 18 cm) long, splitting in winter along the edges to release 5 to 10 oval seeds. Initially light green turning dark brown in fall and whitish tan in winter.

Ecology. Occurs on dry-to-wet sites and spreads along stream banks, preferring open conditions but also persisting in shade. Seldom found above 3,000 feet (900 m). Forms colonies from root sprouts and spreads by abundant animal-and water-dispersed seeds. Seeds remain viable for many years. Nitrogen fixer.

Resembles honeylocust, *Gleditsia triacanthos* L., which has longer leaflets - 1 inch (2.5 cm) long. Seedlings resemble partridge pea, *Chamaecrista fasciculata* (Michx.) Greene, an annual plant with once pinnately compound leaves.

States with suspected infestations are shown in gray.



Silktree - June

History and use. A traditional ornamental introduced from Asia in 1745. Potential use for forage and biofuel.

Silktree, Mimosa

T. Bodner

5.2.1 Silktree at CBTS

One silktree population was found at CBTS (figure 4). Silktree reproduces through abundant seeds and root sprouts. Seedpods remain on the trees throughout the winter, can float in water, and remain viable for many years. CBTS's population is easily manageable, but will require monitoring in subsequent years due to the plant's prolific seed source. Several populations were located off of CBTS lands and will remain a threat to CBTS. Surveys should be conducted yearly to locate new populations of silktree as well as resprout.

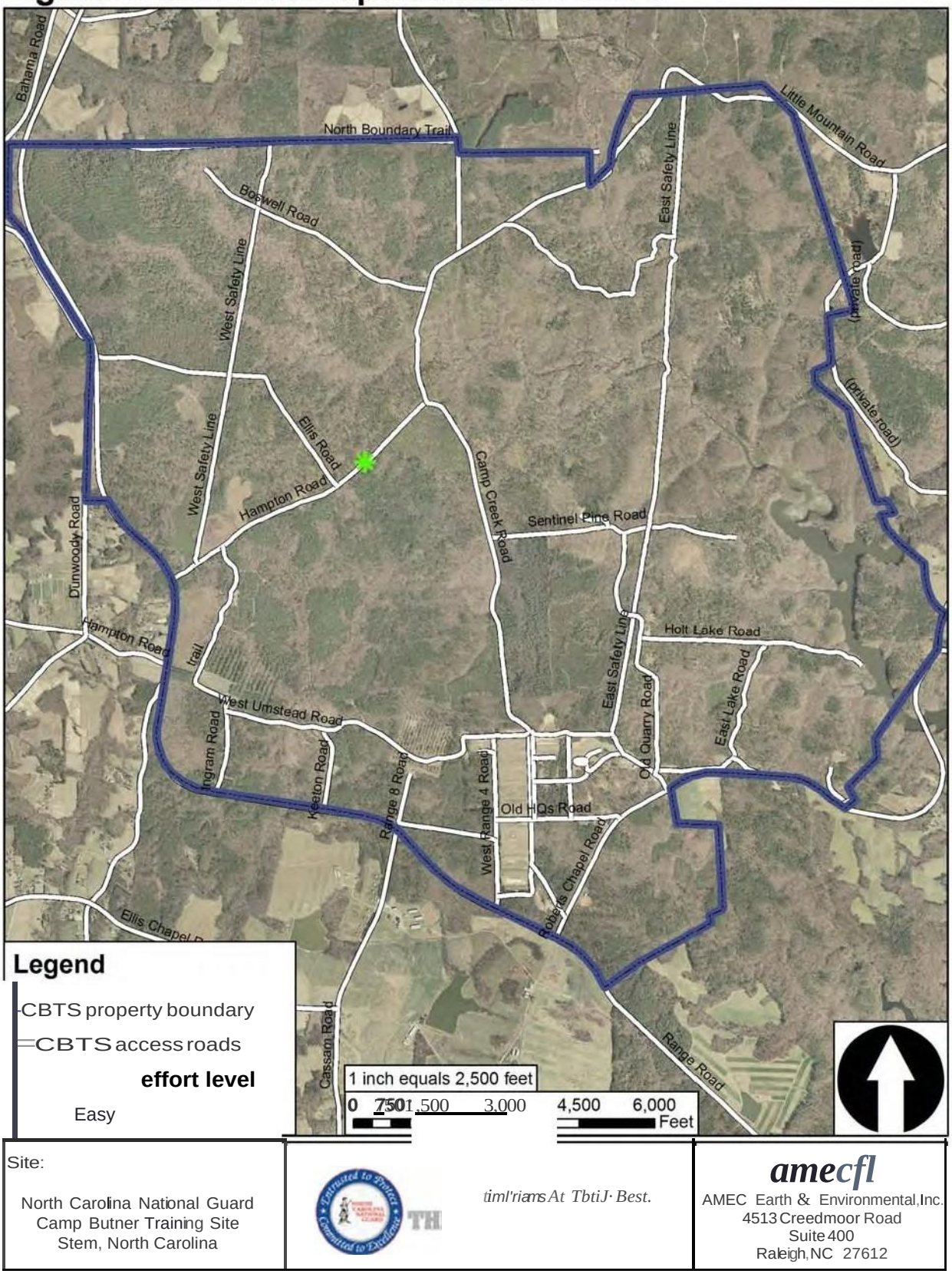
5.2.2 Recommended control procedures for Silktree

Large Trees. Make stem injections using Arsenal AC* or Garlon 3A in dilutions as specified on the herbicide label (anytime except March and April). When felling trees apply the herbicide to stem and stump tops immediately after cutting.

Saplings. Use Garlon 4 as a 20-percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II to young bark as a basal spray.

Seedlings and saplings. Thoroughly wet all leaves with one of the flowing herbicides in water with a surfactant. July through October Garlon 3A, Garlon 4, or glyphosate herbicide can be used as a two percent solution (8 ounces per 3-gallon mix).

Figure 4. Silk Tree Populations on CBTS



Site:

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5.3 LONICERA JAPONICA, JAPANESE HONEYSUCKLE – BIOLOGICAL DESCRIPTION

Lonicera japonica Thunb. **LOJA**

Plant. Semievergreen to evergreen woody vine, high climbing and trailing to 80 feet (24 m) long, branching and often forming arbors in forest canopies and/or ground cover under canopies and forming long woody rhizomes that sprout frequently.

Stem. Slender woody vine becoming stout to 2 inches (5 cm) in diameter, with cross section round and opposite branching. Brown and hairy becoming tan barked, fissured, and sloughing with age. Rooting at low nodes.

Leaves. Opposite, broadly ovate to elliptic to oblong, base rounded, tips blunt-pointed to round. Length 1.6 to 2.6 inches (4 to 6.5 cm) and width 0.8 to 1.5 inches (2 to 4 cm). Margins entire but often lobed in early spring. Both surfaces smooth to rough hairy, with undersurface appearing whitish.

Flowers. April to August. Axillary pairs, each 0.8 to 1.2 inches (2 to 3 cm) long, on a bracted stalk. White (or pink) and pale yellow. Fragrant. Thin tubular flaring into five lobes in two lips (upper lip four-lobed and lower lip single-lobed), with the longest lobes roughly equal to the tube. Five stamens and one pistil, all projecting outward and becoming curved. Persistent sepals.

Fruit and seeds. June to March. Nearly spherical, green ripening to black, glossy berry 0.2 inch (5 to 6 mm) on stalks 0.4 to 1.2 inches (1 to 3 cm) long. Two to three seeds.

Ecology. Most commonly occurring invasive plant, overwhelming and replacing native flora in all forest types over a wide range of sites. Occurs as dense infestations along forest margins and right-of-ways as well as under dense canopies and as arbors high in canopies. Shade tolerant. Persists by large woody rootstocks and spreads by rooting at vine nodes and animal-dispersed seeds.

resembles yellow jassamine, *Gelsemium sempervirens* (L.) St. Hil., which has thinner leaves and hairless stems. **Also resembles** native honeysuckles, *Lonicera* spp., that usually have reddish hairless stems and hairless leaves and do not form extensive infestations.

States with suspected infestations are shown in gray.

Japanese honeysuckle - April

History and use. Introduced from Japan in the early 1800s. Traditional ornamental, valued as deer browse, with some value for erosion control. Still planted in wildlife food plots.

T. Bodner

T. Bodner

5.3.1 Japanese honeysuckle at CBTS

Japanese honeysuckle is seen in two forms at CBTS. It is commonly seen covering established vegetation forming dense canopies, and it is also seen spreading across the forest floors beginning to form mats of sprawling vines. Japanese honeysuckle is semi-evergreen and is difficult to control due to woody rhizomes that sprout frequently. Correct area estimation is difficult due to the plant's growth forms; however CBTS is estimate to have 1.9 acres of Japanese honeysuckle. The largest area most established infestation is CBTS property South of Roberts Chapel Road. Plants that have become established along the access road form canopies on native vegetation and are invading the surrounding forest floor.

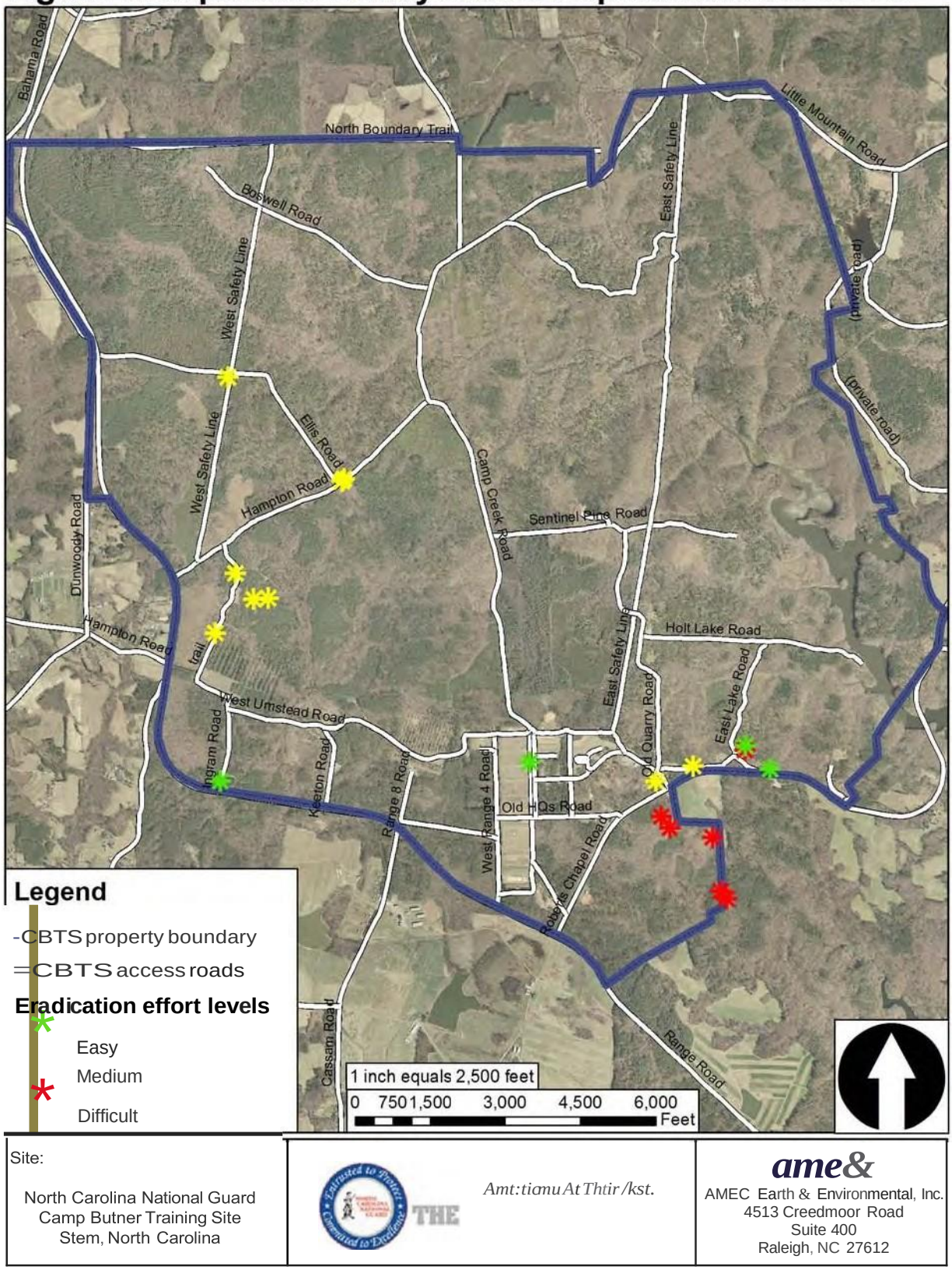
5.3.2 Recommended control procedures for Japanese honeysuckle

Foliar Control. June through August apply Escort* XP with a surfactant by broadcast spraying 2 ounces per acre in water (0.6 dry ounces per 3-gallon mix) or by spot spraying 2 to 4 ounces per acre in water (0.6 to 1.2 dry ounces per 3-gallon mix). Or, treat foliage with one of the following herbicides in water with surfactant (July to October or during warm days in early winter) keeping spray away from desirable plants: a glyphosate herbicide as a 2-percent solution (8 ounces per 3-gallon mix) or Garlon 3A or Garlon 4 as a 3-to-5-percent solution (12 to 20 ounces per 3-gallon mix).

Cut-treat. Cut large vines just above the soil surface and immediately treat the freshly cut stem with a glyphosate herbicide or Garlon 3A as a 20-percent solution (2.5 quarts per 3-gallon sprayer in water with a surfactant July to October (safe to surround plants).

Integrate approach. Prescribed burning in spring will reduce dense ground mats and sever climbing vines for more effective herbicide treatments to resprouting vines.

Figure 5. Japanese Honeysuckle Populations on CBTS



Site:

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5.4 *HEDERA HELIX*, ENGLISH IVY BIOLOGICAL DESCRIPTION

Hedera helix L. **HEHE**

Plant. Evergreen woody vine climbing to 90 feet (28 m) by clinging aerial roots and trailing to form dense ground cover. Thick dark-green leaves with whitish veins and three to five pointed lobes when juvenile. Maturing at about 10 years into erect plants or branches with unlobed leaves and terminal flower clusters that yield purplish berries. **Toxic to humans when eaten and triggering dermatitis in sensitive individuals.**

Stem. Woody slender vines when a ground cover and growing to 10 inches (25 cm) in diameter when climbing infested trees and rocks by many fine to stout aerial rootlets. Vines pale green (sometimes reddish tinged), rooting at nodes, becoming covered with gray-brown shiny bark, segmented by encircling and raised leaf scars, and roughened by tiny ridges. Bark light gray to brown, bumpy and gnarly, with aerial rootlets developing along the side where clinging to vertical structures. Aerial rootlets exuding a gluelike substance. Older vines sometimes grown together where crossed.

Leaves. Alternate, with shapes varying according to age—typical juvenile plants having three to five pointed lobes and mature plants broadly lanceolate and unlobed, 2 to 4 inches (5 to 10 cm) long and 2.5 to 5 inches (6 to 12 cm) wide. Thick and waxy, smooth and hairless, dark green with whitish veins radiating from the petiole and pale green beneath. Petioles to 6 inches (15 cm) long, pale green and often reddish tinged.

Flowers. June to October. Terminal hairy-stemmed umbel clusters of small greenish-yellow flowers on mature plants. Five thick and pointed petals, 0.1 inch (3 mm) long. Each petal radiating from a five-sided domed green floral disk, 0.1 inch (3 mm) wide, tipped by a short pistil.

Fruit and seeds. October to May. Clusters of spher_cal drupes, 0.2 to 0.3 inch (7 to 8 mm). Pale green in late summer ripening to dark blue to purplish in late winter to spring.

States with suspected infestations are shown in gray.

English Ivy - June

Ecology. Thrives in moist open forests, but adaptable to a range of moisture and soil conditions, including rocky cliffs. Shade tolerance allowing early growth under dense stands, but becoming adapted to higher light levels with maturity. Avoids wet areas. Amasses on infested trees, decreasing vigor, and increasing chance of windthrow. Serves as a reservoir for bacterial leaf scorch that infects oaks (*Quercus* spp.), elms (*Ulmus* spp.), and maples (*Acer* spp.). Spreads by bird-dispersed seeds and colonizes by trailing and climbing vines that root at nodes. Drupes mildly toxic, discouraging over consumption by birds.

resembles grape, *Vitis* spp., which has a leaf that is similarly shaped but not thick and often hairy.

History and use. Introduced from Europe in colonial times. Traditional ornamental and still widely planted as an ornamental. Source of varnish resin, dye, and tanning.


June


January


July


July


July


July


July


June

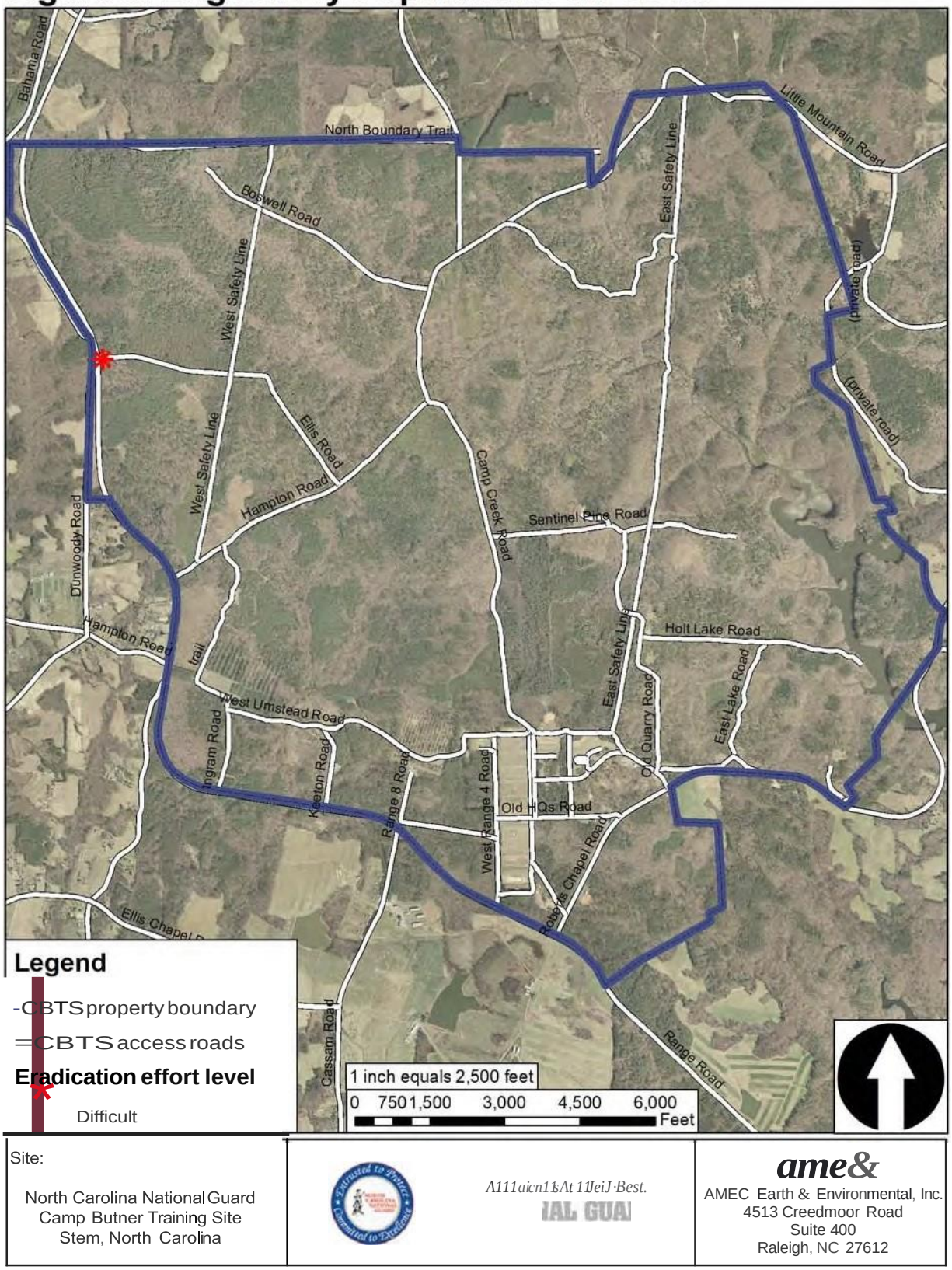
5.4.1 English Ivy at CBTS

A small population of English Ivy is established at CBTS. The area is approximately .04 acres and although the infestation is small in size it is a large threat to the Pine Oak forest community it inhabits. English Ivy is very shade tolerant when yound, allowing establishment of early growth; however at maturity it is adapted to higher light levels. English ivy will eventually cover the tree canopy to reach needed sunlight harming the host forest. The ivy population at CBTS can be addressed while still accessible. The eradication will be difficult, requiring several years to monitor the progress. English ivy is a popular landscaping plant and is spread from neighbours through bird droppings. Although no neighbouring populations were identified in the immediate surrounding area, new populations of English ivy should be monitored yearly.

5.4.2 Recommended control procedures for English Ivy

Foliar Control. Wet leaves (until runoff) with one of the following herbicides in water with a surfactant (July to October for successive years): Garlon 3A or Garlon 4 as a 3-to-5-percent solution (12 to 20 ounces per 3-gallon mix) or a glyphosate herbicide as a 4-percent solution (1pint per 3-gallon mix) or a glyphosate herbicide as a 4-percent solution (1 pint per 3-gallon mix). Use a string trimmer to reduce growth layers and injure leaves for improved herbicide uptake. Cut large vines and apply these herbicides to cut surfaces. Or, apply Garlon 4 as a 20-percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II as a basal spray to large vines being careful to avoid the bark of the host tree.

Figure 6. English Ivy Populations on CBTS



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LESPEDEZA CUNEATA, CHINESE LESPEDEZA BIOLOGICAL DESCRIPTION

Lespedeza cuneata (Dum.-Cours.) G. Don **LECU** Synonym: sericea lespedeza

Plant. Perennial ascending-to-upright leguminous forb, 3 to 6 feet (1 to 2 m) in height, with one-to-many leafy slender stems often branching at midplant, three-leaflet leaves, and tiny whitish flowers. Plant arising from a woody rootcrown. Dormant brown plants remaining upright during most of the winter.

Stems. Often gray green with lines of hairs along the stem.

Leaves. Alternate, crowded and numerous, three-leaflet leaves. Each leaflet oblong to linear with a hairlike tip, 0.4 to 0.8 inch (1 to 2 cm) long and 0.1 to 0.3 inch (3 to 8 mm) wide. Green above and dense whitish hairy to light gray green beneath. Hairy petioles 0.2 to 0.6 inch (5 to 15 mm) long, absent for upper leaves. Stipules narrowly linear.

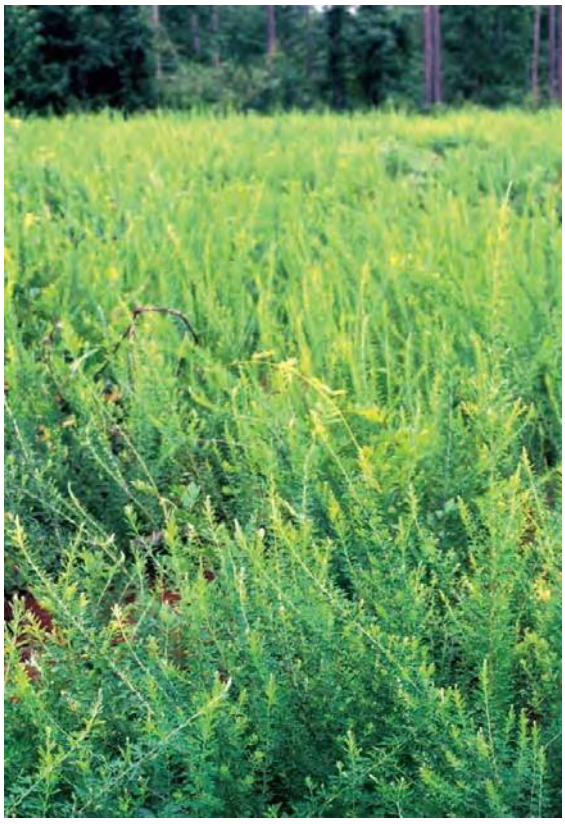
Flowers. July to September. Clusters of 1 to 3 pealike flowers crowded in upper leaf axils. Flowers white with purple marks, 0.1 to 0.3 inch (4 to 7 mm) long and shorter than leaves. Hairy five-lobed calyx shorter than petals.

Fruit and seeds. October to March. Flat ovate to round single-seeded legume pod 0.12 to 0.15 inch (3 to 4 mm) wide. Pods clustered in terminal axils, scattered along the stem, and clasped by persistent sepals. Green becoming tan.

Ecology. Occurs in new and older forest openings, dry upland woodlands to moist savannas, old fields, right-of-ways, and cities. Flood tolerant. Forms dense stands by sprouting stems from rootcrowns that prevent forest regeneration and land access. Cross-and self-pollinates. Spreads slowly from plantings by seeds that have low germination, but remain viable for decades. Nitrogen fixer.

Resembles native lespedeza, *L. virginica* (L.) Britt., which grows in tufted clumps instead of infestations, has crowded clusters of pink-purple to violet flowers and somewhat larger leaflets 0.6 to 1.2 inches (1.5 to 3 cm) long, and brown stems.

States with suspected infestations are shown in gray.



Service lespedeza - Julyl

History and use. Introduced from Japan in 1899—first near Arlington, VA, and soon afterwards in north-central Tennessee—and escaped. Benefited from government programs that promoted plantings for erosion control. Still planted for quail food plots, soil stabilization, and grazing. Plant improvement breeding programs still underway.

February

July

July

September

July

5.4.3 Chinese lespedeza at CBTS

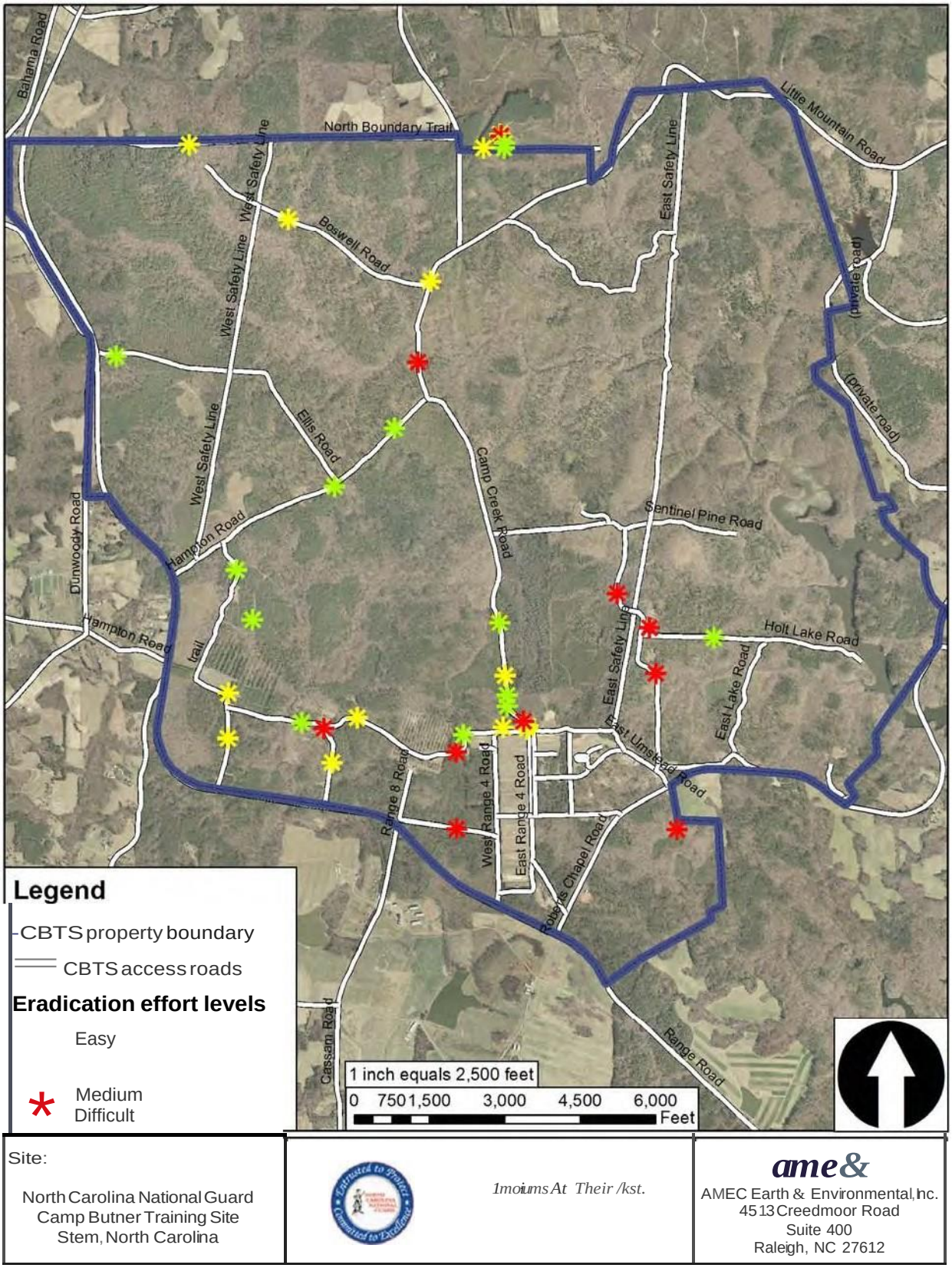
Chinese lespedeza was found along the majority of roads and trails at CBTS. An estimated 2.6 acres of CBTS land is invaded by Chinese lespedeza. At CBTS the populations are their densest when in direct sun. Strands start to thin in shaded areas. Populations at CBTS are easily accessible due to growth along roadways and can be treated with minimal effort. Focus on dense areas for primary treatment and mowing for 2 to 3 months before chemical treatment will aid in eradication. All populations will require long term monitoring.

5.4.4 Recommended control procedures for Chinese lespedeza

Foliar Control. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to September): Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix), Escort * XP at three-fourths of an ounce per acre (0.2 dry ounces per 3-gallon mix), Transline+ as a 0.2-percent solution (1ounce per 3-gallon mix), a glyphosate herbicide as a 2-percent solution (8ounces per 3-gallon mix), or Velpar L* as a 2-percent solution (8ounces per 3-gallon mix).

Integrate approach. Mowing 1 to 3 months before herbicide applications can assist control.

Figure 7. Chinese lespedeza Populations on CBTS



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5.0 MICROSTEGIUM VIMINEUM, NEPALESE BROWNTOP

Microstegium vimineum (Trin.) A. Camus **MIVI**
Synonyms: Japanese stilt grass, Mary's grass, basketgrass

Plant. Sprawling, annual grass, 0.5 to 3 feet (15 to 90 cm) in height. Flat short leaf blades, with off-center veins. Stems branching near the base and rooting at nodes to form dense and extensive infestations. Dried whitish-tan grass remains standing in winter.

Stem. Ascending to reclining, slender and wiry, up to 4 feet (120 cm) long, with alternate branching. Covered by overlapping sheaths with hairless nodes and internodes. Green to purple to brown. Aerial rootlets descend from lower nodes.

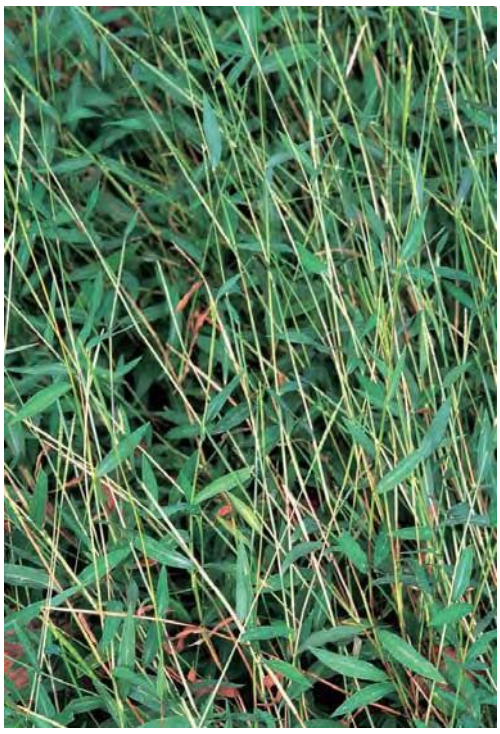
Leaves. Alternate (none basal) projecting out from stem, lanceolate to oblanceolate, 2 to 4 inches (5 to 10 cm) long and 0.07 to 0.6 inch (2 to 15 mm) wide. Blades flat, sparsely hairy on both surfaces and along margins. Midvein white and off center. Ligule membranous with a hairy margin.

Flowers. July to October. Terminal, thin and spikelike raceme, to 3 inches (8 cm) long. Unbranched or with one to three lateral branches on an elongated wiry stem. Other thin racemes of self-pollinating flowers enclosed or slightly extending from lower leaf sheaths. Spikelets paired, with the outer stemmed and inner sessile.

Seeds. July to December. Husked grain, seed head thin, grain ellipsoid, 0.1 inch (2.8 to 3 mm) long, with seedstalks partially remaining during winter.

Ecology. Flourishes on alluvial floodplains and streamsides, mostly colonizing flood-scoured banks, due to water dispersal of seed and flood tolerance. Also common at forest edges, roadsides, and trailsides, as well as damp fields, swamps, lawns, and along ditches. Occurs up to 4,000 feet (1200m) elevation Very shade tolerant. Consolidates occupation by prolific seeding, with each plant producing 100 to 1,000 seeds that can remain viable in the soil for 3 years. Spreads on trails and recreational areas by seeds hitchhiking on hikers' and shoes and clothes.

States with suspected infestations are shown in gray.



Nepalese Browntop - September

Resembles crabgrass, *Digitaria* spp., and nimblewill, *Muhlenbergia schreberi* J.F. Gmel., both having broad short leaves, but distinguished from Nepalese browntop by branching seed heads and stout stems. **Also resembles** whitegrass, *Leersia virginica* Willd., which is a perennial with flat, compressed seed heads.

History and use. Native to temperate and tropical Asia, and first identified near Knoxville, TN, around 1919. Ground cover with little wildlife food value.

December
September
T. Bodner
September
May
T. Bodner
June
May

5.5.1 Microstegium at CBTS

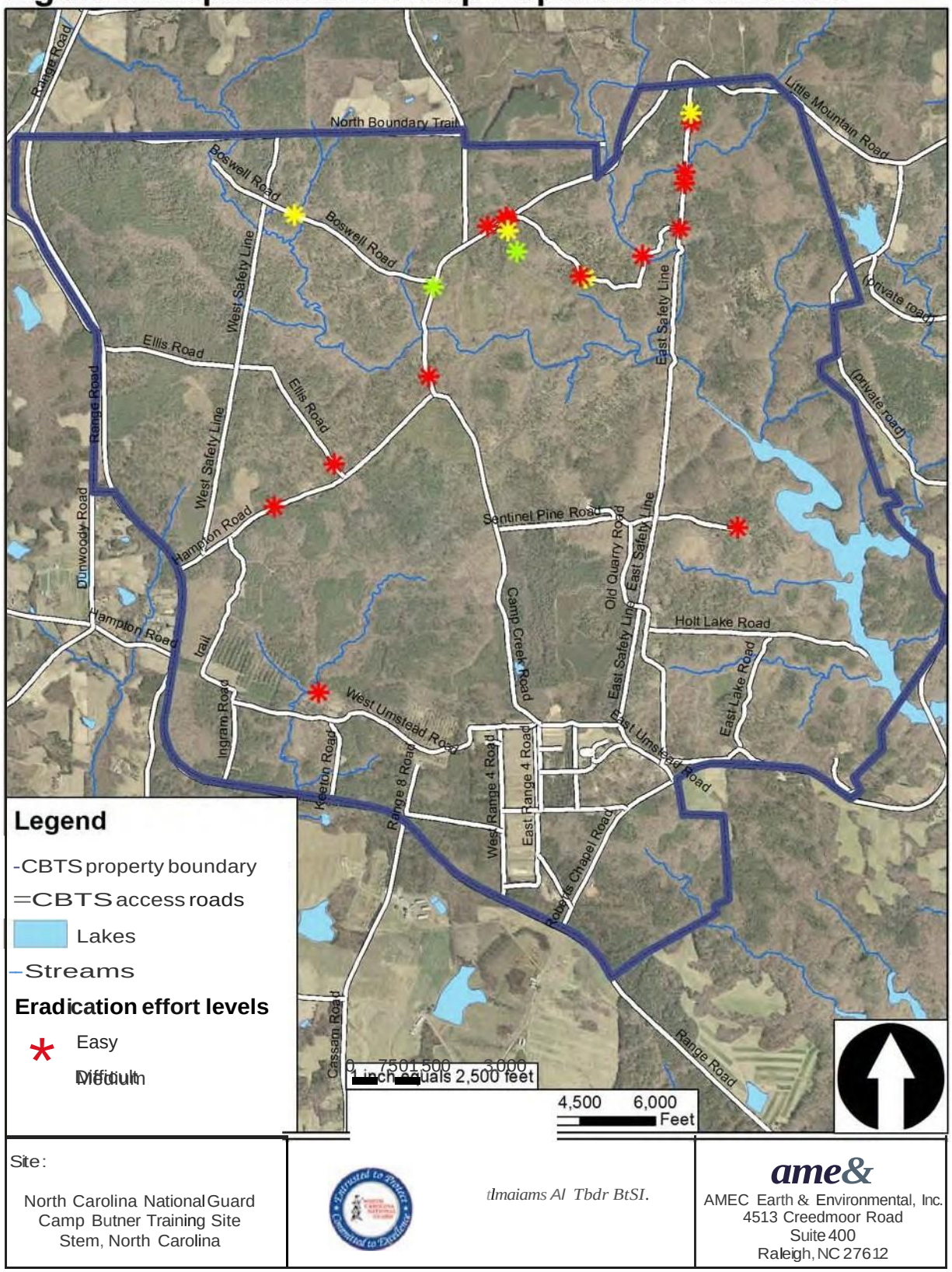
Microstegium is a common invader of forested floodplains, ditches, forest edges, fields, and trails and was found on CBTS in all of the listed areas. This invasive is a significant problem at CBTS. Microstegium was located at CBTS on floodplains along most streams, on wet depressions within mesic mixed hardwood forest, and in piedmont bottomland forest. An estimated 3.2 acres of Butner property contains established Microstegium populations (Figure 8.). Microstegium is spread by regular mowing, tilling, foot traffic, as well as natural disturbances such as scouring associated with flooding. Populations found at CBTS along streams will most likely have populations established throughout the floodplain along drainage paths. Populations are spreading along tails at CBTS due to vehicle movement and foot traffic.

5.5.2 Recommended control procedures for Microstegium

Foliar Control. Apply a glyphosate herbicide as a 2-percent solution in water (8ounces per 3-gallon mix) with a surfactant in summer. Or, apply Vantage (see label) for situation that require more selective control and less impact on associated plants and wetlands.

Integrate approach. Mowing or pulling just before seed set will also prevent seed build-up in the soil seed bank. Repeat treatments for several years to control abundant germinating seeds.

Figure 8. Nepalese Browntop Populations on CBTS



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5.6 PAULOWNIA TOMENTOSA, PRINCESS TREE – BIOLOGICAL DESCRIPTION

Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud. **PAtO2** Synonym: empresstree

Plant. Deciduous tree to 60 feet (18 m) in height and 2 feet (60 cm) in diameter with large heart-shaped leaves, fuzzy hairy on both sides, showy pale-violet flowers in early spring before leaves, and persistent pecan-shaped capsules in terminal clusters in summer to winter. Abundant flower buds present on erect stalks over winter.

Stem. Twigs and branches stout, glossy gray brown and speckled with numerous white dots (lenticels). No terminal bud. Lateral leaf scars raised, circular, and becoming larger, dark, and sunken. Bark light-to-dark gray, roughened, and becoming slightly fissured. Stem pith chambered or hollow and wood white.

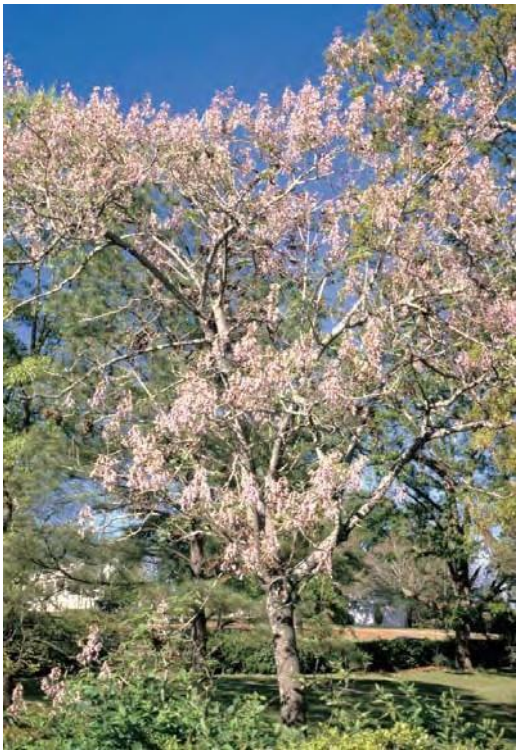
Leaves. Opposite, heart-shaped and fuzzy hairy on both surfaces, 6 to 12 inches (15 to 30 cm) long and 5 to 9 inches (13 to 23 cm) wide. Leaves larger on resprouts, 16 to 20 inches (40 to 50 cm) across, with extra tips often extending at vein tips. Petioles rough hairy, 2 to 8 inches (5 to 20 cm) long.

Flowers. April to May. Covered with showy erect panicles of pale-violet flowers before leaves in early spring, tubular with five unequal lobes. Fragrant. Flower buds fuzzy, linear, and becoming ovoid in summer and persistent on erect stalks over winter.

Fruit and seeds. June to April. Terminal clusters of pecan-shaped capsules 1 to 2 inches (2.5 to 5 cm) long and 0.6 to 1 inch (1.5 to 2.5 cm) wide. Pale green in summer turning to tan in winter and eventually black and persistent into spring. Capsules splitting in half during late winter to release tiny winged seeds.

Ecology. Common around old homes, on roadsides, riparian areas, and forest marigins in infested areas. Infrequently planted in plantations. Spreads by wind and water dispersed seeds. Invades after fire, harvesting, and other disturbances. Forms colonies from root sprouts.

States with suspected infestations are shown in gray.



Princesstree - April

Resembles southern catalpa, *Catalpa bignonioides* Walt., and northern catalpa, *C. speciosa* (Warder) Warder *ex* Engelm., which have leaves with sparsely hairy upper surfaces and rough hairy lower surfaces and long slender, persistent beans.

History and use. Introduced in the early 1800s from East Asia. Has been widely planted as an ornamental and grown in scattered plantations for speculative high-value wood exports to Japan.

October
June
June
June
March
June
June
October

5.6.1 Princess tree at CBTS

One population of princess tree was located at CBTS (Figure). Princess tree population was estimated to cover approximately .001 acres. Several mature trees were seen along the borders of CBTS on neighboring properties. Princess tree seeds are winged and can spread in strong winds. This species should be monitored yearly for additional populations.

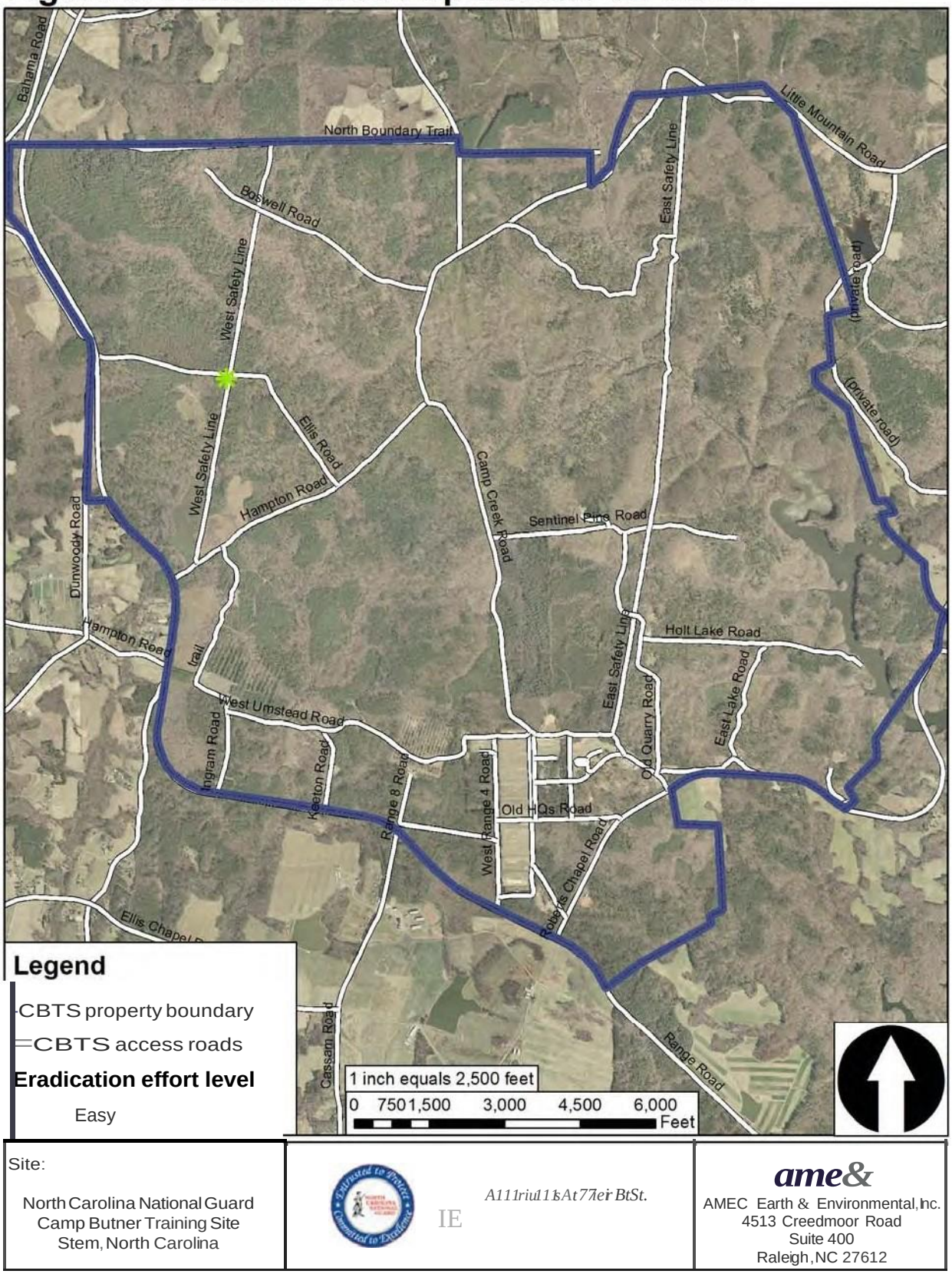
5.6.2 Recommended control procedures for Princess tree

Large trees. Make stem injections using Arsenal AC* or a glyphosate herbicide in dilutions and cut spacings specified on the herbicide label. Treat anytime except March and April. When felling trees, apply the herbicides listed to the stems and stump tops immediately after cutting.

Saplings. Apply Garlon 4 as a 20-percent solution in basal oil, begetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II to yound bark as a basal spray.

Resprouts and seedling. Wet leaves with on of the following herbicides in water with a surfactant (July to October): Aresenal AC* as a 1-[ercent solution (4 ounces per 3-gallon mix); a glyphosate herbidide, Garlon 3A or Garlon 4 as a 2-percent solution (8 ounces per 3-gallon mix).

Figure 9. Princess Tree Populations on CBTS



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5.7 PUERARIA MONTANA VAR. LOBATA, KUDZU BIOLOGICAL DESCRIPTION

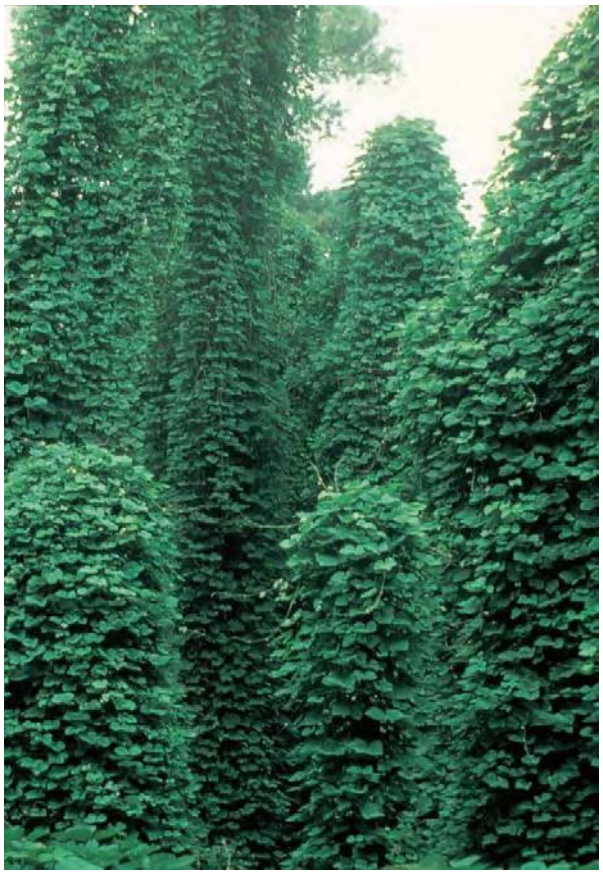
Pueraria montana (Lour.) Merr. **PUMOL**
Synonyms: *P. lobata* (W_lld.) Ohwi, *P. montana var. lobata* (Willd.) Maesen & S. Almeida

States with suspected infestations are shown in gray.

Plant. Deciduous twining, trailing, mat-forming, ropelike woody leguminous vine, 35 to 100 feet (10 to 30 m) long with three-leaflet leaves. Large semiwoody tuberous roots reaching depths of 3 to 16 feet (1 to 5 m). Leaves and small vines dying with first frost and matted dead leaves persistent during winter.

Stem. Woody vines to 10 inches (25 cm) in diameter, round in cross section, with infrequent branching. Stems yellow green with dense erect golden hairs and upward matted silver hairs, aging to ropelike, light gray, and hairless. Frequent unswollen nodes that root when on the ground. Mature bark eventually rough, rigid, and usually dark brown.

Leaves. Alternate, pinnately compound three-leaflet leaves, each leaflet 3 to 7 inches (8 to 18 cm) long and 2.5 to 8 inches (6 to 20 cm) wide. Usually slightly lobed (unless in shade): a two-lobed symmetric middle leaflet and two one-lobed side leaflets, all petioles swollen near leaflets. Tips pointed. Margins thin membranous and fine golden hairy. Leafstalks 6 to 12 inches (15 to 30 cm) long, long hairy, base swollen, with deciduous stipules.



Kudzu - July

Flowers. June to September. Axillary slender clusters (racemes), 2 to 12 inches (5 to 30 cm) long, of pealike flowers in pairs (or threes) from raised nodes spiraling up the stalk, opening from the base to top. Petals lavender to wine colored with yellow centers.

Fruit and seeds. September to January. Clustered dry, flattened legume pods (bulging above the seeds) each 1.2 to 3 inches (3 to 8 cm) long and 0.3 to 0.5 inch (8 to 12 mm) wide. Green ripening to tan with stiff golden-brown hairs. Splitting on one to two sides to release a few ovoid seeds.

Ecology. Occurs in old infestations, along right-of-ways and stream banks. Forms dense mats over the ground, debris, shrubs, and mature trees forming dense patches by twining on objects less than 4 inches (10 cm) in diameter. Colonizes by vines rooting at nodes and spreads by wind, animal, and water dispersed seeds. Seed viability variable. Leguminous nitrogen fixer.

History and use. Introduced from Japan and China in early 1900s with continued seed importation. Erosion control, livestock feed, and folk art.

Kudzu
October
April
June
July
November
T. Bodner

5.7.1 Kudzu at CBTS

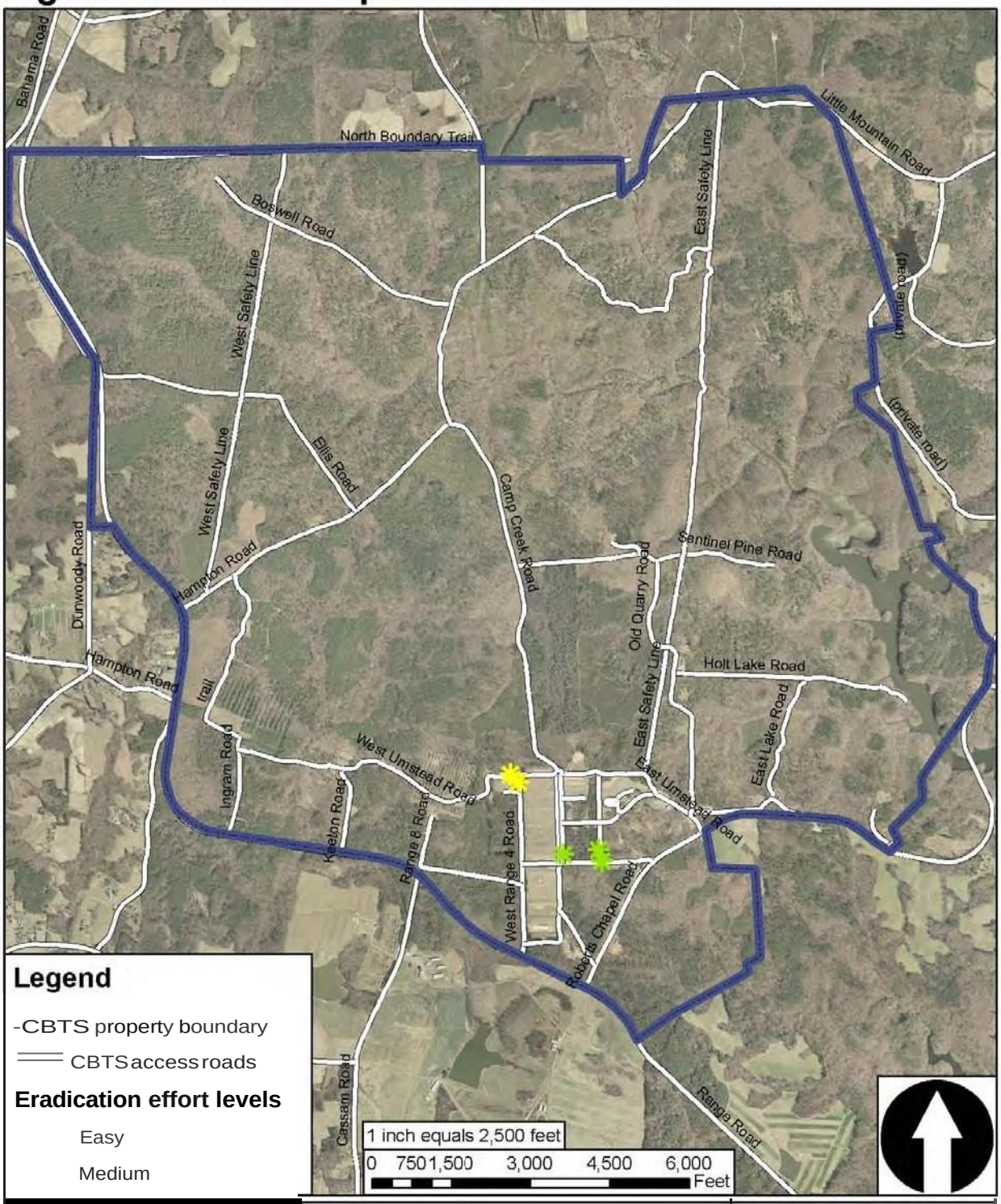
Although kudzu is not currently a major problem at CBTS, kudzu will remain a constant threat to CBTS due to neighbouring populations. Large infestations of Kudzu are found along all roads surrounding CBTS property. An estimated .2 acres of kudzu is established at CBTS currently. Large root crowns develop as plants age and are a reason Kudzu is difficult to control. Populations should be treated immediately to stop the spread and monitored yearly for resprout. In addition, CBTS should monitor its borders yearly to prevent new populations from establishing on CBTS lands. Kudzu can spread via wind, water, and animal movement.

5.7.2 Recommended control procedures for Kudzu

Foliar Control. Wet all leaves (until runoff occurs) with one of the following herbicides in water with a surfactant for successive years until regrowth does not occur – July to September, Escort * XP (nontarget plants may be killed or injured by root uptake) at 3 to 4 ounces per acre in water (0.8 to 1.2 dry ounces per 3-gallon mix). When safety to surrounding vegetation is necessary, Transline (Transline control a narrow spectrum of plant species) as a 0.5-percent solution in water (2ounces per 3-gallon mix); spray climbing vines as high as possible or cut vines that are not controlled after herbicide treatment.

Partial Control. Apply Garlon 4 or a glyphosate herbicide as a 4-percent solution in water (1 pint per 3-gallon mix) with a surfactant during the growing season and apply repeatedly. Cut large vines and immediately apply these herbicides to the cut surfaces. For controlling vines less than 2 inches in diameter, apply Garlon 4 as a 20 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) or apply undiluted Pathfinder II as a basal spray to large vines as a basal spray (January to April).

Figure 10. Kudzu Populations on CBTS



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5.0 WISTERIA SINENSIS, CHINESE WISTERIA BIOLOGICAL DESCRIPTION

Chinese wisteria, *Wisteria sinensis* (Sims) DC. **WISI Japanese wisteria, *W. floribunda*** (Willd.) DC. **WIFL**

Plant. Deciduous high climbing, twining, or trailing leguminous woody vines (or cultured as shrubs) to 70 feet (20 m) long. Chinese and Japanese wisteria difficult to distinguish due to possible hybridization.

Stem. Woody vines to 10 inches (25 cm) in diameter with infrequent alternate branching. Twigs densely short hairy. Older bark of Chinese wisteria tight and dark gray with light dots (lenticels) compared to white bark of Japanese wisteria.

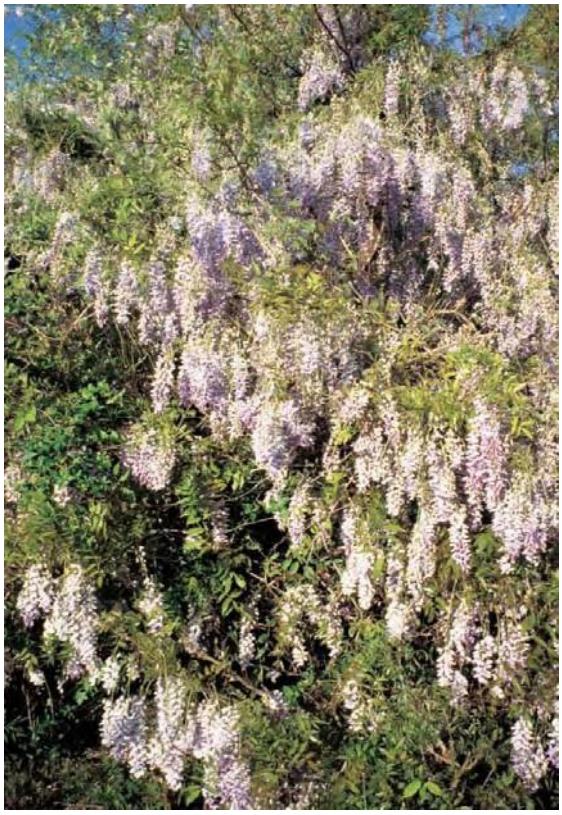
Leaves. Alternate, odd pinnately compound 4 to 16 inches (10 to 40 cm) long, with 7 to 13 leaflets (Chinese) or 13 to 19 leaflets (Japanese), and stalks with swollen bases. Leaflets oval to elliptic with tapering pointed tips
1.6 to 3 inches (4 to 8 cm) long and 1 to 1.4 inches (2.5 to 3.5 cm) wide. Hairless to short hairy at maturity but densely silky hairy when young. Margins entire and wavy. Sessile or short petioled.

Flowers. March to May. Dangling and showy, stalked clusters (racemes) appearing when leaves emerge, 4 to 20 inches (10 to 50 cm) long and 3 to 3.5 inches (7 to 9 cm) wide. All blooming at about the same time (Chinese) or gradually from base (Japanese). Pealike flowers, corolla lavender to violet (to pink to white). Fragrant.

Fruit and seeds. July to November. Flattened legume pod, irregularly oblong to oblanceolate, 2.5 to 6 inches (6 to 15 cm) long and 0.8 to 1.2 inches (2 to 3 cm) wide. Velvety hairy, greenish brown to golden, splitting on two sides to release one to eight flat round brown seeds, each 0.5 to 1 inch (1.2 to 2.5 cm) in diameter.

Ecology. Form dense infestations where previously planted. Occur on wet to dry sites. Colonize by vines twining and covering shrubs and trees and by runners rooting at nodes when vines covered by leaf litter. Seeds are water-dispersed along riparian areas. Large seed size a deterrent to animal dispersal.

States with suspected infestations are shown in gray.



Chinese wisteria - April

resemble native or naturalized American wisteria, *W. frutescens* (L.) Poir., which does not form extensive infestations, occurs in wet forests, flowers in June to August after leaves developed, and has 6-inch (15-cm) flower clusters, 9 to 15 leaflets, hair-less pods, and slender old vines. **Also may resemble** trumpet creeper, *Campsis radicans* (L.) Seem. ex Bureau, which has leaflets with coarsely toothed margins.

History and use. Introduced from Asia in the early 1800s. Traditional southern porch vines.

Chinese wisteria shown in images

Non-native Wisterias

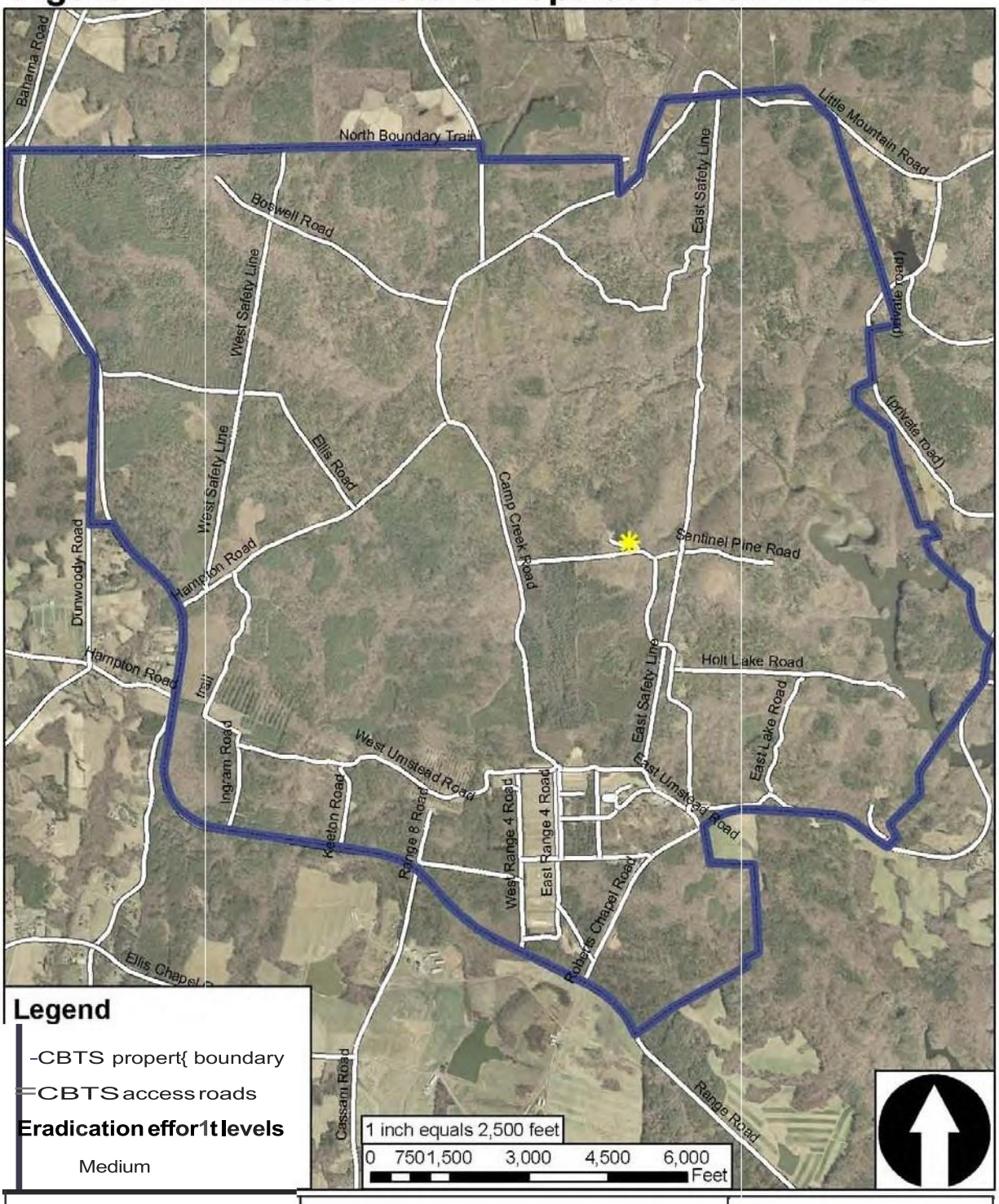
5.8.1 Chinese wisteria at CBTS

Chinese wisteria and Japanese wisteria are difficult to distinguish apart due to hybridization between the species. One population of Chinese wisteria was sighted at CBTS and was approximately.4 acres in size. Wisteria is a popular landscaping plant and although it was not sighted in the neighbourhood immediately surrounding CBTS, it could have been introduced to the site.

5.8.2 Recommended control procedures for Chinese wisteria

Foliar Control. Wet all leaves (until runoff occurs) with one of the following herbicides in water with a surfactant: In July to October for successive years when regrowth appears use Garlon 4 as a 4-percent solution (15ounces per 3-gallon mix). For July to September for successive years when regrowth appears use Transline (controls a narrow spectrum of plant species) as a 0.5 percent solution in water (2 ounces per 3-gallon mix when safety to surrounding vegetation is desired. In September through October with repeated application use a glyphosate herbicide as a 4-percent solution (1 pint per 3-gallon mix).

Figure 11. Chinese Wisteria Populations on CBTS



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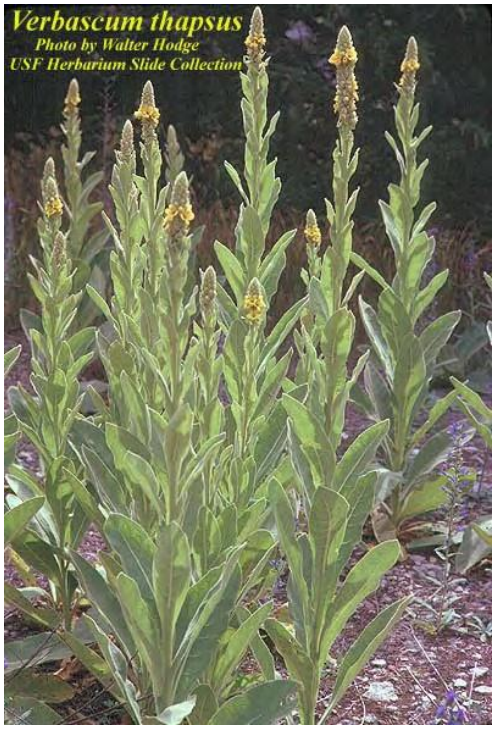
6.0 OTHER NOXIOUS WEEDS

Common mullein was sighted during the field survey on CBTS (Figure 10). *Verbascum thapsus* is considered noxious weeds in current literature and is listed on State lists in Colorado and Hawaii. It is not currently listed on the Federal Noxious Weeds list or North Carolina's State list of invasives. This plant can be weedy or invasive according to several sources and is considered a Class C noxious weed*.



Common names for *Verbascum thapsus* include: big taper, common mullein, flannel plant, velvet dock, velvet plant, and woolly mullein. Common mullein is a weed of landscapes, perennial crops, and roadsides, often found in gravel where the soil is dry. The biennial herb forms a large basal rosette the first year and an erect, usually non-branched stem the second year. Leaves of the basal rosette and stem are densely hairy. After the stem has grown, fused yellow petals are present from June through September. The plant is found throughout the US.

Common mullein was seen along newly graded road at CBTS and although individuals were few, totalling .001 acres, the species should be monitored. If the plants begin to grow a monoculture along roadsides eradication measures should be taken. The primary areas of concern at CBTS are newly upturned roads with soil that have high gravel content, are dry upland soil, and receive full sun.

* Uva, R.H., J.C. Neal, & J.M. DiTomaso. 1997. *Weeds of the Northeast*. Cornell University Press. Ithaca, New York. 397pp.

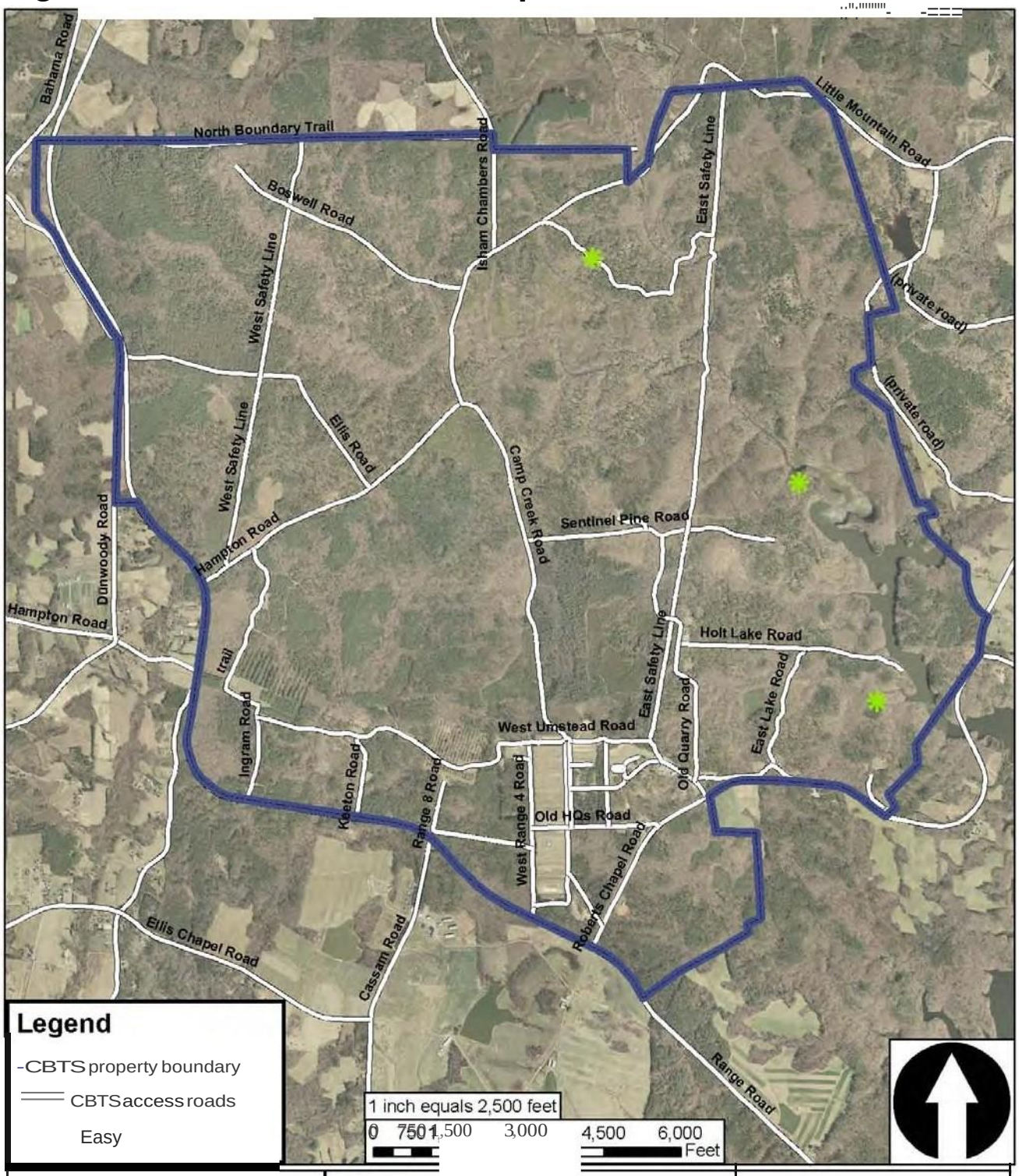
7.0 CONCLUSIONS

Managing and controlling invasive exotic plants is difficult, expensive and requires a long-term commitment. Managers have limited resources and so prioritizing efforts is critical. High priority should be given to those species that have substantial impacts on natural resources or are believed to be easy to manage. High priority should also be given to those species that are not yet established or causing major impacts but have the potential to do so. Low priority should be given to species that cause little impact, are virtually impossible to control, or both.

High priority populations at CBTS are the following (given in order of importance): all populations of kudzu, English ivy, Chinese wisteria, silk tree, princess tree, and tree-of-heaven. Populations of Japanese honeysuckle that can be easily eradicated (green populations), and similar populations of Chinese lespedeza should also be considered high priority.

Low priority populations would include: easily eradicated populations of Microstegium, difficult eradication level populations of Chinese lespedeza, medium and difficult eradication level populations of Japanese honeysuckle, medium and difficult eradication level populations of Microstegium.

Figure 12. Common Mullien Populations on CBTS



Site:
North Carolina National Guard
Camp Butner Training Site
Stem, North Carolina

A111eriar11sAt Their B.

amec9
AMEC Earth & Environmental, Inc.
4513 Creedmoor Road
Suite 400
Raleigh, NC 27612

REFERENCES

Assorted authors. 200_. *State noxious weed lists for 46 states*. State agriculture or natural resource departments.

DCNR. *DCNR Invasive Exotic Plant Turtorial for Natural Lands Mangagers.* [Online] June 2008. < http://www.dcnr.state.pa.us/Forestry/invasivetutorial/Inventory.htm>

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Enviro Tracking #:	**ARNG ENVIRONMENTAL CHECKLIST**	State ARNG
INRMP17	Enter information in the yellow shaded areas.	NC

1. PROJECT NAME:

NC Integrated Natural Resource Management Plan

2. PROJECT NUMBER: (MILCON if applicable)	3. DATE PREPARED:
NIA	4-May-16

4. DESCRIPTION AND LOCATION OF THE PROJECT/PROPOSED ACTION:

a. Location (Include a detailed map, if applicable):

Camp Butner Training Site

b. Description:

Implementation of the NC Natural Resource Management Plan for Camp Butner Training Site

c. The proposed action will involve (check all that apply):

D **Training activities/areas** D **Construction** 0 **Natural resource management**
D **Maintenance/repair/rehabilitation** D Real estate action D **Environmental plans/surveys**
0 **fnnovative readiness training project**
D Other (Explain):

d. Project size (acres): N/A (if annlicablel Acres of new surface disturbance (proposed): (if annlicablel

5. START DATE of PROPOSED ACTION (dd-mmm-yy): Note: This must be a future date.

6. PROGRAMMED FISCAL YEAR (if applicable): 2017/18

7. END DATE (if applicable):

I?Afffii;I PEIJ1$IG/tiic'ANAIIY5JS)GVIDJ;

To use a categorical exclusion, the project must satisfy the following three screening criteria: no segmentation, no exceptional circumstances and a qualifying categorical exclusion that covers the project. The following decision tree will guide the application and documentation of these three screening criteria. The criteria were extracted from 32 CFR Section 651.29 and represent the most common screening conditions experienced in the ARNG. NOTE: Each question in Part B must have an applicable block checked for concurrence with REC.

1. Is this action segmented (the scope of the action must include the consideration of connected, cumulative, and similar actions)? D YES (go to #30) O NO (go to #2)

2. Is there reasonable likelihood of significant environmental effects (direct, indirect,and cumulative)? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) ☐ NO (go to #3)

3. Is there a reasonable likelihood of significant effects on public health, safety or the environment? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) O NO (go to #4)

4. Is there an imposition of uncertain or unique environmental risks? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) ☐ NO (go to #5)

5. Is the pro1ect of greater scope or size than is normal for the category of action? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) O NO (go to #6)

6. Does the project introduce or employ unproven technology? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.
D YES (go to #30) O NO (go to #7)

.•) •• <)>/ •.. .<.-.... •... .: .• F?AJ".B,..QEPl51QNANA,LY'S)S(c9iitjm.1¢d)X " . .: • . •. .• . ·/;). .:•. . . •. . . .·. .<

7. Will there be reportable releases of hazardous or toxic substances as specified in 40 CFR Part 302? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

O YES (go to #30) O NO (go to #8)

8. If proposed action is in a non-attainment or maintenance area, will air emissions exceed de minimus levels or otherwise require a formal Clean Air Act (CAA) conformity determination? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. D YES (go to #30) O NO (go to #g) D N/A (go to #9)

9. Will the project have effects on the quality of the environment that are likely to be highly controversial? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

D YES (go to #30) O NO (go to #10)

10. Will the project establish a precedent (or make decisions in principle) for future or subsequent actions that are reasonably likely to have future significant effects? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. D YES (go to #30) O NO (go to #11)

11. Has federal funding been secured for the Innovative Readiness Training (IRT) project?

O N/A (go to #13) D YES (go to #13) D NO (go to #12)

12. NOTE: IRT projects not currently funded can secure approved NEPA documentation. However, once funding is secured State ARNG is required to coordinate with ARNG-ILE-T to complete natural and cultural surveys via proponent funding.

D CONFIRMED (go to #27)

13. Do you have a species list from the U.S. Fish and Wildlife Service that is less than 90 days old?

[2] YES (go to #14) Granville: 3/25/15; Durham: 12/26/12 O **NO (update species list return to #13)**

14. In reviewing the species list, what determination was made by the State ARNG?

O No species present (go to #16)

O No affect (go to #16)

D **May affect but not likely to adversely affect (go to #16i_.Q§,t,e_ 9f US_FW!?:_Q., IJQl,;lf,nce_:** 1

0 May affect likely to adversely affect (go to #15)

15. Does an existing Biological Opinion cover the action?

O YES (go to #16) **Date of BO:** D NO (go to #30)

16. Have the Endangered Species Act, Section 7 requirements completed?

[2] YES (go to #17) Granville: 3/25/15; Durham: 12/26/12 **D NO (complete documentation, return to #16)**

17. Does the project involve an undertaking to a building or structure that is 50 years of age or older?

D YES (go to #18) O NO (go to #20)

18. Has the building or structure been surveyed for the National Register of Historic Places?

O YES (go to #19) 0 NO (complete inventory, return to #18)

19. Is the building or structure eligible for or listed on the National Register of Historic Places?

O YES (go to #20) O NO (go to #20)

20. Does the action involve ground disturbing activities?

D YES (go to #21) O NO (go to #22)

21. Has an archaeological inventory or research been completed to determine if there are any archeological resources present?

D YES (go to #22) **D NO (complete inventory or conduct research, return to #21)**

22. In reviewing the undertaking, under the National Historic Preservation Act (NHPA) (for both above and below ground resources), what determination was made by the State ARNG?

0 No 106 undertaking; no additional consultation required under NHPA (go to question #27)

O No properties affected (go to #24) Date of SHPO Concurrence:

0 No adverse effect (go to #24) Date of SHPO Concurrence:

0 Adverse effect (go to #23)

23. Has the State ARNG addressed the adverse effect?

DYES (place date of MOA or existing PA and explanation of mitigation in box below, go to #24) O NO (go to #30)

23a.

24. Per DoDI 4710.02 did the state ARNG determine that tribal consultation was necessary for this project?

D YES {go to #25)

0 NO (Provide reason Inthis block 24a, go to #27)

See **INRMP** Appendix A for contact documentation

25. Did the Tribes express an interest or respond with concerns about the project?

D YES (go to #26) 0 NO (go to #27) Date of Documentation:

26. Has the State ARNG addressed the Tribal concerns?

DYES (place date of MOU or explanation of how State ARNG addressed tribal concerns in box below, go to #27)

D NO (address concerns, return to #26)

Comolete onlv if additional documentation is reauired in auestion #26

26a.

27. Does the project involve an unresolved effect on areas having special designation or recognition such as those listed below? For any yes responses go to #30 otherwise go to #28. If any No response is a result of negotiated and/or previously resolved effects please describe resolution in box 27a below.

TYPE	Unresolved Effects?	TYPE	Unresolved Effects?
a. Prime/Unique Farmland	No	e. Wild/Scenic River	No
b. Wilderness Area/National Park	No	f. Coastal Zones	No
c. Sole-Source Aquifer	No	g. 100-year Floodplains	No
d. Wetlands	No	h. National Wildlife Refuges	No

27a.

28. Is this project addressed in a separate EA or EIS review?

(2]YES (complete table below; go to Part C, Determination) DNO (go to #29)

Document Title:	**Environmental Assessment with FNSI**
Lead Aaencv:	NCARNG
Date of Decision Document:	9/28/2001

29. Does the project meet at least one of the categorical exclusions listed in 32 CFR 651 App B?

DYES (complete table below; go to Part C, Determination) DNO (go to #30)

List primary CAT EX code	
Descibe why CAT EX applies	

30. At this time your project has not met all the qualifications for using a categorical exclusion under 32 CFR 651. Unless the scope of the project is changed, it will require an Environmental Assessment or possibly an Environmental Impact Statement. If you feel this is in error, please call your NEPA Regional Manager to discuss. If needed, go to Part C Determination.

Additional Information (if needed):

PART C - DETERMINATION

On the basis of this initial evaluation, the following is appropriate:

D IAW 32 CFR 651 Appendix B, the proposed action qualifies for a Categorical Exclusion (CX) that does not require a Record of Environmental Consideration.

☑ A Record of Environmental Consideration (REC).

☐ An Environmental Assessment (EA).

☐ A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS).

Signature of Proponent (Requester)

Braden Ramage
Printed Name of Proponent (Requester)

May 05, 2016
Date Signed

Vickie A. Dudick
Environmental Program Manager

VICKIE A. DUDICK
Printed Name of Env. Program Manager
Director of Environmental Management

Date Signed
HI04'18

Other concurrence (as **needed):**

Signature	Signature
Rodney D. Newton Printed Name	Printed Name
/r9 rYl QGj1 2ofG Date Signed	Date Signed
Signature	Signature
Printed Name	Printed Name
Date Signed	Date Signed
Signature	Signature
Printed Name	Printed Name
Date Signed	Date Signed

ARNG Record of Environmental Consideration State ARNG

Enviro Tracking #:

INRMP17 **Enter information in the yellow shaded areas.** NC

1. PROJECT NAME:	
NC Integrated Natural Resource Management Plan	
2. PROJECT NUMBER: (MILCON **if** applicable)	3. DATE PREPARED:
N/A	4-May-16

4. START DATE of PROPOSED ACTION (dd-mmm-yy): Note: This must be a future date

5. PROGRAMMED FISCAL YEAR: 2017/18

6. END DATE if a licable :

7. DESCRIPTION AND LOCATION OF THE PROPOSED ACTION:

a. Location (Include a detailed map, if applicable):
Camp Butner Training Site

b. Description:
Implementation of the NC Natural Resource Management Plan for Camp Butner Training Site

8. CHOOSE **ONE** OF THE FOLLOWING:

[/] An existing environmental assessment" adequately covers the scope of this project. Attach FNSI if EA was completed by another federal agency (non-ARNG).
EA Date (dd-mmm-yy): 28-09-01 Lead Agency: NCARNG

O An existing environmental impact statement" adequately covers the scope of this project.
EIS Date (dd-mmm-yy): Lead Agency:

O After reviewing the screening criteria and completing the ARNG environmental checklist, this project qualifies for a **Categorical Exclusion** (select below).
Categorical Exclusion Code:
See 32 CFR 651 App. B
Categorical Exclusion Code:
See 32 CFR 651 App. B
Categorical Exclusion Code:
See 32 CFR 651 App. B

D This project is exempt from NEPA requirements under the provisions of:
Cite superseding law:

– !

***Copies of the referenced EA or EIS can be found in the ARNG Environmental Office within each state.**

9. REMARKS:

Environmental Program Manager

VICKIE DUDICK
Printed Name of Env. Program Manager

0 Date Signed Date Signed

Proponent Information:
10. Proponent:
11. Address:
12. POC:
13. Comm. Voice:

14. Proponent POC e-mail:

Signature of Proponent (Requester)

Braden Ramage

Printed Name of Proponent (Requester)

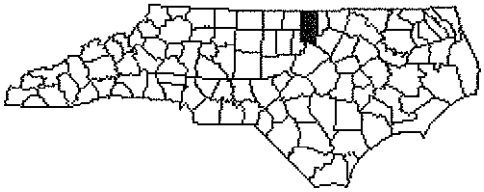
May 17, 2016

17 MAY 2016

U.S. Fish & Wildlife Service

Endangered Species, Threatened Species,Federal Species of Concern, and Candidate Species,

Granville County, North Carolina



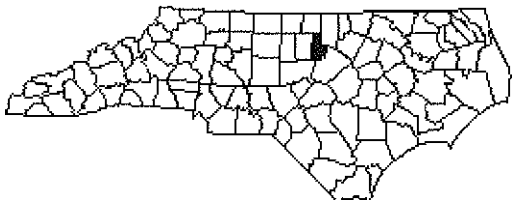
Updated: 03-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American eel	*Anguilla rostrata*	FSC	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Carolina darter	*Etheostoma collis lepidinion*	FSC	Current
Carolina madtom	*Noturus jiiriosus*	FSC	Current
Pinewoods shiner	*Lythrurus matutinus*	FSC	Obscure
Roanoke bass	*Ambloplites cavifrons*	FSC	Current
Invertebrate:			
Atlantic pigtoe	***Fusconaia n7asoni***	FSC	Current
Brook floater	*Alasmidonta varicosa*	FSC	Current
Chowanoke crayfish	*Orconectes virginiensis*	FSC	Obscure
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Green floater	*Lasmigona subviridis*	FSC	Current
Yellow lampmussel	*Lampsilis cariosa*	FSC	Current
Yellow lance	*Elliptio lanceolata*	FSC	Current
Vascular Plant:			
Butner's barbara's-buttons	*Marshallia* sp.	FSC	Current
HarpereIla	*Ptilimnium nodosum*	E	Current
Prairie birdsfoot-trefoil	*Lotus unifoliolatus* var. *helleri*	FSC	Current
Smooth coneflower	*Echinacea laevigata*	E	Current
Smooth-seeded hairy nutrush	*Scleria* sp. *1*	FSC	Historic
Tall larkspur	*Delphinium exaltatum*	FSC	Current
Torrey's Mountain-mint	*Pycnanthemum torrei*	FSC	Historic
Nonvascnlar Plant:			
Lichen:			

U.S. Fish & Wildlife Serviue

Endangered Species, Threatened Species,Federal Species of Concern, and Candidate Species,

Durham County, North Carolina



Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American eel	*Anguilla rostrata*	FSC	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
CaroJina darter	*Etheostoma collis lepidinion*	FSC	Current
Carolina madtom	*Noturus furiosus*	FSC	Current
Pinewoods shiner	*Lythrurus matutinus*	FSC	Obscure
Roanoke bass	*Ambloplites cavifrons*	FSC	Current
Invertebrate:			
Atlantic pigtoe	*Fusconaia masoni*	FSC	Current
Green floater	*Lasmigona subviridis*	FSC	Current
Panhandle pebblesnail	*Somatogyrus virginicus*	FSC	Current
Septima's clubtail	*Gomphus septima*	FSC	Historic
Yellow lampmussel	*Lampsilis cariosa*	FSC	Current
Vascular Plant:			
Butternut	*Jug/ans cinerea*	FSC	Historic
Michaux's sumac	*Rhus michauxii*	E	Current
Smooth coneflower	*Echinacea laevigata*	E	CulTent
Sweet pinesap	*Monotropsis odorata*	FSC	Current
Tall larkspur	*Delphinium exaltatum*	FSC	Current
Nonvascular Plant:			
Lichen:			

Definitions of Federal Status Codes: