INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

2010-2014

FORT RUCKER, ALABAMA

NATURAL RESOURCES BRANCH
ENVIRONMENTAL AND NATURAL RESOURCES DIVISION
DIRECTORATE OF PUBLIC WORKS

July 29, 2009

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FORT RUCKER, ALABAMA

APPROVAL

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C. 670a *et seq.*) as amended.

James A. Muskopf
Colonel, U.S. Army
Garrison Commander
U.S. Army Aviation Center of Excellence
and Fort Rucker
Fort Rucker, Alabama

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Date

Cynthia Dohner
Regional Director
Region 4
U.S. Fish and Wildlife Service

_____
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Date

N. Gunter Guy, Jr.
Commissioner
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3 MAY 11
Date

Cynthia Dohner
Regional Director
Region 4
U.S. Fish and Wildlife Service

for Jan Everham, AL ES Deputy Field Supervisor
6-10-2011
Date

N. Gunter Guy, Jr.
Commissioner
Alabama Department of Conservation
and Natural Resources

N. Gunter Guy Jr.
05/12/2011
Date

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FORT RUCKER, ALABAMA

PREPARED BY

BioResources, LLC
P.O. Box 1464
Auburn, AL 36831-1464

FORT RUCKER REVIEW

Edwin P. Janasky, Director of Public Works
Alfred T. Townsend, Chief, Environmental and Natural Resources Division, Directorate of Public Works
Delarie Parmer, Chief, Natural Resources Branch, Directorate of Public Works
Sean Sparks, Chief, Training Division, Directorate of Plans, Training, Mobilization and Security
Phillip Anderson, Attorney/Advisor, Office of the Staff Judge Advocate
Kenneth J. Jackson, CPRP Chief, Community Recreation Division, Directorate of Family and Morale, Welfare and Recreation

INSTALLATION MANAGEMENT COMMAND - SOUTHEAST REVIEW

Robert Larimore, Natural Resources, IMCOM-SE

Ron Smith, Natural Resources, IMCOM-SE

Installation Management Command – Southeast
ATTN: IMSE-PWD-E (Mr. Larimore)
1593 Hardee Avenue, SW
Fort McPherson, GA 30330-1057

PREFACE

"One Team, One Fight, One Future"

Treat every acre according to its needs and utilize every acre according to its capabilities in support of the military mission.

Fort Rucker, Alabama... home of U.S. Army aviation, a critical component of the nation's defense.

Fort Rucker, Alabama... home of some of the most diverse plant and wildlife communities in the region.

Training troops to win on battlefields around the globe and taking care of natural resources... Fort Rucker is proving that the two missions are indeed compatible and even complement each other.

Fort Rucker is proud of its contribution toward the defense of the United States of America. For over 50 years, Fort Rucker has trained soldiers and other members of the United States Armed Forces in skills needed to protect the American way of life. The mission of Fort Rucker has changed over the decades... from training troops in many combat and combat support roles during World War II to today's diverse mission of training Army aviators and others in various combat skills. Training opportunities provided at Fort Rucker are first rate today, just as they have been over the decades.

This Integrated Natural Resources Management Plan is Fort Rucker's plan of action for the conservation of the natural resources entrusted to the U.S. Army. The plan is for a five-year period, but the philosophy behind it is for a much longer period of time. Fort Rucker will conserve its biological diversity and make sound decisions regarding the use of renewable natural resources to support both the military mission and needs of the region.

Lands on Fort Rucker have been used to serve this nation's defense since the beginning of World War II. As the installation enters the 21st Century, this legacy is not taken lightly by those who use Fort Rucker today. This Integrated Natural Resources Management Plan is dedicated to the next generation of soldiers, their families, and other Americans who will use these lands and their natural resources.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FORT RUCKER, ALABAMA

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EXECUTIVE REPORT

"We do not own this land; we are caretakers of the land and the plant and animal species that inhabit it. The American people entrust the land to our care, and we shall fulfill their trust. We shall conserve and protect these resources for the future."[1]

Purpose

This Integrated Natural Resources Management Plan (INRMP) guides implementation of the natural resources program on Fort Rucker, Alabama from 2010 through 2014. The program conserves Fort Rucker's land and natural resources and helps ensure compliance with related environmental laws and regulations. The Plan also helps ensure the maintenance of quality training lands to accomplish Fort Rucker's critical military mission.

Environmental Compliance

This INRMP is required by the Sikes Act (16 U.S.C. 670a et seq.), Department of Defense Instruction 4715.3 (*Environmental Conservation Program*), and Army Regulation 200-1 (*Environmental Quality, Environmental Protection and Enhancement*). This INRMP helps Fort Rucker comply with other federal and state laws, most notably laws associated with environmental documentation, wetlands, endangered species, water quality, and wildlife management in general. This plan is compatible with the Installation Real Property Master Plan (RPMP) and Operations of the US Army Aviation Center of Excellence and Fort Rucker. This plan describes how Fort Rucker will implement provisions of AR 200-1 and local regulations, most notably Fort Rucker Regulation 215-1 (*Hunting, Fishing, Water Safety, and Trapping)* (2009) and portions of 2010 *Range and Training Area Regulation* No. 385-1.

Fort Rucker is required to prepare an Outdoor Recreation Plan (AR 200-1). This INRMP, particularly Chapter 13.0, is that Outdoor Recreation Plan.

This INRMP has the signatory approval of the U.S. Fish and Wildlife Service and Alabama Department of Conservation and Natural Resources. This signature approval includes agreement that the INRMP complies with the Endangered Species Act. Review of the INRMP is considered informal consultation with regard to the Endangered Species Act.

The Sikes Act requires that an INRMP include:

- Fish and wildlife habitat improvements or modifications
- Range rehabilitation for support of wildlife
- Specific habitat improvements and protection of threatened and endangered species
- Control of off-road vehicle traffic
- Wetland protection, restoration, and creation where necessary for support of fish or wildlife
- Regular review of this INRMP and its effects, not less often than every five years
- Provisions for spending hunting and fishing permit fees exclusively for the protection, conservation, and management of fish and wildlife, including habitat improvement, and related

[1] Robert M. Walker, Assistant Secretary of the Army, Testimony before Congress, July 11, 1995.

activities in accordance with the INRMP

- Exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars
- Priority for contracts involving implementation of this INRMP to state and federal agencies having responsibility for conservation of fish and wildlife

Scope

This plan applies to organizations internal and external to Fort Rucker that are involved with, or interested in, the management or use of Fort Rucker lands and natural resources. Plan application includes active duty units, National Guard and Reserve Components, directorates, private groups, and individuals. This INRMP is an integral part of the Fort Rucker Installation Master Plan.

Relationship to the Military Mission

Fort Rucker is responsible for the training of U.S. Army aviators and their support personnel as its primary military mission. These soldiers are among the most specialized military professionals in the world, and their training is intense and complex. Fort Rucker trains Survival, Evasion, Rescue, Escape (SERE) as well as other members of the nation's Armed Forces... in particular U.S. Army National Guard and Reserve units in the region. These latter ground-oriented missions often involve considerable interaction with the installation's natural resources.

This INRMP supports the military mission by protecting and enhancing training lands upon which the mission is critically dependent. The INRMP also describes recreational opportunities associated with natural resources to the Fort Rucker community, thus supporting the Fort Rucker commitment to both Quality of Life and Communities of Excellence programs.

The INRMP describes impacts of the military mission upon natural resources and means to mitigate these impacts. However, this INRMP does not evaluate Fort Rucker's military mission, nor does it replace any need or requirement for environmental documentation of the military mission at Fort Rucker.

Partnerships

This INRMP cannot be implemented by Fort Rucker alone. Fort Rucker is forging partnerships with various agencies to manage its natural resources. Major partners in the implementation of this Plan are the U.S. Fish and Wildlife Service and the Alabama Department of Conservation and Natural Resources. Other partners in this effort include universities, other federal and state agencies, contractors, and private citizens.

Planned Major Initiatives

This INRMP includes a description of ongoing natural resources programs and projects. Most of these will either be continued or completed subject to the availability of funds. The most important projects

within this INRMP include the following:

- Implementing an ecosystem management philosophy.
- Implementing the Integrated Training Area Management (ITAM) program.
- Monitoring flora, fauna, and water quality.
- Implementing a geographic information system to allow better decisions regarding use and management of Fort Rucker natural resources.
- Protection of unique natural resources areas in terms of special habitats and overall biological richness.
- Implementing a forest management program to support the military mission, meet natural resources goals, and provide forest products when possible within the constraints of the primary and secondary goals. .
- Implementing older age and uneven-aged pine stand management, including growing season burning, in selected areas.
- Continuing agricultural outleasing and evaluate new opportunities for outleasing.
- Managing fish and wildlife habitat for all species of wildlife.
- Managing fish and wildlife species including traditional game management programs as well as programs designed for nongame, particularly species of special concern.
- Rehabilitating damaged training lands and minimizing erosion, particularly erosion associated with the Aerial Gunnery Range Complex and helicopter hover points.
- Conducting grounds maintenance programs in a cost-effective manner.
- Providing an effective integrated pest management program.
- Conducting effective natural resources law enforcement.
- Informing soldiers and other members of the Fort Rucker community of the value of installation natural resources and means to conserve those resources.
- Implementing a comprehensive outdoor recreation program.
- Protecting cultural resources while conducting natural resources management.
- Using NEPA to conserve natural resources.

Costs and Benefits

- **Military Mission Benefits:** Implementation of this Plan will improve the quality of training land. It will enhance mission realism through more options for training as well as more intensive planning of missions. It will improve the ability for long range planning at Fort Rucker.

- **Environmental Benefits:** The Plan provides the basis for the conservation and protection of natural resources. It will help reduce vegetation loss and soil erosion due to military activities. It will reduce the potential for environmental pollution. It will provide biodiversity conservation. Plan implementation will increase overall knowledge of the operation of the Fort Rucker ecosystems through surveys and research.
- **Other Benefits:** Troop environmental awareness will be enhanced while training at Fort Rucker. Both community relations and Fort Rucker's environmental image, internal and external to Defense, will be enhanced. Quality of life for the Fort Rucker community and its neighbors will be improved. Plan implementation will decrease long-term environmental costs and reduce personal and installation liabilities from environmental noncompliance.
- **Costs:** Full implementation of this INRMP will cost about $13,617,930 for the FY 10 - FY 14 period to implement. Funding will be primarily from revenues generated from the sale of hunting

and fishing permits and timber products, agricultural outleasing revenues, environmental funds, and training funds designated for implementation of the Integrated Training Area Management (ITAM) program.

Summary

This Integrated Natural Resources Management Plan will comply with environmental laws, conserve and protect Fort Rucker's natural resources, improve Fort Rucker's relationship with the public, and enhance the military mission. This Plan will not resolve all existing and/or future environmental issues. It does, however, provide the guiding philosophy, personnel, and means to minimize and work toward resolution of such issues.

1.0 GOALS AND POLICIES

Army Environmental Vision Statement

The Army will be a national leader in environmental and natural resource stewardship for present and future generations as an integral part of our mission2

The Army's commitment to natural resources management is reflected in the U.S. Army Environmental Strategy into the 21st Century. The Army environmental strategy is depicted as a building established on a solid foundation with four pillars supporting the environmental stewardship vision and the Army mission. The four pillars symbolize the Army environmental program and represent the four major activity areas, which include conservation. The conservation pillar focuses on responsibly managing Army lands to ensure long-term natural resource productivity so the Army can achieve its mission. This Army commitment to natural resources management is emphasized in Army Regulation 200-3 (*Natural Resources - Land, Forest, and Wildlife Management*), which requires that Integrated Natural Resources Management Plans (INRMP) be developed and maintained for all Army installations.

It is important to understand the relationship between the natural resources program and Fort Rucker as a whole. A comparison of installation goals and goals of the natural resources program helps identify this relationship.

1.1 Fort Rucker Command Vision

The Fort Rucker Command Mission is to:

> "Train military, civilian, and international personnel in aviation and leadership skills IOT support AFORGEN and prepare the Army to dominate in Full Spectrum Operations in JIIM environment; integrate Army aviation warfighting doctrine and requirements determination across the DOTMLPF; manage available resources; and sustain our commitment to the well-being of our Soldiers, civilians, retirees, and families" (United States Army Aviation Center of Excellence Campaign Plan 2009)

2 The Army Environmental Policy Institute (AEPI) facilitated the development of the first formal "Army Environmental Strategy," publishing the document in 1992 with signatures from the Secretary of the Army (Togo D. West Jr.) and Chief of Staff of the Army (Gen. Gordon R. Sullivan). This is the cornerstone statement.

1.2 Fort Rucker Natural Resources Goals

Below are general Fort Rucker natural resources goals and policies used to attain them. These policies also serve as a checklist to monitor the success of the plan. Some policies fit more than one category. When this occurs, the most-fitting category was chosen. More specific objectives are included within chapters describing management programs.

1.2.1 Military Readiness

Provide quality natural resources as a critical training asset upon which to accomplish the military mission of Fort Rucker.

- Ensure no net loss in the capability of installation lands to support existing and projected military training and operations on Fort Rucker as required by the 1997 Sikes Act revisions.
- Maintain quality training lands through range monitoring and damage minimization, mitigation, and rehabilitation.

1.2.2 Stewardship

Manage natural resources on Fort Rucker to assure good stewardship of all lands entrusted to the care of the Army.

- Use ecosystem management strategies to protect, conserve, and enhance native fauna and flora with an emphasis on biodiversity enhancement.
- Monitor and manage soils, water, vegetation, and wildlife on Fort Rucker with a consideration for all biological communities and human values associated with these resources.
- Provide economic and other human-valued products of renewable natural resources when such products can be produced in a sustainable fashion without significant negative impacts on the military training mission or other natural resources.
- Provide professional enforcement of natural resources related laws.
- Involve the surrounding community in the Fort Rucker natural resources program.
- Ensure the Fort Rucker natural resources program is coordinated with other agencies and conservation organizations with similar interests.

1.2.3 Quality of Life

Improve the quality of life of the Fort Rucker community and general public through high quality natural resources-based recreational opportunities.

- Provide high quality opportunities for hunting and fishing within biological and recreational carrying capacities of the resources.
- Provide high quality natural resources-based opportunities for other outdoor recreation, such as hiking, boating, camping, nature study, equestrian activities, etc.
- Provide conservation education opportunities.

1.2.4 Compliance

Comply with laws and regulations that pertain to management of Fort Rucker's natural resources.

- Manage natural resources within the spirit and letter of environmental laws, particularly the Sikes Act upon which this Integrated Natural Resources Management Plan (INRMP) is predicated.
- Protect, restore, and manage sensitive species and wetlands.
- Use procedures within the National Environmental Policy Act (NEPA) to make informed decisions that include natural resources considerations and mitigation.
- Ensure Fort Rucker's natural resources program is consistent with the protection of cultural and historic resources.
- Implement this INRMP within the framework of Army policies and regulations.

1.3 Support of Installation Goals

Implementation of this INRMP will support the goals of Fort Rucker, as reflected in the Fort Rucker Command Mission. INRMP implementation will directly help accomplish the Environmental Stewardship goal. Implementation of this INRMP will help sustain lands needed to accomplish the military mission goal. The openness of the Fort Rucker natural resources program to the general public is a major aspect of the installation's commitment to being a "valued neighbor."

1.4 Biodiversity Conservation and Ecosystem Management

Biological diversity (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 Department of Defense has developed 'A Department of Defense (DoD) Biodiversity Management Strategy" (The Keystone Center, 1996). This Strategy 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 Defense investment*** to preserve and protect the environment;
(3) ***expedite the compliance process*** and help avoid conflicts;
(4) ***engender public support*** for the military mission; and
(5) ***improve the quality of life*** for military personnel.

The Keystone Center report (1996) 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 protection 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 INRMP, ITAM, and other planning protocols;
- involve internal and external stakeholders up front;
- emphasize the regional (ecosystem) context;
- use adaptive management;
- involve scientists and use the best science available; and

- concentrate on results.

The Department of Defense (DoD Instruction 4715.3, *Environmental Conservation Program*) describes ecosystem management as, "*a process that considers the environment as a complex system functioning as a whole, not a collection of parts, and recognizes that people and their social and economic needs are a part of the whole*". Ecosystem management is not articulated formally in law, but its basic concepts have strong legal compliance aspects, especially within the Endangered Species Act, Sikes Act, and other laws such as the Clean Water Act and NEPA. Ecosystem management is a strategy that will help conserve biodiversity and maintain fully functional ecosystems.

The Department of Defense goal with regard to ecosystem management is, *"To ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, that approach shall maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations*."[3]

Principles and guidelines to achieve this goal are:

- Maintain and improve the sustainability and native diversity of ecosystems.
- Administer with consideration of ecological units and time frames.
- Support sustainable human activities.
- Develop a vision of ecosystem health.
- Develop priorities and reconcile conflicts.
- Develop coordinated approaches to work toward ecosystem health.
- Rely on the best science and data available.
- Use benchmarks to monitor and evaluate outcomes.
- Use adaptive management.
- Implement through installation plans and programs.

Ecosystem management provides a means for Fort Rucker to conserve biodiversity and continues to provide high quality military readiness. Fort Rucker is a user of land, both in terms of military training and producing renewable natural resource products. Ecosystem management incorporates protection and use within a management program.

3 DODI 4715.3, Enclosure 6, "Goal of Ecosystem Management"

Fort Rucker will use ecosystem management to guide its program in the next five years and beyond. This management strategy enables the installation to conduct military training while conserving natural resources upon which the quality of training ultimately depends. Concurrently, ecosystem management helps ensure compliance with environmental laws and production of renewable natural resources products.

1.5 Integrated Training Area Management

Integrated Training Area Management (ITAM) is an Army-wide program to provide quality training environments to support the Army's military mission. ITAM was initiated as the primary tool to ensure no net loss of training capability when it was realized that Army training lands were being degraded to the point where their capabilities to sustain military missions were in jeopardy.

As part of the ITAM budgetary and planning process, subject to the future availability of ITAM funding, Fort Rucker has been designated a Category II installation. Category II installations are large installations, with important training missions and significant environmental sensitivities to missions (ODCSOPS, 1995).

Goals and objectives specific to ITAM are found in the ITAM Program Strategy, Section 2.1 (ODCSOPS, 1995). These are incorporated into objectives within this INRMP. ITAM program components are described in sections 8.8 - *Land Rehabilitation and Maintenance*, 8.14 - *Training Requirements Integration*, 9.2.1 - *Land Condition Trend Analysis*, 9.6.2 - *Geographic Information System*, and 12.2 - *Military Personnel Awareness* of this INRMP.

2.0 LOCATION AND ACREAGE

2.1 Location

Fort Rucker is located on the East Gulf Coastal Plain in southeastern Coffee and southwestern Dale counties, Alabama, some 25 miles northwest of Dothan between the cities of Daleville, Enterprise and Ozark. This is the "Wiregrass" region of southeast Alabama, so named for the wiry appearance of Pineland three-awn (*Aristida stricta)*, that once grew profusely in the area. The main military reservation extends northwestward from the floodplain of the Choctawhatchee River. The main reservation comprises 57,772 acres (63,251 acres if include satellite and leased lands) (Directorate of Plans, Training, Mobilization, and Security [DPTMS], 2009) and is nearly rectangular in shape, averaging 17 miles long by 9 miles wide. Map 2.1 shows the location of Fort Rucker in Alabama.

Cairns Army Airfield (AAF), located east of State Highway 85 in Dale County, 2.8 miles south of Fort Rucker's main reservation, comprises an additional 1,326 acres. The airfield is situated on a ridge top extending from the main reservation on the north through Daleville and Cairns AAF on the south. The main runway complex is at elevations 305-325 feet mean sea level (msl) with forested slopes dropping gradually both eastward and westward to floodplains (164 feet msl) of Claybank Creek and the Choctawhatchee River, respectively (McGee, 1987; 1204th Engineer Co., 1995; Rust Environment and Infrastructure, 1999).

2.2 Satellite Installations

Fort Rucker uses 64 leased sites to support its military mission. These sites total 1,734 acres and are located in Alabama and Florida. Leased sites are not included within this INRMP in terms of management of natural resources. These sites are maintained in accordance with the lease agreements.

Many of the principal aviation training facilities are located off the Fort Rucker main reservation. Map 2.2 shows the location of these satellite facilities in relation to the Fort Rucker main reservation. The following paragraphs provide a description of these facilities and their current uses at the time this plan was written.

Allen Stagefield. Allen stagefield (114 acres) is located in Houston County, 13 miles southeast of Fort Rucker's cantonment area. Principal aircraft using this facility are TH-67 training helicopters.

Brown Stagefield. Brown stagefield (176 acres) is located 2.5 miles west of New Brockton, southeast of Fort Rucker's cantonment area. Principal aircraft using this facility are OH-58 AC scout helicopters.

Cairns Army Airfield. Cairns AAF (1,326 acres) is situated three miles south of Fort Rucker's cantonment area. Principal aircraft using this facility are TH-67 training helicopters and fixed wing aircraft assigned to the Army Aviation Center of Excellence.

Goldberg Stagefield. Goldberg stagefield (101 acres) is located in Dale County, four miles south of Echo. Principal aircraft using this facility are CH-47D cargo helicopters.

High Bluff Stagefield. High Bluff stagefield (190 acres) is located in Geneva County, 3.75 miles

northwest Hartford. Principal aircraft using this facility are TH-67 training helicopters.

Highfalls Stagefield. Highfalls stagefield (40 acres) is located in Geneva County, 5.7 miles west of Hartford. Principal aircraft using this facility are helicopters used in test and research activities conducted by the U.S. Army Aviation Development Test Activity.

Hunt Stagefield. Hunt stagefield (153 acres) is located east of Fort Rucker, near Highway 231 and five miles (8 km) north-northeast of Newton in Dale County. Principal aircraft using this facility OH-58D scout helicopters.

Louisville Stagefield. Louisville stagefield (105 acres) is located near Louisville, Alabama approximately 35 miles north of Fort Rucker. Louisville stagefield is currently inactive.

Lucas (10-C) Stagefield. Lucas stagefield (180 acres) is located in Coffee County, 25 miles southwest of Fort Rucker between Highway 87 and Phillips Creek. Principal aircraft using this facility are TH-67 training helicopters.

Runkle Stagefield. Runkle stagefield (235 acres) is located in Coffee County, 28 miles west of Fort Rucker on the east side of the Pea River

Shell Army Heliport. Shell Army Heliport (296 acres) is located in Coffee County, 4 miles west of the Installation boundary and 5 miles north of downtown Enterprise within the Enterprise city limits. Principal aircraft using this facility are OH-58AC scout training helicopters.

Skelly Stagefield. Skelly stagefield (194 acres) is located in Coffee County, 35 miles west of Fort Rucker on the north side of Highway 134 and just west of the Pea River. Principal aircraft using this facility are UH-1/UH-60 utility helicopters.

Stinson Stagefield. Stinson stagefield (191 acres) is located in Coffee County, west of Fort Rucker and three miles southeast of Elba. Principal aircraft using this facility are UH-60 utility helicopters.

TAC-X Stagefield. TAC-X stagefield (111 acres) is a special-use facility located 30 miles south of Fort Rucker in Geneva County, on the west bank of Double Bridges Creek and about 2 miles north of Highway 52.

Toth Stagefield. Toth stagefield (128 acres) is located 10 miles southeast of Fort Rucker, on the south side of Highway 84 in Houston County. Principal aircraft using this facility are AH-64 attack helicopters.

2.3 Neighbors

The following discussion is limited to the seven southeast Alabama counties (Barbour, Coffee, Covington, Dale, Henry and Houston) influenced by the socioeconomic impact of Fort Rucker. Predominately rural in nature, these counties comprise the Southeast Alabama Economic Development District. The District has been classified as a long-term Economically Distressed Area (EDA) by the Southeast Alabama Regional Planning and Development Commission. Dothan, the largest city in the region, is the only area within the district that does not qualify as economically distressed (Higginbotham /Briggs and Associates, 1991).

The area around Fort Rucker has traditionally relied on farming for income. Manufacturing is now the leading employment sector for the seven county region followed by trade (wholesale and retail) and government. The forest industry is a major component of the manufacturing sector. Revenue generated from forest products (predominantly pine sawtimber and pulpwood) in the seven-counties totaled $31,525,000 in 1992. The influence of Fort Rucker can be seen most strongly in Coffee and Dale Counties, where earning from the government sector account for 47.3 and 33.7 percent, respectively, of total earnings (Rust Environment and Infrastructure, 1999).

There are four state parks and two significant open space recreational areas in the region (Conecuh National Forest and Eufaula National Wildlife Refuge). Two wildlife management areas administered by the state (Barbour Wildlife Management Area and Geneva State Forest Wildlife Management Area) are also found in the area. Within the seven counties, only six cities have the necessary finances to support comprehensive municipal recreation programs (Rust Environment and Infrastructure, 1999).

The seven-county area experienced a 30% increase in population during the last 30 years with the greatest rate of growth (60 %) in Dale and Houston Counties. The Dale County population declined by almost 10 % following the Vietnam Conflict, largely due to a decrease in activities at Fort Rucker. During 1990-1994, population of the seven counties increased by an average of 2.7% (Rust Environment and Infrastructure, 1999).

Major population centers within a 30-mile radius of Fort Rucker include:

- **Ozark**. Called the "Home of Fort Rucker", Ozark (population over 15,000) is the county seat of Dale County. Besides Fort Rucker, the largest employer, the economy of Ozark depends upon manufacturing, agriculture, construction, and wood products (Office of the Mayor, U. S. Census, 2000).

- **Daleville**. Billed as the "Gateway City", Daleville (population over 4,600) is located on the south side of Fort Rucker at the main entrance to the post. Daleville has been closely tied to Fort Rucker since 1942, when a railroad siding from the Atlantic Coast Line was constructed near the town to handle materiel coming in for construction of the new Army camp (Office of the Mayor, 2000 Census).

- **Enterprise**. The largest city in Coffee County, Enterprise (population over 25,000) is located 7 miles west of Fort Rucker. Although agriculture plays an important role in its economy, manufacturing, retail sales, and services account for over 50% of the annual earning of residents (Office of the Mayor, 2000 Census).

- **Dothan**. Dothan (2000 population of over 67,589) is the largest city in the seven-county region and is the county seat for Houston County. Some 20 miles southeast of Fort Rucker, Dothan housing, social and cultural opportunities, and recreational facilities are desirable to soldiers assigned to the post Dothan Public Information Office, 2000 Census).

- **Geneva**. Located 22 miles south of Fort Rucker, Geneva is the county seat for Geneva County. It has a population of over 4,300 and serves as a trade center for the surrounding farms and rural population (Office of the Mayor, 2000 Census).

2.4 Acreage and Acquisition

2.4.1 The Bear Farm

The largest single parcel of Fort Rucker Military Reservation land was originally acquired under a U.S. Department of Agriculture depression-era program to purchase, retire from production, and convert tracts of up to 35,000 acres of sub-marginal farmland into game and bird refuges. In October 1935 formal approval of the "Pea River Land Use Project" for acquisition of such land in Dale and Coffee counties was announced. Between 1936 and 1938 ownership of 31,760.6 acres in Dale and Coffee counties (acreage based on U.S. lease to Alabama described below) were transferred to the federal government at an average price of $7.46 per acre. The "Bear Farm," as it was nicknamed locally due its planned use as a federal game and bird refuge, was leased to the State of Alabama (Pea River State Forest) as a recreational facility in 1940. Although the lease was for 50 years, it contained a provision allowing the federal government to retake possession at any time (McGee, 1987; Dothan Progress Ltd., 1995).

With the approaching war in Europe, the Alabama Department of Conservation agreed with the Alabama Armory Commission to turn over some 25,000 acres of Pea River State Forest to the Alabama National Guard for use as an artillery firing range. In July 1941 the War Department announced the Pea River Project as a training site for some 30,000 infantrymen. On 15 August 1942, Executive order No. 9224 transferred the Pea River Project from the Department of Agriculture to the War Department with the provision that it be returned when no longer needed for military purposes (McGee, 1987; Dothan Progress Ltd., 1995).

2.4.2 Cantonment Area

In January 1942 the U. S. Attorney filed suit in Federal Court District Court under *eminent domain* to take immediate possession of some 29,055 acres of land in Dale County between the existing Pea River Project and Atlantic Coast Line Railroad between Newton and Enterprise (based on Army Engineers Acquisition map, title for 24,191.38 acres in Dale County eventually transferred to the U.S.). This major acquisition was needed for additional infantry training land and included all remaining privately-owned lands in Coffee County within boundaries of the Pea River Project that had not been voluntarily sold to the government (some 1,992.89 acres that fell within the boundaries of the old Bear Farm in Coffee County eventually were transferred to the U.S.). Total land acquired in this acquisition of land for the Ozark Triangular Division Training Camp was 26,184.27 acres (McGee, 1987; Dothan Progress Ltd., 1995).

The overall total land area transferred to the U.S. for both major acquisitions of land was 57,944.87 contiguous acres which today make up Fort Rucker's main military reservation (McGee, 1987; Dothan Progress Ltd., 1995).

2.4.3 Cairns Army Airfield

In September 1942 the U.S. Government used *eminent domain* to take possession of 1,259 acres of good farmland south of Daleville (title for 1,430.99 acres eventually transferred to the U.S.) for development of an air base designated as Ozark Army Airfield. The airfield was later renamed to honor Major General Bogardus S. Cairns, Fort Rucker Commanding General and Aviation School Commandant from 1957 until his death in December 1958 (McGee, 1987; Dothan Progress Ltd., 1995).

2.5 Installation History

Section 19-2 briefly summarizes the pre-military history of the land that is now Fort Rucker. Section 2-4 includes the history of Fort Rucker as it relates to land acquisition. The below section is adapted from Higginbotham/Briggs and Associates (1991) and Dothan Progress Ltd. (1995).

2.5.1 The Formative Years -- The Depression Era, World War II, and the Korean Conflict

During the early years of the Great Depression of the 1930s, the principal problem faced by the people of the Wiregrass was the low price of farm products. One objective of the New Deal Program of the Franklin D. Roosevelt administration was to increase farm income by taking marginal land out of production and decreasing overall agricultural production, prompting the Pea River Land Use (Bear Farm) project described in Section 2.4.1.

During World War II America conducted a manpower mobilization unprecedented in terms of total numbers; the United States put into uniform more than 16 million (one-sixth of the total male population) and also approximately 333,000 women. This mobilization called for new training camps and military bases, including the Ozark Triangular Division Camp and Ozark AAF, described in Section 2-4. In January 1942 only a few weeks after the surprise Japanese attack on Pearl Harbor, the U.S. Army Corps of Engineers completed construction plans for the 4,600 acre cantonment area of the camp. The project included 1,500 buildings and streets and other facilities for the price of $24,620,160. This work was completed in fewer than 120 days. Before the camp was officially opened on 1 May 1942, the War Department named it Camp Rucker in honor Colonel Edmund W. Rucker, a Civil War Confederate officer given the honorary title of "General," who became an industrial leader in Birmingham.

The first troops to train at Camp Rucker were those of the 81st (Wildcat) Infantry Division; the 81st Division left Rucker for action in the Pacific Theater in March 1943. Three other infantry division trained at Camp Rucker during World War II -- the 35th, the 98th, and the 66th. The 66th Panther Division left for the European Theater in October 1944. Camp Rucker was also used to train dozens of smaller units, including tank, infantry replacement, and Women's Army Corps units. During the latter part of World War II, several hundred German and a few Italian prisoners-of-war were held on the southern edge of the post.

Camp Rucker was inactive from March 1946 until August 1950. The principal Army unit operating at Rucker during the Korean conflict was the 47th Infantry Division, which trained replacement troops for combat in Korea.

2.5.2 The Army Aviation Center and Fort Rucker

U.S. Army Aviation was born on 6 June 1942 with a War Department directive establishing organic air observation for the field artillery, thus creating a requirement for aviators. Aviator training began in August 1942 in the Air Training Department of the Field Artillery School, Fort Sill, Oklahoma. Camp Rucker and Army Aviation merged in 1954 with establishment of the Army Aviation School at Camp Rucker by Department of the Army General Order No. 85, dated December 1954. Camp Rucker was inactivated in June 1954 after the Korean conflict ended, but was reopened to prepare for movement of

the Army Aviation School to Camp Rucker. The United States Army Aviation Center was established by General Order No. 17, dated 2 March 1955, as a Class I activity at Camp Rucker to include the Army Aviation School and other such activities as might be assigned. On 26 October 1955 the post was given permanent status with the name change from Camp Rucker to Fort Rucker. Separate designations for the Army Aviation Center and Aviation School were maintained until 15 May 1974 when the two were consolidated as the U.S. Army Aviation Center.

2.5.3 The Maturing of Army Aviation

Prior to the mid 1950s the Army Air Forces/U.S. Air Force had provided primary training for Army Aviation pilots and mechanics. In 1956 the Department of Defense gave the Army control over all of its own training. Gary and Wolters Air Force bases in Texas, where the Air Force had been conducting this training were also transferred to the Army. Lacking adequate facilities at Fort Rucker, Army Aviation continued primary fixed-wing training at Camp Gary until 1959 and primary rotary-wing training at Fort Wolters until 1973. In 1956 the Army Aviation Center began assembling and testing weapons on helicopters. These tests led to the development of armament systems for Army helicopters.

Both Army Aviation and the helicopter came of age during the Vietnam Conflict. The most widely used helicopter, the UH-1 Iroquois utility helicopter or Huey, began to arrive in significant numbers in 1964; before the end of the conflict more than 5,000 of these versatile aircraft were introduced into Southeast Asia. They were used for medical evacuation, command and control, air assault, troop and materiel transport, and as gunships. The AH-1 Cobra attack helicopter arrived in 1967 to partially replace the Huey in its gun ship capacity. Other important helicopters in Vietnam included the OH-6 Cayuse and the OH-58 Kiowa scout helicopters and CH-47 Chinook and CH-54 Tarhe cargo helicopters.

Following Vietnam the Army turned its major attention back to the threat of a mid or high intensity conflict in Europe. Creation, implementation, and consolidation of Army Aviation as a separate Branch dominated the 1980s, an evolution that had been debated by Army leaders since the Korean Conflict.

2.5.4 Fort Rucker and the Army Aviation Branch

During the late 1970s and early 1980s Army Aviation grew in size and technical sophistication by developing new doctrine, tactics, aircraft, equipment and organizational structure. This work included development and fielding of several new or radically modified aircraft, including the AH-64 Apache attack helicopter, the UH-60 Black Hawk utility helicopter, and the OH-58D armed reconnaissance helicopter, an enhanced version of the Kiowa scout helicopter. Rapid growth caused increasingly complex problems in training, procurement, doctrine development, proponent responsibility, and personnel management. Following extensive studies by Department of the Army and Training and Doctrine Command (TRADOC), near consensus among Army leaders was reached in favor of Aviation as a separate branch of the Army, effective 12 April 1983.

The first Aviation officer basic and advance courses began at Fort Rucker in 1984 followed by a gradual consolidation of all aviation related activities to the installation. In 1986 the U.S. Army Air Traffic Control Activity became part of the branch, and in 1987 a Non Commissioned Officer academy was established at Fort Rucker. In 1988 the Army Aviation Logistics School, which had been dependent on the Transportation Center at Fort Eustis, was incorporated into the Aviation Branch.

During operations in Grenada, Panama, and the Persian Gulf region, Army Aviation played major and decisive roles; one of the first blows of Operation Desert Storm was struck by Army Aviation. AH-64

attack helicopters destroyed Iraqi early warning sites shortly before Allied bombs began exploding over Baghdad. Then during the 100 hours of ground war, Army helicopters dominated nighttime operations.

2.5.5 Fort Rucker in the Post-Cold War Era

Decreased military budgets following the end of the Cold War forced Army Aviation to downsize, but the post-Cold war environment also provides new opportunities for Army Aviation and Fort Rucker. For instance, Aviation is uniquely qualified for infiltration, reconnaissance, evacuation, and strike missions of unconventional warfare. Because of its unique combination of versatility, deployability, and lethality, Army Aviation is assuming additional missions and functions in the rapidly changing world of the 21st century, and Fort Rucker remains at center stage in these efforts.

3. MILITARY MISSION

U. S. Army Aviation Branch Vision

"We will provide the force highly motivated aviation soldiers and leaders with a warrior ethos, equipped with modern systems and trained to world-class proficiency, capable of strategic responsiveness and the ability to dominate across the full spectrum of operations. Leaders and soldiers are the centerpiece for the Army Transformation to the future" (U.S. Army Aviation Center Installation Command Plan [condensed] 2001).

3.1 Overview

3.1.1 Mission of the Aviation Center

The primary mission of the U.S. Army Aviation Center of Excellence *(U.S. Army Aviation Center of Excellence Installation Command Plan [condensed] 2001)* is to train military, civilian, and international personnel in aviation and leadership skills; develop the doctrine, training, leaders, organization materiel and soldiers for Army Aviation's future warfighting requirements; manage available resources; and sustain our commitment to the well-being of our soldiers, civilians, retirees and families to meet the readiness needs of our Army and our Nation, now and in the future.

3.1.2 Post Population and Major Troop Units

The Fort Rucker population consists of 15,014 military and civilian personnel. Over 148,000 retired military and family members live in the Fort Rucker Service Area. Major troop units assigned to the U.S. Army Aviation Center and Fort Rucker include the 1st Aviation Brigade and the Aviation Training Brigade (Directorate of Resources Management [DRM], 2009).

The Aviation Training Brigade conducts flight training. Each of three subordinate battalions is responsible for flight training operations at one of three Fort Rucker basefields: the 1st Battalion, 14th Aviation Regiment at Hanchey Army Heliport; the 1st Battalion, 223rd Aviation Regiment at Cairns AAF; and the 1st Battalion, 212th Aviation Regiment at Lowe Army Heliport. A fourth battalion, the 1st Battalion, 11th Aviation Regiment, located on main post, provides air traffic control services for Fort

Rucker and performs maintenance on tactical navigation aids.

1st Aviation Brigade units are responsible for conducting a wide range of activities. Units of the Brigade provide advanced individual training in air operations and aviation maintenance fields, conduct officer basic and advanced courses and warrant officer military development training (Warrant Officer Career College), and operate numerous tactical simulation facilities. Units of the brigade also include the 98th Army Band, and a Military Police company.

In FY 00, 216,471 flying hours were logged in the 594 aircraft at Fort Rucker. The installation graduated 8,144 students. Fort Rucker supports 7 U.S. Army Reserve centers and about 100 National Guard units in the region. Two of the Army National Guard units are artillery. At present these artillery units train on Fort Rucker, but they remain on roads and firing points with no maneuver training (DRM, 2000).

3.2 Natural Resources Needed to Support the Military Mission

Fort Rucker primary aviation training military mission is not a particularly natural resources-intensive use mission. Primary requirements in terms of natural resources involve airspace and landing-hovering lands, which are open and relatively flat. There is also a requirement for isolated space that has target visibility for training aerial gunnery.

Survival, Escape, Resistance, and Evasion (SERE) training is a critical component of aviator training at Fort Rucker. This one-week course is conducted in the central training areas of the post. Effective training requires conditions as close to natural as possible.

However, Fort Rucker's role in supporting Reserve and National Guard forces is more land intensive. Areas with overhead concealment are required, and there is a need for land for firing ranges with open ground for target visibility. There is also a requirement for openings in the forest for various activities, especially artillery firing. There is a proposal for a battle maneuver area, which would require maneuver corridors that are able to accommodate heavy armor and artillery. This will require a less dense forest than is normally found on the installation. It will also require a relatively open understory.
All of these mission requirements are supported by and in many cases enhanced by the move at Fort Rucker to restore the original longleaf pine ecosystem wherever appropriate or indicated by natural conditions.

3.3 Effects of the Military Mission on Natural Resources

The loss of native ecosystems due to construction and land clearing associated with the cantonment area and various outlying airfields and staging fields is the primary impact of the military mission on Fort Rucker. Rotor wash, which simulates intense local wind erosion, is the primary impact of helicopter training operations on natural resources. Other effects of helicopter training include noise, physical disturbance of wildlife, and projectile impact. Impact damage occurs within the impact area on Fort Rucker. Munitions damage soil, vegetation, and wildlife upon impact. Wildfires, which may have positive or negative effects, are often caused by projectile impact.

Damaging effects of ground-oriented military missions come primarily from vehicle maneuver, which

erodes soil and vegetation via equipment moving across the landscape. The extent of this damage is determined by many factors, including vehicle weight and the distribution of this weight, soil type, extent of soil wetness, vegetation, terrain, and the type of training mission involved.

The major negative effects of intensive and continuous use of Army training lands are:

- The loss of historical sites, vegetation, water resources, and wildlife.
- Diminished quality of available realistic training areas.
- Diminished operational security.
- Ineffective tactical operations.
- The creation of safety hazards to personnel and equipment.
- An increase in training, maintenance costs, and litigation.

On Fort Rucker, none of these have been significant in the long-term or on an installation-wide basis. However, unless erosion control measures are continued and matched to the intensity of the military mission, with the associated benefits of a robust ITAM program, detrimental effects to training and safety hazards are likely.

3.3.1 Past and Current Military Mission Impacts on Natural Resources

3.3.1.1 Geology, Soils and Surface Water Resources

Soils in the Fort Rucker area are highly susceptible to erosion. Training activities involving tracked and wheeled vehicles and impacts of ordnance on the gunnery-range complex destroy vegetative covers and de-stabilize soil surfaces such that they readily erode during rainfall events. In addition, rotor wash at helicopter hover points is a major cause of wind erosion. The large area affected by these activities, combined with the erodible nature of soils throughout the reservation, make erosion an important problem at Fort Rucker (Rust Environment and Infrastructure, 1999).

While the climate is conducive to rapid healing of land cover after training operations, the surface soil is generally delicate. If disturbed continuously or frequently, the soil loses its capability to voluntarily re-seed and re-establish ground cover. Uncovered areas begin to erode quickly, and unless repair and control measures are taken, the damage becomes extensive (Higginbotham/Briggs and Associates, 1991).

Adverse effects of soil erosion include loss of topsoil, formation of gullies, which destroy training lands, loss of soil fertility for plant growth, and stream, pond, and lake sedimentation. Soil erosion, runoff, and subsequent sedimentation in surface water bodies result in adverse impacts to the aquatic biota communities in streams and other wetlands. In addition, sedimentation may reduce the capacities of streams and other wetlands to carry storm water runoff, resulting in increased flooding and impacts to floodplains (Rust Environment and Infrastructure, 1999).

Soil erosion and its effects on stream water quality, was the second most significant issue raised at the installations master plan PDEIS public scoping meeting. Comments dealt principally with previous episodes of erosion and surface runoff from the installation onto private property downstream, resulting in sedimentation of Steep Head Creek and Harris Mill Creek (Bo's Creek), as well as increased flooding and associated stream bank erosion, loss of timber, and damage to a seven-acre fish pond (Rust Environment and Infrastructure, 1999).

Comments indicate that under current conditions, soil erosion and runoff from Fort Rucker are having a moderate[4] level of impact on soils, resulting in indirect impacts to surface water bodies and associated floodplains and wetlands both on and off the Fort Rucker reservation. Atwood *et al.* (1994) describe the erosional inputs during recent flooding events as having resulted in a heavy bed load of sand in the majority of streams within Fort Rucker. Substrates of most streams were described as consisting of flowing sand, shifting sandbars, and dunes which buried in-stream structures, such as woody debris, gravel, and cobbles and disrupted stream morphology by filling pools and riffles (Rust Environment and Infrastructure, 1999).

3.3.1.2 Groundwater/Drinking Water Resources

Ground water and drinking water resources in the Fort Rucker vicinity are impacted at a low level[5] by current training operations on Fort Rucker. The withdrawal of ground water by drinking water wells has caused a drawdown of aquifer water levels beneath the installation, particularly in the upper aquifer (the Nanafalia and Clayton formations discussed in section 7-5). This impact is being mitigated through generally limiting pumping time among supply wells, as well as, placing a limit on total ground water use. If operations are expanded, it may be necessary to increase water conservation measures and/or to rely more heavily on the deeper Ripley Formation for drinking water. Nevertheless, despite the existing cone of depression in upper aquifers, there is an abundant water reserve, which is more than adequate to meet the needs of Fort Rucker and surrounding communities (Metcalf and Eddy, 1992).

3.3.1.3 The Biological Environment

Habitat types and associated flora and fauna of the Fort Rucker reservation are impacted at negligible to moderate levels by the current level of training. The presence of the installation and performance of the many operational activities essential to its missions inevitably has adverse effects on certain species and habitats, and continuation of these activities at current levels is expected to continue to affect aquatic and terrestrial species and their habitats at a similar level of impact (Rust Environment and Infrastructure, 1999).

Soil erosion impacts stream habitats as described above. Homogeneous substrates of shifting sand, which occur in many streams on and downstream of the reservation as a result of sedimentation, generally do not support diverse and abundant populations of benthic macro invertebrates or the fish which feed on them. If soil erosion continues as expected, these stream habitats and their aquatic biota will continue to be impacted. No federally listed threatened or endangered vertebrate or invertebrate species is known to inhabit these streams (Atwood *et al.*, 1994). Substrate quality should improve as sediment inputs decline due to erosion control programs and as fine sediments are gradually flushed from the streams. Accordingly the level of impact on stream habits by continuing to train at current levels would be moderate (Rust Environment and Infrastructure, 1999).

Aquatic habitats and their biota also may be affected by the discharge of wastewaters from the installation in streams. All wastewaters, other than storm water runoff, are treated prior to their discharge. Discharge

[4] Conspicuous degradation in quality, likely to have some limited negative effects to habitation/use by biota or use by people.

[5] Minor degradation in quality --unlikely to affect habitation/use by biota or use by people.

limits generally are met by the permitted treatment facilities; therefore, wastewater discharges have only a low level of impact on aquatic habitats and biota (Rust Environment and Infrastructure, 1999).

Terrestrial wildlife is affected by noise from helicopter-training and weapons-firing activities that take place over extensive areas both on and outside the reservation. Although most studies of the effect of noise of domesticated animals show increased heart rates, changes in blood chemistry related to adrenaline releases, or startle responses as a result of exposures to aircraft noise, there were no serious effects on survivability, growth or marketability of domestic animals in these studies (Rust Environment and Infrastructure, 1999).

Wildlife may have a different response. Aircraft noise is a concern because anything that increases the annual energy expenditure could result in decreased survival rates. Elevated environmental noise levels could reduce the range of hearing for wildlife. This could impact the ability of wildlife to locate food, flee from predators, locate a mate, and/or tend to offspring. Studies of aircraft noise on wild animals usually have involved observations of wildlife reactions to aircraft overflights. These behavioral studies are primarily performed with direct observations or telemetry to track movements. Few have examined the heart rate and blood chemistry of wild receptors (Rust Environment and Infrastructure, 1999).

In 1980, the EPA published a literature review summarizing research on the effects of noise on animals (EPA, 1980). Most studies on mammals revealed various levels of startle responses. Long-term impacts from these startle responses are not understood, and neither is the extent to which mammals become adjusted to aircraft noise. In avian studies the main response to aircraft noise is flushing -- a particular concern with nesting birds due to the potential for egg damage. Although the majority of studies indicate no direct effects on egg hatchability due to noise, increased function poses greater risk for accidental breakage or predation by other animals (Rust Environment and Infrastructure, 1999).

Wildlife is capable of becoming habituated or showing decreased responsiveness to stimuli after repeated exposure. Wildlife inhabiting Fort Rucker has been exposed to noise from training activity for many years. Therefore, the level of impact from noise likely would be low to moderate, depending on the sensitivity to noise and the degree of habituation of particular species (Rust Environment and Infrastructure, 1999).

Discussions with military wildlife managers on many military installations (by Gene Stout, Gene Stout & Associates) indicate that many wildlife species become acclimated to mission-related noise, including helicopter overflights, jet overflights, artillery firing, shelling, bombing, and detonation. For example, the use of helicopters at Fort Sill, Oklahoma is not nearly as effective for white-tailed deer census as on private lands due to a very low flush rate of deer on the military reservation as the helicopter flies overhead.

It is unlikely that operations at Fort Rucker adversely affect resident wildlife sufficiently to reduce population levels, although distributions of species on the reservation may be affected as sensitive species avoid areas of high noise exposure. No species which are federally-listed as endangered or threatened are known to utilize the reservation for reproduction or feeding, except for the American alligator which is listed as threatened in order to protect endangered crocodilians that are similar in appearance.
Of State-protected species whose presence on the reservation has been confirmed, birds are probably the most sensitive to noise, but they also are the most mobile and capable of avoiding high-noise areas. The southeastern pocket gopher is probably rather insensitive to noise, as shown by the results of a study that found no decrease in small mammal populations around airports (Krausman *et al*., 1993). The noise sensitivity of the American alligator and the gopher tortoise has not been determined (Rust Environment

and Infrastructure, 1999).

In sum, certain species inhabiting the reservation or its vicinity are somewhat impacted by effects of operational activities at Fort Rucker, including sedimentation and noise. However, there apparently have been no overall significant impacts on the biological environment (Rust Environment and Infrastructure, 1999).

3.3.2 Future Military Mission Impacts on Natural Resources

It is difficult to quantify effects of future military missions on natural resources at Fort Rucker. If the mission remains essentially unchanged, mission impacts on natural resources will remain similar to those today.

3.3.2.1 Geology, Soils and Surface Water Resources

Completion of real property projects listed in Section 4-6 would likely increase erosion during construction phases. However, erosion/sediment control programs at Fort Rucker are expected to prevent a long-term increase in soil erosion due to these projects. Increased construction, use of the tracked vehicle maneuver area, and use of the firing range and helicopter landing areas would likely increase erosion. However an increase in erosion/sedimentation control programs by an amount comparable to the increase in construction and operational activities would be expected to result in no net increase in erosion and sedimentation impacts, though these impacts still may be significant during the 2010-2014 time frame of this INRMP.

3.3.2.2 The Biotic Environment

Construction of planned projects will occur principally within the cantonment area and other developed areas of the installation. None of the proposed projects would be located in wetlands. Effects on sensitive and/or rare species would be similar as with current operations, and impacts to habitats and biota will be minimal.

Since most projects would occur principally in the cantonment area or other developed areas, impacts on the biological environment would be generally limited to areas already affected under conditions. Sensitive wildlife would have avoided these areas or become habituated to effects such as noise. Expanded mitigation would limit increases in erosion and sedimentation and their impacts on streams, wetlands, and biota. Thus, the impact of any expanded construction activity would likely not be greater than that under current operations or those already planned for the period of this INRMP (Rust Environment and Infrastructure, 1999).

3.3.2.3 Other Considerations

There are numerous positive effects of the military mission on natural resources. The most general, and most significant, is the Fort Rucker commitment to natural resources management, including minimizing and mitigation of military mission damage. This natural resources commitment is beneficial for both natural resources in general and people who use natural resources products.

The presence of Fort Rucker continues to preserve native ecosystems by preventing development and municipal expansion, and by ensuring that land uses are conducted in a manner that protects the environment. Natural resources considerations and safety demands associated with the training mission

limit the extent of other potentially damaging land uses. Damage from the training mission will be repaired under the Land Rehabilitation and Maintenance (LRAM) component of ITAM.

The success of Fort Rucker's conservation efforts is attested to by its diverse, self-sustaining natural resources. Providing effective military training and public land stewardship is a significant challenge. Comparing natural resources on Fort Rucker with its neighbors and other public lands demonstrates that the Army at Fort Rucker is up to this challenge.

3.4 Effects of Natural Resources or Their Management on the Military Mission

Topography is a major consideration in siting activity areas. All firing ranges within Fort Rucker are located around a common impact area located in the northern portion of the reservation where the varied terrain can be used for units to fire and maneuver. The terrain and vegetation are used for training exercises such as selection and occupancy of defensive positions, concealment and camouflage, and tactical movement. Helicopter basefields and stagefields are sited based on topography of the land, vegetative cover, wind direction, and obstructions in the area (Rust Environment and Infrastructure, 1999).

Trafficability in extended periods of wet weather on both dirt roads and in off-road areas is very limited due to the nature of the clay-sand soil that is predominant throughout the post. Roads with unstabilized surfaces become rutted with as few as three successive passes of a vehicle and then impassable because vehicles bottom-out. The lubricity of the soil requires low speeds in wet weather, especially on curves and hills where even tracked vehicles are prone to side-slip. Because of this soil factor, vehicle traffic in cross-country movement areas is restricted in wet weather. As a rule, no more than two medium and heavy vehicles should follow the same off-road trace to avoid displacing the surface soil and leaving a permanent footprint rut (Higginbotham /Briggs and Associates, 1991).

Soldiers need to be aware of their environment, whether during war or peacetime. There are always rules of engagement, and planning and implementation of these plans must take these rules into account. Learning to plan around environmental restrictions helps develop a disciplined mindset that is a valuable asset to today's soldier. However, this disciplined mindset must be balanced to avoid "negative training" from excessive constraints.

4.0 FACILITIES

4.1 Overview

Map 4.1 shows the general layout of Fort Rucker. On-post land at Fort Rucker consists of three major categories: aviation basefields and stagefields, ground maneuver training areas and ranges, and the cantonment area. Range and training areas constitute the major portion of land use with 51,735 acres (DPTMS, 1994) available for ground maneuver training and operations (including the 13,159-acre impact area). Training areas and firing ranges are used extensively throughout the year by soldiers assigned to Fort Rucker, active Army units from other installations, U.S. Army Reserve, National Guard, and U.S. Air Force units (Higginbotham /Briggs and Associates, 1991).

4.1.1 Aviation Training Facilities

Fort Rucker infrastructure includes 860 buildings with approximately 9,441,810 sq. ft. of floor space (DPW, 2009a). The following training facility summary is based largely on information compiled by Rust Environment and Infrastructure. To achieve its aviation training mission, Fort Rucker utilizes aviation facilities of several types located both on and off the military reservation. Because requirements for training areas and airspace cannot be met on the Fort Rucker reservation alone, an additional 3,628 acres of government-owned land (Section 2-2) and 1,734 acres of leased land located off the reservation are also utilized (DPW, 2004a).

Cairns AAF is the only aviation facility at Fort Rucker capable of handling fixed-wing aircraft. Other aviation facilities used in support of aviation training are heliports categorized either as basefields or stagefields. Basefields serve as home-ports for helicopters and have a full range of maintenance and classroom facilities as well as helicopter parking and refueling areas. Stagefields are used primarily for practicing standard maneuvers, such as takeoffs, turns, landing, and hovering, as well as emergency maneuvers, but not for basing of aircraft. As a general rule, helicopters return to designated basefields following practice at stagefields.

Three active basefields (Lowe, Hanchey, and Knox Army Heliports), four of 15 active stagefields (Ech, Tabernacle, Hatch, and Hooper), and one forward arming/refueling point (Molinelli) are located on the main Fort Rucker reservation. Cairns Army Airfield and Shell Army Heliport plus 15 active stagefields are *not* located on the main Fort Rucker Military Reservation. Guthrie basefield *is not* included in this discussion because it is inactive.

Besides basefields and stagefields, there also are approximately 133 tactical training sites both on and off the reservation. Most off-reservation sites are located on leased property or public land. These sites are used for activities such as low-level navigation (day and night), operation in confined areas, and advanced tactical maneuvers. Fort Rucker also has developed an extensive system of airspace corridors and special visual flight rule (VFR) routes to promote the safe and efficient flow of traffic during VFR conditions. There are four active corridor/route systems, corresponding to Cairns AAF and Lowe, Shell and Hanchey Army Heliports. One other system corresponds to the inactive Guthrie basefield.
Local aviation training areas are used by Fort Rucker aircraft. Within these are designated areas of operation (AOs) provide for the separation of aircraft and different types of aviation training. Combined with the areas on and adjacent to the Fort Rucker Military Reservation, these AOs encompass

approximately 9,000 sq. miles and encompass all of southeast Alabama, a portion of southwest Georgia, and the northern portion of the Florida panhandle, of which the Army owns or leases only approximately 100 sq. miles. The Army depends heavily on the cooperation of the civilian sector to accomplish its aviation-training mission.

In addition to operations and training activities of the U.S. Army Aviation Center of Excellence, there are more than 30 other tenants and activities on the installation. Tenant activities include Air Force undergraduate and conversion helicopter pilot training; operation of the U.S. Army Combat Readiness (Safety) Center; research on air crew training and performance; operation of the Army School of Aviation Medicine, the Army Aeromedical Center, and the Army Aeromedical Research Laboratory (Higginbotham/ Briggs and Associates, 1991).

4.1.2 Ground Maneuver Training Facilities

Fort Rucker affords terrain suitable for units up to battalion size to conduct training for extended periods. Terrain and vegetation lend themselves to exercises such as selection and occupancy of defensive positions, concealment and camouflage, limited patrolling, and some tactical movement. More extensive maneuver is possible with a fair degree of realism for smaller units (Higginbotham/Briggs and Associates, 1991).

The road and trail network throughout the training areas permit cross-country movement of all classes of tactical vehicles. Bridges on dirt roads extending north from the vicinity of Lowe Army Heliport have been constructed with load capacities sufficient to pass tanks and self-propelled artillery. A concrete turning pad has been constructed across State Highway 27 to permit passage of tracked vehicles into areas north of Highway 27. Access to all-weather roads is possible throughout the training area system (Higginbotham/Briggs and Associates, 1991)

The area available for ground maneuver training is sub-divided into 49 training areas to permit several training activities to occur at the same time. Tracked vehicles are permitted to operate in certain designated areas with other areas set aside for wheeled vehicles only. The terrain is well suited for most non-firing tactical type exercises and is heavily used by the Aviation School and other units. Communications training, bivouac, land navigation, vehicle operator cross-country driving; survival, evasion, resistance , and escape; medical field operations, potable water production, and forward air traffic control are the main categories of exercises conducted. Lake Tholocco, when full of water, offers 690 acres of water surface for training. Although used primarily for recreation, it also affords an opportunity to conduct CH-47 helicopter float and recovery training and could support engineer rafting training (Higginbotham/Briggs and Associates, 1991).

The Alabama Army National Guard (ALARNG) conducts tracked-vehicle training activities on the reservation and also operates a Unit Training and Equipment Site (UTES), a fenced compound for storage and maintenance of tracked vehicles including the M88 Recovery Vehicle, M113 Armored Personnel Carrier and M577 Command Post Vehicle. Tracked vehicles use a 1.5 mile Test Track to exercise and test vehicles. These facilities are used for training inactive duty personnel on weekends throughout the year (Rust Environment and Infrastructure, 1999).

4.1.3 Training Ranges

Firing ranges for military training at Fort Rucker are located in the northern portion (Land Management Unit [LMU] 1) of the installation, around the periphery of the common impact area, which allows all

ranges to be used at the same time. Included in this area are 20 small arms ranges (include but are not limited to) a range for use of privately-owned weapons, a demolition training area, a movement-to-contact range, an ambush range, a squad live-fire range, a dedicated aerial gunnery range (with numerous well-distributed firing points for 20 and 30mm guns and 2.75 inch folding fin aerial rockets), 24 field artillery firing points, and one field artillery observation post. Map 4.1.3 shows locations of these ranges.

4.2 Transportation System

Fort Rucker and the communities in the seven-county region are served by an adequate regional transportation system, with the road and rail networks being the most accessible. Although no interstate highways pass through the seven-county area, there are six federal highways, over 30 state routes and county roads, and five rail companies serving the area. In addition, commercial airports, river transportation, and deep-water port facilities are all available within a reasonable distance from Fort Rucker, (Rust Environment and Infrastructure, 1999).

4.2.1 Roadways

The internal road network of Fort Rucker provides motor access to all areas of the installation and is capable of handling all types of highway vehicles. There are 198 miles of road on Fort Rucker, of which 136 miles are paved (DPW, 2004). The street network of the cantonment area is a curvilinear grid system. Outside this area, the street network follows no distinguishable pattern. All roadways are hard surfaced and generally in good condition (Rust Environment and Infrastructure, 1999).

The road system is the most important transportation system in the seven-county region. North-south movement is generally easier in the region than east-west movement, primarily because highways serving the former alignment are wider and less circuitous. North-south movement is facilitated by a principal arterial system consisting of U.S. Highways 231 and 431, and Alabama Highway 167. These arterials provide linkage between the main urban centers of southeastern Alabama and access to the cities of Montgomery, Alabama and Columbus, Georgia to the north and Florida to the south. U.S. 84 and Alabama 134, though generally narrower and more circuitous, provide the only adequate direct movement from east to west. To the north, U.S. 82 through Barbour County provides east-west movement between Montgomery, Alabama and Brunswick, Georgia. In addition, Alabama Highway 52 between Geneva and Columbia provides through access from Florida to Georgia, connecting with highways in both states (Rust Environment and Infrastructure, 1999).

4.2.2 Railways

There are about five miles (8.05 km) of railroad tracks at Fort Rucker, mostly in good condition and conforming to Federal Railroad Administration (FRA) Class 2 safety standards. The nearest Strategic Rail Corridor Network (STRACNET) is the Louisville and Nashville Railroad main line through Montgomery, Alabama. The Seaboard Coast Line (SCL) track between Fort Rucker and Montgomery is the connector to STRACNET. This track meets the standards for FRA Class 2 track. The Fort Rucker region is served by an extensive rail system. Five rail companies serve the region, with Dothan acting as the eastern hub and Andalusia the western hub of the system. The Louisville and Nashville, the Wiregrass Coastline, and the Southern Railway handle mainline freight trackage, while short line freight

service is handled by the Hartford and Slocomb and the Atlanta & Saint Andrews Bay rail companies (Rust Environment and Infrastructure, 1999).

4.2.3 Water Transportation

The least-used method of transportation in the region is water transportation. The Chattahoochee River, which is part of the Apalachicola-Chattahoochee-Flint Waterway System, is the only navigable waterway in the region. Its use is limited to seasonable barge traffic due to its limited channel depth and width. Docks in the region are located at Columbia and Eufaula, Alabama. Deep-water port facilities located within a reasonable distance from Fort Rucker are found in Mobile, Alabama and Panama City, Florida (Rust Environment and Infrastructure, 1999)

4.2.4 Air Transportation

Civilian air transportation facilities in the Fort Rucker region are limited. The only commercial airport located in the Southeast Alabama Regional Planning and Development district is the Dothan-Houston County Municipal Airport. This airport serves most of the district and adjacent areas in Alabama, Florida, and Georgia. Commercial passenger service to this facility is provided by several commercial airlines. The nearest commercial jet service currently is located at Montgomery, Alabama and Tallahassee, Florida. In addition to the Dothan-Houston County Airport, there are 12 general aviation airports located in the district (Rust Environment and Infrastructure, 1999).

4.3 Water Supply

Fort Rucker is endowed with both surface and groundwater, but only groundwater is currently used for drinking water. The water supply system serves the cantonment area, Hanchey AHP, and Knox AHP. Hanchey and Knox have no other source of water. This system has been privatized and is now provided by American Water. Cairns AAF is connected to the City of Daleville water system. Shell Army Heliport is connected to the City of Enterprise water system.

There are seven wells supplying water. All, except well No. 7, have a pumping capacity of 500 gallons per minute (gpm). Well No. 7 is rated at 1,000 gpm. Wells at Fort Rucker are over 600 feet deep, and there are no reports of draw down affecting production when the wells are in use. Fort Rucker has noticed some turbidity in the water from some wells when they are pumped for an extended period of time. As a result, the pump time for each well has been generally limited to 18 hr/day. The State of Alabama has not placed restrictions on the amount of water withdrawn, but Fort Rucker limits itself to four million gallons per day.
Much of the distribution system piping is nearly 50 yr. old, but the 116 miles of piping have been well maintained, and the system is in good working order. The distribution system includes two 500,000-gallon elevated, steel storage tanks and two 500,000-gallon ground-level storage tanks in the cantonment area (Rust Environment and Infrastructure, 1999).

According to the most recent available data, average daily water consumption for Fort Rucker is 2,418,000 gallons (Metcalf and Eddy, 1992). Assuming that the industrial requirements are approximately 10 percent or 241,800 gallons of daily usage, per capita consumption per day is approximately 150 gallons.

Primary production wells for Fort Rucker are sampled regularly for pH, chlorine, coliform bacteria,

metals, nutrients, and organic constituents (Metcalf and Eddy, 1992). Groundwater quality in the area is good, with excessive iron and hardness levels being the only problems (Rust Environment and Infrastructure, 1999).

The U.S. Army Corps of Engineers (2004) recently conducted a study to evaluate the potential of Lake Tholocco as a drinking water reservoir to serve southeastern Alabama. This study concluded that in order to provide an adequate drinking water supply, the water level in the lake would have to be raised significantly, resulting in inundation of surrounding areas and the elimination of the current land use. Therefore, this proposal will not be implemented.

4.4 Projected Changes to Facilities

The Installation Real Property Master Plan (RPMP) facilitates development of real property assets of the installation, including land, facilities, and infrastructure to ensure that these assets support assigned or projected missions of Fort Rucker. A significant constituent of the RPMP consists of plans for the construction of major projects on Fort Rucker. Currently, 21 major construction projects totaling $236,558,000 are being considered. All of these would be located either in the cantonment area or in the developed area of an airfield. Therefore, none of these are expected to significantly impact natural resources or their management on Fort Rucker. An Environmental Assessment will be prepared for each project, prior to construction, to address environmental impacts.

5.0 RESPONSIBLE AND INTERESTED PARTIES

5.1 Fort Rucker

5.1.1 Commanding General/Commandant

The Commanding General commands the U.S. Army Aviation Center of Excellence and Fort Rucker, implementing policies and directives of the Department of the Army (DA) and the U.S. Army Training and Doctrine Command (TRADOC) (USAAVNCE 1988). He bears ultimate responsibility for management of natural resources on Fort Rucker, including its land, forests, and wildlife (Department of the Army, 1996). Acting through the Command Group, Personal and Special Staff, Directors, and separate Commanders, the Commanding General/Commandant is responsible for (AR 200-1 *Environmental Quality, Environmental Protection and Enhancement* 1995):

- providing for funding and staffing of natural resource management professionals and other resources required to effectively manage natural resources on the installation;
- planning land utilization to avoid or minimize adverse effects on environmental quality and provide for sustained accomplishment of the mission;
- entering into appropriate Cooperative Plans (16 USC670a), with State and Federal conservation agencies for the conservation and development of fish and wildlife, soil, outdoor recreation, and other resources;
- ensuring the functioning of an Installation Environmental Quality Control Committee;
- ensuring ongoing and timely coordination of current and planned land uses between mission, natural resources, environmental, legal, and master planning;
- inspecting and reviewing mitigation measures that have been implemented or recommended for the protection of natural resources as prescribed in environmental documentation in accordance with AR 200-1 (*Environmental Quality, Environmental Protection and Management*);
- ensuring all installation land users are aware of and comply with procedures and requirements necessary to accomplish objectives of this INRMP together with laws, regulations, and other measures designed to comply with environmental quality objectives; and
- appointing a natural resources management professional as the Installation Natural Resources Coordinator.

5.1.2 Assistant Commandant

The Assistant Commandant serves as the principal assistant to the Commanding General/ Commandant for command and management of the U.S. Army Aviation Center and Fort Rucker. He directs and is responsible for all aspects of training conducted at Fort Rucker.

5.1.3 Chief of Staff

The Chief of Staff serves as principal assistant to the Commanding General/Commandant in matters pertaining to plans, training, mobilization, and security. As such, the Chief of Staff is responsible for ITAM implementation.

5.1.4 Garrison Commander

The Garrison Commander serves as major assistant to the Commanding General/ Commandant and Chief of Staff in matters pertaining to information management, logistics, contracting, public safety, human resources, community and family activities, and public works. As such, the Garrison Commander is responsible for most of the implementation of this INRMP.

5.1.5 Director of Public Works

The Director of Public Works (DPW), acting through the chief of his Environmental and Natural Resources Division, is responsible for (AR 200-1 1995):

- managing all phases of Fort Rucker's Natural Resources Program with appropriate natural resources management professionals;
- developing and implementing programs to ensure the inventory, delineation, classification, and management of all applicable natural resources to include: wetlands, scenic areas, endangered and threatened species, sensitive and critical habitats, and other natural resource areas of special interest;
- providing for the training of natural resources personnel;
- submitting EPR requirements and annual work plans;
- implementing this INRMP;
- reviewing all environmental documents (e.g. environmental impact assessments and statements and remedial action plans) and construction designs and proposals to ensure adequate protection of natural resources, ensuring that technical guidance as presented in this INRMP is adequately considered; and
- coordinating with local, State, and Federal governmental and civilian conservation organizations relative to Fort Rucker's natural resources management program.

5.1.5.1 Environmental and Natural Resources Division

Responsibilities of the Chief, Environmental and Natural Resources Division include the identification and protection of cultural resources (Chapter 14.0), and compliance with the National Environmental Policy Act (NEPA) (Chapter 15.0).

The Chief, Environmental and Natural Resources Division, acting through the Chief of the Natural Resources Branch carries out all other DPW responsibilities for the integrated management of natural resources on Fort Rucker addressed in this INRMP, including land, forest, wetlands, and fish and wildlife management.

The Chief, Natural Resources Branch, carries out all integrated natural resource management functions assigned to the Natural Resources Branch.

5.1.5.1.1 Land Management

Responsibilities for land management include:

- ensuring that the terrain of Fort Rucker supports military training activities;
- protecting and, where possible, improving the quality of land and water resources;
- protecting land investments from depreciation by adopting land use practices based upon soil capabilities;
- preventing facilities from contributing to wetlands destruction through erosion by protecting wetlands and flood plains and their functions;
- improving the appearance of the installation and associated facilities through the preservation of natural terrain and vegetation and by appropriate new plantings;
- conserving populations of threatened and endangered plants and their habitats;
- ensuring the preservation and protection of archeological, historical, and architectural resources from damage or destruction during natural resources management.

5.1.5.1.2 Forestry

Responsibilities specific to Forestry include:

- ensuring that the terrain of Fort Rucker supports military training activities;
- protecting and, where possible, improving the quality of land and water resources;
- providing a sustainable forest ecosystem via sound and scientific forest management;
- developing and maintaining an installation-wide continuous forest stand inventory;
- implementing and incorporating recommended best management practices for forestry in Alabama;
- implementing prescribed burning guidelines

5.1.5.1.3 Fish and Wildlife

Responsibilities specific to Fish and Wildlife include:

- planning and implementing fish and wildlife management tasks via biologically sound fish and wildlife management techniques;
- providing expertise and support to the Installation Commander to ensure Fort Rucker compliance with restrictions set forth in the Endangered Species Act (ESA) and other applicable laws;
- cooperating with the Alabama Department of Conservation and Natural Resources, the and Directorate of Community and Family Activities, and the Installation Outdoor Recreation Advisory Council to set hunting season opening and closing dates, bag limits, and other regulations governing water safety and harvest of fish and game on Fort Rucker (USAAVNC Reg. 215-1);
- cooperating with State and Federal fish and wildlife management agencies in fulfillment of installation fish and wildlife management duties and responsibilities;
- coordinating with the Director of Public Safety to ensure Federal, State, and Installation laws and regulations pertaining to fish and wildlife are enforced;
- coordinating the preparation and implementation of endangered species management and recovery plans by designating critical habitat, designating habitat to be burned, providing direction of forest, fire, and wetlands management conducted in endangered and/or threatened species habitat and providing personnel and equipment resources to assist the Forestry Section during prescribed burning as appropriate;
- providing geographic information system (GIS) support for ITAM and other natural resources management programs;
- coordinating with Range Control to ensure that an up-to-date roster of closed areas and areas

designated for hunting and fishing is available at all times;
- coordinating with the Aviation Branch Safety Office (ABSO) and the Outdoor Recreation Advisory Council to establish a daily quota of hunters for each hunting area;
- operating game check stations to collect biological and other data during deer, turkey, and other hunting seasons as appropriate;

5.1.6 Director of Plans, Training, and Mobilization

The Director of Plans, Training, Mobilization and Security (DPTMS), acting through various division chiefs, is principal assistant to the Chief of Staff for planning, estimating, coordinating, integrating and supervising: military training, installation schools, short and long-range mission and mobilization planning, troop movements, aviation operations, range operations, nuclear biological and chemical plans, operations and training, operational security, intelligence, counterintelligence and security activities, emergency operations, special events and ceremonies and force modernization and integration activities. The DPTMSEC provides staff supervision of the 6th Weather Flight, 18th Weather Squadron, ACC.

Training Division, DPTMSEC, is directly responsible for implementation and/or support of portions of this INRMP that directly affect or interact with training responsibilities including:

- operating and maintaining the Fort Rucker Range Complex, associated training facilities, field training sites, and range equipment;
- preparing, maintaining, and enforcing Post Range Regulations (FR Reg. 385-1);
- providing overall coordination for implementing Fort Rucker's ITAM program to include Environmental Awareness and Training Requirements Integration components;
- coordinating with and informing DPW of military training requirements and objectives as it relates to the implementation of short and long-term range development plans;
- coordinating with DPW on training activities that may affect fish and wildlife, forestry, wetlands, or cultural resources;
- post daily briefing of available hunting areas;
- coordinate, design and implement range development plans; and
- develop and execute Fort Rucker's ITAM program requirements.

5.1.7 Director of Family and Morale, Welfare and Recreation

The Director of Family and Morale, Welfare and Recreation establishes procedures and governs various aspects of installation Morale, Welfare and Recreation activities. The Chief, Community Recreation Division, develops and executes the Community Recreation Program, manages all attendant facilities, and monitors the Outdoor Recreation Council. Responsibilities of Community Recreation Division's Outdoor Recreation Branch include:

- planning and implementing the installation Outdoor Recreation Program (AR 215-1);
- supervising and maintaining outdoor recreation activities;
- collecting fees and charges for the Pro Shop, Engineer Beach campsites, Equipment Issue Center, and Lake Tholocco Recreation Area;
- printing and issuing Sikes Act Hunting and Fishing Permits and collecting fees for same;
- establishing, if necessary, a recreational hunting and fishing activity fee to defray costs associated with recreational activities not in support of issuing the Sikes Act Permit;
- planning and conducting group hunting and fishing activities;
- planning, developing, and managing facilities relating to fish and wildlife resources, such as camping areas, game processing facilities, marina, boat ramps, fishing piers, and elevated permanent deer stands;
- participating in national and state-sponsored hunting and fishing events such as National Fishing Week and National Hunting and Fishing Day.

5.1.8 Director of Public Safety

The Director of Public Safety (DPS) is responsible for providing military police and fire protection support to the installation. Natural resources functions within DPS are conducted by the Military Police Activity's Operations Division, which includes a Game Warden Section. Military police responsibilities of the DPS include enforcing laws and regulation on Fort Rucker including those pertaining to hunting, fishing, and other natural resources recreation. Specific responsibilities of the Game Warden Section include:

- enforcing Federal, State, and Installation laws and regulations pertaining to fish and wildlife;
- enforcing Federal, State, and Installation laws and regulations pertaining to archeological and other cultural resources;
- executing warrants pertaining to the violation of laws and regulation regarding fish, wildlife, hunting, fishing, or boating;
- recommending and enforcing suspension of access privileges for specified infractions of laws and regulations pertaining to fish, wildlife, hunting, or fishing;
- ensuring cooperation between the Game Warden Office and the DPW Fish and Wildlife Section for completion of wildlife law enforcement duties and responsibilities;
- coordinating with other State and Federal law enforcement agencies for completion of wildlife law enforcement duties and responsibilities;
- ensuring Fort Rucker wildlife law enforcement personnel are qualified and trained to carry out all assigned duties and responsibilities; and
- providing sufficient equipment to support the wildlife law enforcement program for completion of program responsibilities.

5.1.9 Public Affairs Office

The Public Affairs Office (PAO) is responsible for promoting an understanding of Army Aviation, the Aviation Branch, and Fort Rucker among its various publics and providing professional public affairs advice and support to installation leaders and activities. The PAO is an important component of Fort Rucker's natural resources program, especially in disseminating information critical to the success of the program. Specific responsibilities include:

- supporting Fort Rucker's natural resources program by providing news releases and public information notices of activities important to the Installation or community, to include National Hunting and Fishing Day and National Fishing Week and
- assisting DPW in promoting, publishing, and promulgating fish and wildlife information for public release in support of the command, the resource, and the resource user.

5.1.10 Army Contracting Agency

The Army Contracting Agency provides centralized contracting support to the U.S. Army Aviation Center of Excellence and Fort Rucker, satellite/tenant activities, and activities/units in Fort Rucker's area of responsibility. Support to the natural resource program includes:

- providing contract support to DPW for management of land, forest, and fish and wildlife;
- providing contract support to DPTMSEC for implementing the ITAM program;
- providing contract support to DCFA for implementation of the outdoor recreation program; and
- providing contract support to DPS with implementing natural resource law enforcement responsibilities.

5.1.11 Staff Judge Advocate

The Staff Judge Advocate (SJA) provides legal advice and counsel and services to Command, Staff, and subordinate elements of the U.S. Army Aviation Center of Excellence and Fort Rucker, as well as operating the Federal Magistrate Court Program. Specific SJA responsibilities with regard to integrated natural resource management include:

- conducting legal research and preparing legal opinions pertaining to interpretation and application of laws, regulations, statutes, and other directives affecting the administration of personnel, business, property, or financial operations on the installation;
- coordinating with the Department of Justice, Litigation Division of the Office of the Judge Advocate General, and other Governmental agencies on all matters pertaining to litigation for the Federal Government;
- providing legal advice and guidance on legal aspects of procurement, policies, sanctions, and other documents;
- reviews appropriated fund contracts over $100,000 and non appropriated fund contracts over $25,000 for legal sufficiency, and providing legal advice and counsel concerning military affairs, legal assistance, and procurement to Fort Rucker agencies.

5.1.12 Aviation Branch Safety Office

The Aviation Branch Safety Office (ABSO) serves as technical adviser to the Command and staff in planning, organizing, directing, and evaluating USAAVNC safety programs; provides for establishment and implementation of plans, policies, and procedures for safety programs at all levels of Command; assembles, analyzes, summarizes and disseminates data concerning accident experience of the Command; and prepares reports of progress of safety activities. With regard to integrated natural resource management, ABSO responsibilities include:

- establishing limits on the number of hunters that can safely be allowed in each training area at one time in coordination with DPTMSEC, DCFA, DPW, and the Outdoor Recreation Advisory Council;
- coordinating with the Outdoor Recreation Advisory Council, DPW, and DCFA in developing and implementing hunter and water safety education programs;
- determining the type of weapons that can be safely used by hunters in each training area in conjunction with DPTMSEC, DPW, and the Outdoor Recreation Advisory Council.

5.1.13 Outdoor Recreation Advisory Council

The Outdoor Recreation Advisory Council is a non-governing advisory body concerned with the recreational use of natural resources on Fort Rucker. The purpose of the Council is to foster and promote growth of the Outdoor Recreation Program. The Council has the authority to monitor, evaluate, and recommend changes to outdoor recreation programs. Given subsequent approval of Council recommendations by the Garrison Commander, changes are published in applicable governing regulations by the proponent agency. The Chairperson is appointed by the Garrison Commander, and voting members consist of Garrison Command, 110th Aviation Bregade, WOCC, 1st Aviation Bregade, DENTAC, USAARL, NCOA, USACRC, USAAMC, ATSCOM, ACLC, BOSS, Retire Representative, and Family Member Representative. Advisory members (non-voting) of the Council include the Installation CSM, Hunter Safety/Education, DPTMS Training Division, Skeet/Trap Range, DPW Natural Resources , Land, Forestry, and Fish and Wildlife; DPS Game Warden, DFMWR Outdoor Recreation, Community Recreation, ISO, RMO, SJA, IG, USASAM, PAIO, IRAC, DES, and DOTD. A representative of the civilian hunting community and any interested person (s) are invited to attend council meetings.

5.1.14 Other Installation Organizations

Implementation of this Plan will require assistance from other directorates and organizations. Such organizations include the Directorate of Logistics (supply and transportation), Directorate of Resource Management (budget, personnel, and equipment authorizations), Aviation Training Brigade (aerial survey support), 6th Weather Flight, 18th Weather Squadron (ACC), and the Fort Rucker Veterinary Treatment Facility, Gulf Coast Veterinary Services Support District (disposal of dead animals).

5.2 Other Defense Organizations

5.2.1 Southeast Region, Installation Management Command

Installation Management Command - Southeast, located at Fort McPherson, Georgia, is responsible for providing command and technical supervision of Fort Rucker's natural resources program by (AR 200-1):

- assisting with program implementation and conducting staff visits to Fort Rucker;

- reviewing and approving installation EPR submissions;
- reviewing and approving INRMP revisions and updates;
- reviewing and approving timber harvests;
- reviewing outdoor recreation plans for compatibility with the Installation Master Plan and natural resources management plans and programs;
- ensuring that effective natural resources stewardship is an identifiable and accountable function of management.
- Ensuring Army Vision and Priorities

5.2.2 Army Environmental Center

The Army Environmental Center (AEC), located at Aberdeen Proving Ground, Maryland, provides oversight, centralized management, and execution of Army environmental programs and projects. It has support capabilities in the areas of NEPA, endangered species, cultural resources, ITAM, environmental compliance, and related areas.

5.2.3 U.S. Army Corps of Engineers, Mobile District

The U.S. Army Corps of Engineers, Mobile District, assists Fort Rucker by administering contracts for outside or other agency support. These contracts include those involved with erosion control. The Mobile District administers agricultural leasing and forestry programs on Fort Rucker. It also is responsible for issuing wetland permits in accordance with Section 404 of the Clean Water Act.

5.2.4 Waterways Experiment Station

Waterways Experiment Station (WES) is a Corps of Engineers laboratory located at Vicksburg Mississippi. During 1988-1991 WES conducted a study to find the most effective and economical means possible to prevent soil erosion due to helicopter rotor wash (wind erosion) on Fort Rucker.

5.2.5 U.S. Army Environmental Training Support Center

The Environmental Training Support Center specializes in providing material for the Environmental Awareness program within ITAM. Fort Rucker may use this support during 2010-2014 as it implements its ITAM program.

5.2.6 U.S. Army Center for Health Promotion and Preventive Medicine

The Center for Health Promotion and Preventive Medicine (CHPPM) is a support agency for the pest management program on Fort Rucker. However, it also has other responsibilities and functions which impact on Fort Rucker. These include but are not limited to noise monitoring and disease vector surveillance. In recent years the agency has completed a sediment control plan associated with target emplacement, investigated for incidence of Lyme disease, and conducted tests for effects of white phosphorus on waterfowl.

5.3 Other Federal Agencies

5.3.1 U.S. Department of Interior

5.3.1.1 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS), Department of the Interior, has a field office at Daphne, Alabama that provides technical advice to Fort Rucker for the management of its natural resources, particularly management of endangered and threatened species. Department of Army Regulation 200-1, Chapter 11, provides guidance to be followed by Fort Rucker when dealing with the U.S. Fish and Wildlife Service for endangered species management.

The USFWS is a signatory cooperator in implementation of this INRMP in accordance with the Sikes Act. This INRMP supersedes the *Cooperative Management Plan for Conservation and Development of Fish and Wildlife Resources on Fort Rucker Military Reservation* (USAAVNC, 1990). Appendix 5.3.1 contains specific items of that agreement among the USFWS, Alabama Department of Conservation and Natural Resources, and Fort Rucker, as required by the Sikes Act.

5.3.1.2 U.S. Geologic Survey

The U.S. Geologic Survey (USGS) has installed the geographic information system (GIS) at Fort Rucker. However, additional work is needed prior to using this GIS. Under a recent federal organizational change, the USGS also operates a Cooperative Fisheries and Wildlife Unit at Auburn University that has provided natural resource management assistance to Fort Rucker on a number of occasions, notably in identification of factors limiting bobwhite quail on the reservation.

5.3.2 Natural Resources Conservation Service, U.S. Department of Agriculture

The Natural Resources Conservation Service (NRCS) conducted the soils surveys for Dale and Coffee counties, which taken together, include Fort Rucker. NRCS is available to assist with designing erosion control and LRAM projects. This agency may also be used to assist with GIS database development, especially regarding soils.

5.3.3 Environmental Protection Agency

As the nation's major regulatory and advisory body for environmental matters, the Environmental Protection Agency (EPA) has impacts on virtually every program on Fort Rucker. Its regulations and recommendations form the framework of almost every environmental document drafted. Keeping up-to-date with these changes provides a never-ending challenge for Fort Rucker environmental personnel. In addition, EPA Region 4 is responsible for the issuing of permits for sediment control on Fort Rucker.

5.4 State Agencies

5.4.1 Alabama Department of Conservation and Natural Resources

The Division of Wildlife and Freshwater Fisheries provides support to Fort Rucker's natural resources management program in the areas of fisheries, game, and law enforcement. The State District Fisheries Biologist (Enterprise, Alabama) provides technical assistance and advice on matters such as lake restocking, fertilization, aquatic weed control, feeding programs, population survey, fish diseases, fish parasites, and fish kills. The State District Game Biologist (Enterprise, Alabama) provides technical assistance and advice on matters concerning game and non-game wildlife species, including fish and wildlife conservation program development, population surveys, habitat manipulation, habitat maintenance, and predator control. Division of Wildlife and Freshwater Fisheries assistance is also provided in the trapping and relocating of nuisance alligators through a specified State-licensed trapper.

The ADCNR, through the Commissioner of its Division of Wildlife and Freshwater Fisheries, is a signatory cooperator in implementation of this INRMP (16 USC 670a). This INRMP supersedes the *Cooperative Management Plan for Conservation and Development of Fish and Wildlife Resources on Fort Rucker Military Reservation* (Anonymous, 1990). Appendix 5.3.1 contains specific items of that agreement among the ADCNR, USFWS, and Fort Rucker, as required by the Sikes Act.

5.4.2 Alabama Department of Environmental Management

The Alabama Department of Environmental Management provides policy clarification and limited technical assistance in the areas of environmental protection and pollution control and abatement. Some of these compliance matters, especially those affecting water quality, affect natural resources management on Fort Rucker.

5.4.3 Alabama Department of Public Health

The Alabama Department of Public Health conducted a deer encephalitis study in southern Alabama in 1995, which involved Fort Rucker. Fort Rucker personnel provided blood samples to the health department from hunter-harvested deer for this study. Fort Rucker results were negative.

5.5 Surrounding Municipalities

Communities that are either directly adjacent to, or in proximity to, Fort Rucker benefit from the positive effects of natural resources management on Fort Rucker. The installation provides excellent opportunities for general public hunting and fishing. No significant conflicts exist between natural resources management on Fort Rucker and the surrounding community.

5.6 Universities

Regional universities have provided specialized expertise to help manage natural resources on Fort Rucker. Auburn University (Auburn, Alabama) has used Fort Rucker as a study site for a number of graduate studies, notably on white-tailed deer productivity and the effect of feral dogs on white-tailed

deer. Auburn University also does soil testing for Fort Rucker on an as-needed basis under a blanket contract. A study on the interactions between white-tailed deer and habitat on Fort Rucker was done by a University of Tennessee (Knoxville) graduate student. The Southeast Cooperative Wildlife Disease Studies Group (University of Georgia at Athens, Georgia) assists with deer herd health checks on Fort Rucker. Troy State University assisted with the biodiversity study (Mount and Diamond, 1992) on Fort Rucker.

5.7 Contractors

Fort Rucker uses contractors for many programs associated with natural resources, including INRMP preparation, collection of biological data, wildlife food planting, NEPA documentation, ground water testing, and cultural and archaeological surveys. The *Flora and Fauna Survey of Fort Rucker* (Mount and Diamonds, 1992) and preparation of this INRMP are examples. This source of expertise will continue during 2010-2014 as needed.

5.8 Other Interested Parties

The National Wild Turkey Federation provided funds to help establish "walk-in" wild turkey management areas on Fort Rucker. Local Boy and Girl Scout organizations have provided volunteer assistance for the interpretative component of Fort Rucker's natural resources conservation efforts. No local or regional environmental organizations have expressed a strong, demonstrated interest in the management of Fort Rucker's natural resources.

6.0 NATURAL RESOURCES AND CLIMATE

6.1 Topography and Physiography

Fort Rucker extends northwestward from the floodplain of the Choctawhatchee River, rising gradually from 164 feet mean sea level (msl), through undulating to rolling, sometimes deeply dissected, forested terrain to elevations slightly above 515 feet. The main runway complex is at 305-325 feet msl with forested slopes dropping gradually both eastward and westward to floodplains (164 feet msl) of Claybank Creek and the Choctawhatchee River (McGee, 1987; 1204th Engineer Co., 1995; Rust Environment and Infrastructure, 1999).

The Coastal Plain, one of 34 physiographic provinces of the United States, forms a broad, sweeping 3,000-mile arc from Cape Cod to Tampico, Mexico, encompassing nearly 10% of land surface in the continental United States. Major lithologic and structural differences sharply define province boundaries. The Florida peninsula is a seaward prograding, partially emerged, limestone platform dating from the Cretaceous Era, and the northwestward extension of its long axis divides the Atlantic and Gulf Coastal Plains. The Mississippi Embayment, formed by downwarp of the continental margin in the Cretaceous and Tertiary periods, separates the Gulf Coastal Pain into East and West segments.

Fort Rucker is in the Southern Red Hills physiographic district of the East Gulf Coastal Plain, an area generally described as a southward sloping upland of moderate relief (Sapp and Emplaincourt, 1985). Fort Rucker, however, lies in a slightly more rugged area at the southern edge of this physiographic district, in the extreme eastward Buhrstone Hills that developed on indurated resistant siliceous claystone and sandstone (Sapp and Emplaincourt, 1985; Osborne *et al.*, 1989). Terrain on Fort Rucker consequently consists of typically narrow and winding ridgetops that range from highly dissected along the creeks and Lake Tholocco in the eastern portion of the post to gently rolling in the western and extreme eastern portions. Sideslopes are gently rolling in the western part of the reservation and steep in the eastern portion. Drainageways are typically narrow bands of alluvium along small streams. The maximum topographic relief between ridges and valleys is 375 feet (1204th Engineer Co., 1995; Rust Environment and Infrastructure, 1999).

6.2 Geology

The East Gulf Coastal Plain is an elevated former sea bottom, formed at the trailing edge of the North American Plate during Mesozoic and Cenozoic Eras that extends inland from the outer margin of the continental shelf. Consistent with sea bottom origin, geological formations are sedimentary in origin and date to the beginning of the Cretaceous period. Thus Cretaceous, Tertiary, and Quaternary geological formations underlie the Coastal Plain and represent the seaward deposition of sediments coupled with local upward movements of the bedrock (Stout and Marion, 1993). Bedrock is Precambrian and Paleozoic in age, and underlying basement rock includes metamorphic, igneous crystalline and sedimentary rock dating to the Triassic and Paleozoic.

Fort Rucker lies just south of the Sand or Red Hills, a belt of resistant Cretaceous and early Tertiary rocks some 20 to 40 miles wide, which rise some 300 feet above the lowlands. Fort Rucker soils overlie the Buhrstone Escarpment, a formation held up by Early Tertiary shale and sandstone (Roberts, 1996).

Geologic formations that outcrop on Fort Rucker are Tertiary to Holocene in origin (Turner *et al*., 1965; Newton, 1968; Osborne *et al.,* 1989) and strike east-west, dipping to the south at a rate of 15 to 40 feet per mile (Metcalf and Eddy, 1992). From oldest to youngest they are:

Tuscahoma Sand. Of Tertiary origin and approximately 100 feet in thickness, this formation contains fine glauconitic[6] sand with some small shell fragments, gravel, and clay pebbles in its lower layer. Its upper layer consists of olive-gray to yellowish-gray laminated and thin-bedded carbonaceous micaceous silty clay and very fine to fine-grained silty micaceous sand that may be locally glauconitic.

Hatchetigbee and Tallahatta Formations. About 150 feet thick, these formations overlie Tuscahoma Sand and are largely undifferentiated due to similar lithologies and indistinct contact in updip exposures where beds thin considerably. Where present, the lower unit is light-olive-gray to greenish-gray silty fine to medium-grained galuconitic sand from 4 to 10 feet in thickness, and the upper unit is 25 to 50 feet of clay, sand, and claystone. The clay is yellowish gray to dark gray, laminated to clayey, silty, sandy, micaceous, glauconitic, and sparsely lignitic, and the sand is light greenish gray, medium to coarse-grained, glauconitic, micaceous, and locally gravely. Claystone or "Buhrstone," typical of the Tallahatta formation, is yellowish-gray slightly glauconitic sandy claystone and argillaceous sandstone.

Lisbon Formation. This formation overlies the Tallahatta Formation and is 50 to 150 feet thick. Outcrops on Fort Rucker are on hilltops and consist of deeply weathered massive medium to coarse-grained clayey sand. The lower unit contains medium to coarse-grained light-gray calcareous silty sand that weathers to yellowish orange and reddish orange, and the upper part consists of medium to coarse grained calcareous sand containing *Ostrea sellaformis* Conrad, interbedded with white to gray indurated limestone.

[6]Glauconite is a greenish mineral related to muscovite mica that occurs in sands, silts, and clays in the form of tiny pellets that may have originated as fecal pellets from ocean filter-feeding organism. After the pellets sank to the ocean bottom, the matter inside them turned to glauconite. The pellets are especially common throughout both Cretaceous and Tertiary sediments on the Coastal Plain. (Roberts, 1996)

Residuum. This formation is 5 to 100 feet thick. It includes the remains of limestone of Eocene and Oligocene age that have been altered by solution and replacement, and the greatly disarranged beds in the overlying Miocene Series. It overlies the Lisbon Formation in central and northern parts of Dale and Coffee counties and does not outcrop of Fort Rucker except at Cairns AAF and in one small area on the western boundary of the reservation in Training Area 4.

Alluvial High Terrace Deposits. These deposits from the Pleistocene overlie older sediments at two places on the Reservation: in the area where the Atlantic Coast Line Railroad borders the Choctawhatchee River and at the confluence of Steep Head, Blacks Mill, and Claybank creeks.

Low Terrace Deposits. These deposits from the Holocene overlie older sediments in and adjacent to valleys of large creeks on the reservation. The deposits may be up to 40 feet thick and consist of white to yellowish-orange medium to coarse-grained gravely sand and yellowish-gray silty clay.

Cretaceous subsurface formations include the Ripley Formation and the overlying Providence Sand unit of the Selma Group. Tertiary formations in the subsurface include the Clayton and Nanafalia formations (Metcalf and Eddy, Inc., 1992; Rust Environment and Infrastructure, 1999).

6.3 Petroleum and Minerals

Brown Iron Ore. Concretionary limonite, locally referred to as brown iron ore, is present in the Residuum and the Lisbon Formation and may be of future economic importance in the area (Turner *et al.*, 1965; Newton, 1968).

Sand and Gravel. Sand deposits occur in outcrop areas of all geologic units. Prominent beds of sand and gravel occur in the Residuum, Lisbon Formation, and terrace and alluvial deposits (Turner *et al*., 1965; Newton, 1968)

Clay. Clay deposits in the Residuum, Hatchetigbee and Tallahatta Formations, and Tuscahoma Sand have the greatest potential economic value (Turner *et al.*, 1965; Newton, 1968).

No minerals are mined on Fort Rucker. No petroleum deposits are known.

6.4 Soils

Predominant soil series that occur on the Fort Rucker main post, together with comments on their productivity, characteristics, and locations are included in the table below:

Predominant Soil Series on Fort Rucker Main Reservation

Series	Acre Yield / Site Index	Characteristics	Location
Soils occurring over Lisbon Formation (higher elevations)			
Red Bay	Cotton Lint: 310 lb.	Loamy sand over sandy clay	Broad upland ridgetops and

	Corn: 32 bu Loblolly Pine: 90 ft.	loam; well drained, low erodibility	0-8% side slopes
Orangeburg	Cotton lint: 900 lb Corn 100 bu Loblolly Pine: 86 ft	Sandy loam over sandy clay loam; well drained, low erodibility	broad ridgetops and 0-8% slopes
Troup	Cotton lint: 500 lb Corn: 60 bu Loblolly Pine: 80 ft	Loamy sand over sandy clay loam; well drained, low erodibility	Broad ridgetops and 1-20% side slopes
Eustis	Cotton lint: 175 lb. Corn: 15 bu Loblolly Pine: 90 ft	Loamy sand over loamy sand; excessively well drained, low erodibility	0-25% upland slopes
Soils over Hatchetigbee and Tallahatta Formation (higher to middle elevations)			
Lucy	Cotton lint: 650 lb Corn: not suitable Loblolly Pine: 80 ft.	Loamy sand over sandy clay loam; well drained, low erodibility	0-15% upland slopes
Luverne	Cotton lint: not suitable Corn: not suitable Loblolly Pine: 85 ft	Fine sandy loam over sandy clay loam; well drained, high erodibility,	Steep, dissected uplands with 3-15% slopes
Lakeland	Cotton lint: 175 lb. Corn: 15 bu Loblolly Pine: 90 ft.	Loamy fine sand over loamy fine sand; excessively well drained, low erodibility.	0-20% upland slopes
Soils over Tuscahoma Sand (lower elevations)			
Cuthbert	Cotton lint: not suitable Corn: not suitable Loblolly Pine: 80 ft	Loamy sand over clay; moderately well to poorly drained, high erodibility	8-30% upland slopes
Boswell	Cotton lint: 220 lb Corn: 16 bu Loblolly Pine: 85 ft.	Loamy sand over clay; poorly drained, high erodibility	2-12% upland slopes
Shubata and Angie	Cotton lint: 260 lb Corn: 26 bu Loblolly Pine: 85 ft	Loamy sand over sandy clay loam; well to poorly drained, high erodibility	2-12% slopes
Alluvial Soils			
Bibb Soils	Cotton lint: not suitable Corn: not suitable Loblolly Pine: 100 ft.	Silt loam over sandy loam poorly drained, high erodibility	On general alluvium at foot of slopes, heads of and along small drainageways
Eunola	Cotton lint: not suitable Corn: 85 bu Loblolly Pine: 90 ft	Loamy sand over sandy clay loam; poorly drained, high erodibility.	Stream terraces with 0-2% slopes
Myatt	Cotton lint: not suitable	Silt loam over silty clay	Level to slightly depressed

	Corn: 15 bu. Loblolly Pine: 100 ft.	loam, poorly drained, high erodibility	stream terraces of larger streams

*Taken from Henry (1965) and Childs (1979).

Soils are classified in the Norfolk-Ruston-Shubuta Association and the Shubuta-Cuthbert Association. The Norfolk-Ruston-Shubuta Association is composed of well-drained soils on ridge tops and side slopes. This association includes Norfolk, Ruston, Shubuta, Red Bay, and Lakeland soils. These well-drained soils have friable fine sandy loam subsoil. The Shubuta-Cuthbert Association is composed of Shubuta, Cuthbert, Boswell, Ruston, and Eustis soils (Parmer *et al.*, pers. comm).

Dominant soil types are well suited for timber production. Forest site index varies with topography and degree of soil erosion present. Dry ridge tops with low water holding capacity and eroded areas have the lowest potential for timber growth. Site indices for the various southern pine species vary from 60 on poor sites to 100 on lower slopes and sandy alluvial bottomland areas (Parmer *et al.*, pers. comm).

6.5 Water Resources

6.5.1 Surface Water

Fort Rucker is located in the Choctawhatchee River Basin. The Choctawhatchee River originates in the northern section of the coastal plain. The river flows south-southwest, passing along the southeastern perimeter of Fort Rucker. The drainage area of the Choctawhatchee River above Newton is 886 sq. miles (U.S. Geologic Service [USGS], 1994). Farther southwest, at the Geneva County line, the Choctawhatchee River merges with Claybank Creek, the tributary that receives most of the surface water drainage from Fort Rucker. Pea River, the largest tributary of the Choctawhatchee, flows in a southwestern direction along the northwestern perimeter of Fort Rucker, eventually flowing east to its confluence with the Choctawhatchee River (Rust Environment and Infrastructure, 1999).

Claybank Creek and its tributaries drain about 82% of Fort Rucker. The southeastern section is an exception, draining to the Choctawhatchee River via several small streams. Claybank Creek flows in a southerly direction from a source north of Fort Rucker, bisecting the reservation. The northwestern section of Fort Rucker is drained by two main tributaries of Claybank Creek, Blacks Mill Creek, and Bowles Creek/Steep Head Creek, (Rust Environment and Infrastructure, 1999).

All stagefields beyond installation boundaries lie within the Choctawhatchee River watershed. Three stagefields, Louisville, Runkle, and Skelly, are in the Pea River drainage. Runkle and Skelly stagefields were built within the Pea River floodplain. Shell Army Heliport is located within the Claybank Creek drainage system, on high ground near Steep Head Creek. Off-site stagefields in the Choctawhatchee River drainage (upstream from the Pea River confluence) include Allen, Goldberg, Highbluff, Highfalls, Hunt, TAC-X, and Toth. Cairns AAF is situated on high ground between Claybank Creek and the Choctawhatchee River (Rust Environment and Infrastructure, 1999).

There are five lakes within Fort Rucker. Beaver, Buckhorn, Ech, and Parcours lakes are small (less than 20 aces) reservoirs built on tributary streams of Claybank Creek. Lake Tholocco is approximately 620 acres and is used for both recreation and training activities.

Lake Tholocco dam was built in 1936 as a Federal Works Progress Administration project. The age and design specifications led to periodic problems with waters topping the crest of the dam. Three recent failures (March 1990, July 1994, and March 1998) of the emergency spillway resulted in the release of the entire volume of the lake. Lake Tholocco was de-watered and a new emergency spillway was designed and constructed. The modernized design has alleviated the failures and restored Lake Tholocco as an important recreational and training facility (U.S. Army Corps of Engineers, 2009).

Fort Rucker does not use surface water for drinking water. Surface water is used extensively for agricultural purposes. In 1980 agricultural surface water use was estimated at 1.38 million gallons per day (mgd) in Dale County and 3.94 mgd in Coffee County. Recreational use of surface water is largely limited to Lake Tholocco, Dale County Public Lake, Coffee County Public Lake, and several other lakes in the region.

Stream flow data from several gauging stations in the Choctawhatchee River watershed have been collected by the USGS. Gauging stations are located on the Pea River at Elba, the Choctawhatchee River at Newton and Geneva, and Little Double Bridges Creek near Enterprise. Average annual discharge of the Choctawhatchee River at Newton for 2008 (adjacent to Fort Rucker) was 976 cubic feet per second (cfs) to a maximum of 9,190 cfs (USGS, 2009). Average annual flow in the Pea River at Ariton (north of Fort Rucker) was 642 cfs. No USGS flow data were available for Claybank Creek.

6.5.1.1 Surface Water Quality

The USGS historically monitored surface water quality at two stations in the vicinity of Fort Rucker. Surface water data from the Choctawhatchee River and tributaries indicates the rivers are moderately turbid, and hardness (MgCl and $CaCO_3$) ranges from 20-30 parts per million. According to monitoring data, primary and secondary drinking water parameters are acceptable compared to State standards, with exception of manganese and iron, which exceeded State standards. Waters comply with Environmental Protection Agency Ambient Water Quality Criteria, with exception of iron. Organic contaminants were not routinely monitored in these rivers.
The Choctawhatchee River and its tributaries are classified as "Fish and Wildlife" waters by the Alabama Department of Environmental Management. This designation indicates that surface waters are suitable for the propagation of fish, aquatic life, and wildlife but are not suitable for swimming, drinking water, or food processing. The waters of Lake Tholocco formerly were designated for "Fish and Wildlife" and "Swimming." The State of Florida assigned the Choctawhatchee River the status of "Special Water" due to aquatic fauna in the river.

6.5.1.2 Floodplains

Many portions of the Fort Rucker reservation are within areas designated as 100-year floodplains. A 100-year floodplain is defined as a flood hazard area expected to be inundated by a flood of such magnitude that it occurs on average every 100 years. Most 100-year floodplains are in the northwestern portion of Fort Rucker, associated with Bowles Creek and its tributaries. The largest 100-year floodplain is associated with Claybank Creek and extends in a southerly direction through the east-central portion of Fort Rucker. Depictions of 100-year floodplains may be found in Federal Emergency Management Agency (FEMA) maps for Coffee (panel 100) and Dale counties (panels 125, 150, 175, 210, 220, 230, 235, 240, and 255).

6.5.2 Groundwater

6.5.2.1 Groundwater Sources and Characteristics

Several aquifers and confining units underlie Fort Rucker. These aquifers are part of the Southeastern Coastal Plain Aquifer System that extends from northeastern Mississippi in an arc to coastal North Carolina. Fort Rucker lies near the southern edge of the system, where it is hydraulically connected to the Floridian Aquifer System. The Southeastern Coastal Plain Aquifer System forms a thick wedge of sedimentary strata resting upon a base of relatively impervious igneous, metamorphic and sedimentary rock sloping down from the Piedmont. This sediment wedge begins at the Piedmont/Coastal Plain boundary and thickens, in a southerly direction, at 30-35 feet/mile to a depth of approximately 5,500 feet at the Florida coastline. Each aquifer unit parallels the incline of the wedge in such a way that the deepest unit outcrops at the surface farthest inland (at the fall line) and the shallower units outcrop sequentially toward the coast.

Three regional aquifer units underlie the Fort Rucker area. The outcropping aquifer at Fort Rucker is the Lisbon Aquifer, which is subdivided into the Lisbon Formation and deeper Tallahatta and Hatchetigbee formations. This aquifer extends to a depth of 10-140 feet and outcrops on higher ground in northwestern Fort Rucker (e.g. the old Bear Farm, now impact area in LMU 1) and the cantonment area. It consists primarily of sand beds of Eocene to Paleocene origin with groundwater flowing toward the south. The Lisbon Aquifer is separated from deeper aquifers by a confining unit, Tuscahoma Sand. The Tuscahoma Formation primarily outcrops north of Fort Rucker, but it is also surficial in valleys of Claybank, Steep Head, and Bowles creeks. Surface areas of the outcropping Tuscahoma Confining Unit and Lisbon Aquifer at Fort Rucker are roughly equivalent. No other aquifer units outcrop on the reservation.

Immediately below the Tuscahoma confining unit are Nanafalia and Clayton formations, which outcrop north of Fort Rucker, at headwaters of the Choctawhatchee River. The Nanafalia Formation consists of sand bed, hydrologically connected to sand and limestone beds of the Clayton Formation. These formations are 400-500 feet thick and are the primary source of groundwater for Fort Rucker and surrounding municipalities. Overall groundwater flow in these aquifers is to the south.

Due to the extensive pumping of groundwater, cones of depression have developed in the aquifers at Fort Rucker and surrounding municipalities. The potentiometric surface at Fort Rucker has lowered 50-60 feet from elevations measured 40 years ago. A narrow confining unit separates Nanafalia/Clayton formations from the deeper Providence Sand/Ripley Formation. Groundwater flow through these 600 - 800-foot thick sand beds also is to the south. These late Cretaceous to Paleocene formations have been tapped for groundwater by deep wells, with no reported instances of cones of depression. These formations provide a substantial potential auxiliary water supply.

Still deeper formations underlie the Providence Sand/Ripley Formation, including the Blufftown Formation and part of the Eutaw Formation. Blufftown and upper Eutaw formations are separated from the basal (deepest) aquifer by a confining unit of clay and chalk. This confining unit, the middle Eutaw Formation, lies 2,000 - 2,500 feet beneath Fort Rucker. The basal aquifer unit, composed of early-Cretaceous sediments, includes the Tuscaloosa and Atkinson formations. Depth of these formations has precluded their use for groundwater supplies.

6.5.2.2 Groundwater Uses

The primary use of groundwater at Fort Rucker is for drinking water, discussed in Section 4-3. The Fort Rucker potable water supply is provided by groundwater from the Nanafalia/ Clayton and Providence Sand/Ripley formations. There has been a considerable drop in the water table since the oldest wells were completed in 1942. Well 3 at Fort Rucker showed a water table drop from 58 feet in 1951 to 124 feet in 1977 (Metcalf and Eddy, 1992). The USGS-monitored well at Hunt Airfield exhibited a water table change from 89.54 feet below land surface in March 1981 to 103.22 feet in March 1988 (USGS, 1989). Despite the drawdown, aquifers retain an abundant water reserve that is more than adequate to supply the needs of Fort Rucker and the surrounding communities. Due to the cone of depression in groundwater of the Clayton/Nanafalia formations beneath Fort Rucker, it may become necessary to rely more heavily on groundwater from the deeper Ripley Formation in the future, necessitating deeper wells.

A second major use of groundwater is for fire protection. The estimated water supply needed for fire protection both on and off-post is 1,361,750 gallons. Cairns AAF, Lowe Field, and Hanchey Field each store 200,000 gallons for fire protection. Wells in the cantonment area provide firefighting water for Hanchey Field. Lowe Field has a 225 gallon/minute well, and Cairns AAF also has a well to furnish water for fire protection. Shell AHP is connected to the City of Enterprise water system. Most other outlying fields are also connected to public water systems.

6.6 Climate

A variety of factors contribute to Fort Rucker's temperate subtropical climate, including location, topography and air-mass activity. Long hot summers and short mild winters are typical. The table below summarizes weather data for the period 1955-2000.

FORT RUCKER WEATHER DATA FOR THE PERIOD 1955–2000 *

Temperatures	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extreme Max	81	85	89	93	98	103*	103*	101	99	94	88	83
Extreme Min	6*	16	16	31	42	50	57	59	38	32	18	7
Mean Max	59	63	70	78	84	89	91	90	87	78	69	62
Mean Min	39	42	48	55	63	70	72	72	68	56	47	41
Precipitation	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Max 24 Hour	4.01	7.73	4.60	6.45	5.37	4.06	9.76*	4.30	8.39	5.32	5.03	5.66
Max Monthly	13.51	10.28	17.79	14.52	11.67	10.47	19.68	12.97	11.57	10.71	12.24	9.20
Mean Monthly	5.01	5.37	5.80	4.23	4.05	4.63	5.21	4.12	3.94	3.00	3.41	4.30
Mean # of Days With ≥ .01"	10	9	10	7	8	10	14	11	8	6	7	9
Mean # of Days With > .50"	4	3	4	3	3	3	3	2	2	2	2	3
Max 24 Hour Snowfall	2.9	4.1	1.0	0	0	0	0	0	0	0	#	#

Mean Monthly Snowfall	.1	.1	#	0	0	0	0	0	0	0	#	#
Mean # Days with ≥ .10" Snowfall	#	#	#	0	0	0	0	0	0	0	0	0
Mean # Days with ≥ 1.5" Snowfall	#	#	0	0	0	0	0	0	0	0	0	0
Mean # Days with Thunderstorms	2	3	5	5	7	11	16	13	6	2	2	2
Winds	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Prevailing Direction	350-010	350-010	320-340	320-340	050-070	200-220	230-250	050-070	050-070	050-070	350-010	350-010
Mean Monthly Speed	5	5	5	4	4	4	4	3	3	4	4	5
Max Monthly Speed	43	56	64	53	63	64	50	55	71	85*	45	51
Sky Cover and Fog	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Sky Cover > 5/10	61.6	60.3	55.7	46.8	54.2	57.7	54.9	51.6	46.3	44.6	50.2	59.6
Days with Visibility < 7MI	16	13	15	14	17	18	21	22	18	14	14	14
# - Less Than .1 Days * - Extreme Record												

Last Update: 28 Apr 2000 * Data from Department of Air Force (2000)

6.6.1 Precipitation

Average annual rainfall on Fort Rucker is 53 inches, and monthly rainfall ranges from a low of 3.0 inches in October to a high of 5.8 inches in March. Although measurable precipitation (>0.01 inches) occurs on an average of 111 days each year, 41% of monthly precipitation normally occurs on a single day each month (varies from a low of 29% in July to a high of 56% in October). Thunderstorms occur an average of 73 days each year, but are more frequent during summer (13 events per month). Prolonged or severe droughts are rare, although dry periods from 4-6 weeks are common. Flooding occurs every 2 to 3 years, with the last such event in July 1994 during Tropical Storm Alberto.

Precipitation other than rainfall, such as hail, occurs periodically, but events are of short duration. Snowfall is rare at Fort Rucker, and when it occurs, it is usually of short duration with accumulation generally less than 1.0 inch. The last snowfall occurred during February 1993, (trace) and the largest accumulation was 4.9 inches (over a two day period) in February 1973.

There is some degree of cloud cover over Fort Rucker most of the time. For instance, during January 1986 to December 1995, clouds were present 85.7% percent of the time (scattered clouds 32.2% of the time, broken clouds 30.8%, overcast 21.5%, and obscured 1.2%). Clear skies prevailed for only 14.3% of the year. The cloudiest month is July (6.1% clear skies) and the clearest month is October (25.7% clear skies).

6.6.2 Temperature

The influx of moist tropical air from the Gulf of Mexico has moderating effects on temperatures. The average daily temperature for Fort Rucker is 81° F in summer and 51° F in winter; this allows for an average growing season of 249 days/year. Average daily maximum temperatures range from 74° F in January to 96°F in June, July, and August. Daily minimum temperatures range from 21°F in January to 68°F in August. The highest temperature of 103°F was recorded at Cairns AAF during July 1980 and June 1985.

Although frost is common, extremely cold weather is rare. The average frost-free period is 257 days and extends from March to mid-November. Temperatures below freezing are infrequent. The lowest temperature of 6ºF was recorded during January 1985.

6.6.3 Winds

Prevailing winds on Fort Rucker are normally light (3 to 5 knots) and vary in direction. The highest sustained wind speed recorded during the period 1954-1996 was 55 miles per hour (mph) recorded during Hurricane Opal in October 1995. The highest gust was 93.5 mph recorded during the same event.

6.6.4 Unique Weather Patterns

Although common in the area around Fort Rucker, intense weather activity at Fort Rucker is infrequent. High winds associated with thunderstorms occasionally cause damage. Hurricanes and tornadoes originating from areas of low pressure in the Gulf of Mexico occasionally move inland and bring intense winds and rain to the region (e.g. Hurricane Eloise in 1973, Tropical Storm Alberto in 1994, and Hurricane Opal in 1995). Damage from such storms is dependent on their intensity and duration. Severe weather events recorded within a 50 nautical-mile radius of Fort Rucker during 1955-1988 are listed in the table below.

Severe Weather Reported Within a 50-Nautical Mile Radius of Cairns AAF during 1955-1988*

Reports	Wind gusts > 50 knots	Hail > 0.75 inches	No. of Tornados
Total Reports	473	125	304
Most in a Year	35	18	24
Least in a Year	0	0	0
Worst Month	May	March	April
Most Severe Report	1994	3.5 inches	NA

* Data from Department of Air Force (1996).

6.7 Flora

6.7.1 Evolutionary History of East Gulf Coastal Plain Vegetation

Biotic communities of the East Gulf Coastal Plain have been structured by processes operative on both evolutionary and ecological time scales. Major geologic events, including the last uplift of the Appalachian Mountain chain and its subsequent erosion, plate-tectonic changes resulting in geographic shift of the Southeast region from tropical to temperate latitudes, and development of extensive areas of coastal plain during major intervals in which sea level rose and fell by hundreds of meters, have all contributed to development of the region's species-rich flora and fauna. Subsequent glacial/interglacial cycles during the last 2.5 million years caused major climatic and geomorphic changes with attendant ecological changes that included migrations of species and changes in community composition. Regional biotic communities, as we know them today, have assembled only during the 20,000 years since the last major glaciation (Delcourt *et al*., 1993). Appendix 6.7.1 summarizes the evolutionary history of East Gulf Coastal Plain vegetation, including early influences of human uses of forests.

The former longleaf pine region is among the most disturbed landscapes in eastern United States. Land uses including 100 to 400 years of agriculture, open range grazing by hogs and other livestock, repeated logging, and elimination of naturally occurring wildfire have left less than 3% of upland landscape in entirely natural vegetation. It should thus not be surprising that 97% or more of uplands (optimally drained portion of the landscape for agriculture and other human uses) in the region consists of converted lands and disturbance vegetation. The region has been variously described by scientists in one of two ways. Those describing the region in terms of its past prevailing vegetation refer to it as the Southeastern Evergreen Forest or Longleaf Pine Forest, or something similar. On the other hand, those emphasizing the region's potential natural vegetation where fire is excluded, tend to describe it in terms of oak-hickory beech-magnolia association, Southern Mixed Forest, Southern Mixed Hardwood Forest, or some similar characterization (Ware *et al*., 1993). This provides a compelling argument for the restoration of the original longleaf pine ecosystem with its associated species-richness and diversity.

6.7.2 Southern Mixed Hardwood Forest - The Former Longleaf Pine Forest

Longleaf and slash pine forests dominated Coastal Plain uplands for about 5000 years until the arrival of the Europeans. These species did not usually reestablish themselves as dominants after logging. Where periodic burning continued, longleaf pine could reestablish itself as the dominant, but in most areas much denser stands of mixed loblolly and longleaf pine or of mostly loblolly pine became established. Shortleaf pine was often an associate, especially in drier and more northern sites. In moister and more southern sites, slash pine was an associate or even dominant. None of these pines can reproduce under the closed canopy that soon developed in denser second growth stands. The closed canopy also prevented the development of the highly flammable grass cover that typified the original forests and that had facilitated the spread of ground fire. Hardwoods, previously excluded from uplands by periodic ground fires, began to invade pine stands. Although pine seedlings could get started after each timbering of second growth stands, hardwoods, which usually were not cut, also responded to increased sunlight by more rapid growth. Therefore if forests were not burned after cutting, hardwoods became even more predominant after each harvest of pines. Although upland vegetation of the former longleaf pine region has thus become increasingly hardwood-dominated, very few areas in the region have had enough time since they were last timbered, or since fire was excluded, to have reached a stable condition. The prevailing upland vegetation of the region is therefore pine, pine-hardwood (mostly oak), or hardwood-pine (Ware *et al*., 1993).

Pine stands in the region include pine plantations (usually loblolly, or sometimes slash, but rarely longleaf pine), post-cultivation successional stands, and limited areas where natural or inadvertent fire is still frequent enough to maintain longleaf or slash stands. This is probably due to improper cultural practices and historic misconceptions concerning the adaptability and growth patterns of longleaf pine. The most abundant type of forest, pine-hardwood stands, may represent the middle stages of post-cultivation succession, but more often it is a product of one or two previous selective harvestings of pine. While the canopy composition of these stands may bear a strong resemblance to the transitional zone forest described by Sargent (1884), these disturbance-produced stands differ in that they usually have a high stem density and a closed, or rapidly closing, canopy. Hardwood-pine stands, the least abundant of the three forest types, are usually areas where hardwoods, spared by one or more selective harvestings or by increasingly rare ground fires, have managed to close the canopy and prevent further pine reproduction so that only relic canopy pine remain. In both pine-hardwood and hardwood-pine stands, southern red oak is often the most abundant oak, but white oak or post oak (the latter especially on drier site) also may be important. Sweet gum *(Liquidambar styraciflua)* is often the most important hardwood in the lower understory and sapling layer throughout the region and on the Gulf Coastal Plain water oak *(Quercus nigr*a) is often in the sapling layer. The relative proportion of various hardwoods in these stands is in part a product of repeated disturbance but the composition of the stands also reflects the influence of, and interactions between, topography, soil moisture soil texture, and soil chemistry (Ware *et al*., 1993).

6.7.3 Habitat Descriptions

The Fort Rucker Military Reservation lies just at the border between the two longleaf forest types described by Sargent (1884). Immediately to the south of Fort Rucker, the gently rolling topography of the Dougherty Plain obviously favors Sargent's (1884) longleaf pine pyroclimax community. However, the slightly more rugged, sometimes deeply dissected, topography of Fort Rucker, apparently favors Sargent's (1884) longleaf pine-shortleaf pine-hardwoods transition community. Ware *et al.* (1993) place the dividing line between these two former longleaf pine communities just to the north of Dale and Coffee counties, just within (slightly below the northern terminus of) the area of potential vegetation described by Kuchler (1964) as the Southern Mixed Forest Region. Ware *et al.* (1993) also describe the potential natural vegetation (in the absence of fire) of the area containing Fort Rucker as Southern Mixed Hardwood Forest. Section 6.7.2 describes today's Southern Mixed Hardwood Forest and provides a unifying evolutionary context for viewing upland habitats that occur on Fort Rucker, as described by Mount and Diamond (1992).

The following habitat descriptions are based on the *Survey of Fauna and Flora of Fort Rucker, Alabama* (Mount and Diamond, 1992). Criteria and terminology used to identify and designate habitats on the reservation are based on a system designed by these investigators to be relevant to habitats of the Eastern Gulf Coastal Plain. Scientific names of flora and fauna discussed herein can be found in appendices 6.7 and 6.8 respectively.

Mount and Diamond (1992) noted that temporal dynamics are important in interpreting and understanding the distribution of habitat and land-use types within Fort Rucker. Conversions from one habitat type to another may occur rapidly as a result of human activity (*e.g*. forest management) or gradually through natural ecological succession, described in Section 6.7.1. Ecotones between habitat types are another factor to consider. In some instances, such as field-forest boundaries, change across an ecotone from one type to another is relatively abrupt, and the ecotone may be only a few yards wide. Conversely, in some areas, especially where natural forest regeneration has occurred boundaries of habitat types are often irregular and poorly defined, and broad ecotones occur between types. Thus it is impossible to allocate

every specific site to a distinctive habitat type because many are intermediate and have characteristics of two or more types.

Habitat classification and characterization in the Southeast has been attempted by several workers - for Florida by A. M. Laessle, Archie F. Carr, Jr., and Andrew Clewell in a variety of publications and lectures and for Georgia by Charles Wharton. A classification of habitat types of Conecuh National Forest in extreme southern central Alabama by Mount (1980) is available, and Hodgkins (1979) provided a guide to forest types for Alabama and Mississippi, primarily for use by commercial foresters. None of the systems produced thus far, however, in and by itself, is specifically applicable to Fort Rucker. The works of all of these authorities, however, have been taken into consideration, along with those of numerous others, in deriving the classification scheme used herein (Mount and Diamond, 1992).

6.7.3.1 Upland Forested Areas

6.7.3.1.1 Mixed Pine-Hardwood Forests on Mesic Sites

Included in this category are mixed forests containing both pine and hardwood species on moderately well drained, mesic sites where mesophytic species predominate. Such forests are abundantly represented on the reservation in uplands with clay subsoils. They occur throughout and are the dominant type on the western one-half of Fort Rucker. This type of forest has developed naturally on much of formerly cultivated uplands. Generally, topsoils are fairly low in nutrients and consist of sandy clay loams or sandy clays. Most sites are highly erodible, and the topsoil layer may be shallow. On the tops of hills and ridges where conditions become xeric, this forest type may be replaced by one of the two xeric habitat types described below, or by an intermediate type.

Pines in the overstory of these mixed pine-hardwood forests include loblolly, shortleaf, and longleaf, in decreasing order of frequency. Common large hardwood species include southern red oak, water oak, diamond-leaf oak, sweetgum, and yellow-poplar. Less common are post oak, black oak, and hickory. Southern magnolia, beech, white oak, and spruce pine may occur on flats on lower slopes. Predominant small trees include sassafras, dogwood, sourwood, hawthorn, persimmon and wild cherry. Present in lower frequencies of occurrence are blackjack oak, fringe tree, eastern red cedar, yaupon, and devilwood. American holly is scarce.

Shrub understory plants are mostly members of the blueberry/huckleberry complex, wax myrtle, and occasionally, piedmont azalea and red buckeye, along with small individuals of the larger species described above. Blackberry and wild plum may be common in forest openings. Ground cover includes a wide variety of grasses and forbs, including numerous species of legumes, but no particular species are especially characteristic of this habitat type.

A number of factors affect plant composition and frequency of occurrence of component species of these communities. One of the most important is the forest management system being employed. For example, where fire is frequent, mature dogwood tends to thrive along with the larger pines, while fire-susceptible species, such as yellow poplar, are scarce or absent. The herbaceous ground cover becomes thicker and more diverse following fire, and shrubby undergrowth is inhibited.

Animal life in mixed pine-hardwood forests is fairly diverse. Common passerine birds, which may breed here, include the pine warbler, brown-headed nuthatch, red-eyed vireo, northern cardinal, Carolina wren, American crow, and blue jay. Also common are several woodpeckers, including the downy, red-bellied, and pileated, as well as the northern flicker. Other avian residents include the wild turkey, chuck-will's

widow, and several raptors, such as the screech owl and broad-winged, red-tailed, and sharp-shinned hawks. Species diversity is greater during winter due to migrants and non-breeding winter residents.

Common small mammals in this habitat are gray and flying squirrels (and the eastern fox squirrel where the shrub understory is suppressed by fire), the cotton mouse, pine vole, golden mouse, red bat, and several shrew species. The white-tailed deer, armadillo, Virginia opossum, and cottontail rabbit also are common.

Reptiles frequently encountered in this habitat are the eastern box turtle, green anole, eastern glass lizard, gray rat snake, eastern garter snake, and three species of skinks. The copperhead and canebrake rattlesnake are moderately common, especially around thickets along edges of intermittent streams and drains. During winter, the cottonmouth tends to move away from its usual aquatic habitats and into these and other upland forests to overwinter in stump holes and similar places. Amphibians are infrequent in this type of habitat. Those most likely to occur are the southeastern slimy salamander and several treefrog and toad species during the non-breeding period.

Excluding tracts that have been clear-cut and planted in pine, mixed pine-hardwood is the dominant forest type on non-agricultural uplands over the entire eastern Red Hills region. Except for old-growth and relatively open, pine stands that possibly could support the red-cockaded woodpecker (a federally-listed, endangered species), this habitat type does not typically support species of notable scientific importance or rarity. However, this habitat type is significant in its contribution to providing for general wildlife habitat, watershed protection, erosion prevention, and recreation. Biotic carrying capacity and niche diversity of the habitat are enhanced by natural clearings resulting from wildfires and windthrows, and some clearings from human activities.

6.7.3.1.2 Xeric Forest - Clay Hill

Xeric forests - clay hill type of forest, uncommon on the reservation, is usually interspersed as fairly small inclusions within mixed pine-hardwood forest on mesic sites (Section 8-3a(1)). This forest type occurs on extremely dry clay or clay-loam sites, most often on tops of ridges and hills where a sandy surface layer is absent. As in the case of the xeric-sandhill forest type, boundaries between this and adjoining types are usually imprecise with broad ecotones between them.

Dominant trees in this type of forest are blackjack oak, longleaf pine, and to a lesser extent, shortleaf pine. Loblolly pine may occur, but it is not as well adapted to this habitat as it is to other xeric types. Other common tree species are post oak, southern red oak, persimmon, sourwood, white oak, dogwood, and sand hickory. Shrubs include members of the blueberry-huckleberry complex. Hornbeam may occur commonly on some sites. Grasses and herbs are neither particularly abundant nor diverse in xeric forest - clay hill forest types, but goat's rue and blazing star are among species typically present.

Fauna supported by the xeric forest-clayhill habitat type is less diverse than that of the xeric sandhill forest, a condition that may be influenced by the greater difficulty of burrowing in clay soils. Fox squirrels thrive in fairly open stands. Flying squirrels and tree-cavity nesting birds, such as screech owls, may be common where mature hardwoods with cavities or dead pine trees are present. A variety of insectivorous birds feed on forest insects, but no one or two species are particularly characteristic of this forest type. The primary value of this forest type probably lies in the mast produced, which is important as winter food for a variety of wildlife.

6.7.3.1.3 Steep, Forested, Ravine Slopes (Hardwood-dominated)

Slopes which are steep (greater than 45 degrees), forested, and dominated by mature hardwood trees provide habitat which is likely to support some of the less-frequently encountered plants and animals in southeastern Alabama. This is especially true of slopes that face northward and eastward and which have been minimally disturbed. Examples can be found along several watercourses on Fort Rucker, such as some of the steep slopes immediately south of Steep Head Creek. Although this forest type is of particular biogeographical significance within the East Gulf Coastal Plain, it is among those being subjected to heavy clear-cutting on private lands in the Red Hills of southern Alabama

Dominant large trees include American beech, white oak, diamondleaf (laurel) oak, southern magnolia, yellow poplar, water oak, and hickory. Spruce and loblolly pine are present, but their occurrences are relatively scattered and infrequent. Smaller trees include dogwood, sweet bay, hornbeam, sweetleaf, ironwood, and pyramid magnolia. Bigleaf magnolia occurs infrequently. The shrub understory includes red buckeye, mountain laurel, sweet shrub, oak-leaf hydrangea, and along the lower slopes, Florida anise. Herbs include a wide variety of wildflowers and ferns, such as wild ginger, bloodroot, violets, trilliums, partridge berry, and Christmas fern. In areas with increased light penetration, greenbrier, Japanese honeysuckle, and poison ivy may grow profusely.

A variety of vertebrate fauna may utilize steep, forested, ravine slopes as habitat. The most common amphibians in this habitat type are salamanders, especially the southeastern slimy salamander, two-lined salamander, red salamander, and dusky salamander. The gray treefrog also is a frequent inhabitant. Common reptiles in this habitat include lizards, such as the five-lined skink, ground skink, and green anole, and snakes, such as the timber (canebrake) rattlesnake, copperhead, gray rat snake, and ringneck snake.

Common, nongame birds which breed in this type of habitat are the red-eyed vireo, Kentucky warbler, hooded warbler, wood thrush, brown thrasher, yellow-billed cuckoo, Carolina wren, Carolina chickadee, tufted titmouse, blue jay, chuck-will's widow, screech owl, and several woodpeckers. A wide variety of passerine birds also use this habitat type for over-wintering or during migration. The wild turkey is an important game species that utilizes this habitat, especially during winter.

Most common small mammals, which typically utilize steep, forested ravine slopes, include the cotton mouse, golden mouse, eastern chipmunk, southern flying squirrel, eastern gray squirrel, and several shrews. The armadillo, opossum, and gray fox also are frequent inhabitants, and this is a valuable habitat for white-tailed deer, an important game species.

6.7.3.1.4 Hardwood-dominated Mesic Forests

On Fort Rucker hardwood-dominated mesic forest habitat type occurs where mesic (moderate moisture) conditions prevail, such as on lower slopes, on floors of coves and ravines, and along some smaller permanent watercourses. It does not occur where floodwaters tend to stand for more than a few days at a time. Most forests of this type burn only infrequently. Logging has occurred on several sites formerly supporting this habitat type, and in some cases these sites have been converted to stands dominated by loblolly pine.

This forest type typically occupies flat to gently rolling terrain with relatively moist rich soils that support communities dominated by mesophytic hardwoods, such as diamond-leaf oak, white oak, yellow poplar, American beech, maples, southern magnolia, water oak, and black gum. Willow oak may occur, especially on well-drained sandy soils along small watercourses. Longleaf pine usually is absent.

Smaller trees include holly, dogwood, sweet bay, silverbell, hornbeam, sweetleaf, ironwood, and Hercules' club.

The shrub understory includes red buckeye, mountain laurel, piedmont azalea, sweet shrub, Florida anise, and members of the blueberry-huckleberry complex. Needle palm may occur. Herbs include a wide variety of wildflowers and ferns, such as wild ginger, violets, trillium, partridgeberry, and cinnamon fern. In areas with increased light penetration, greenbrier, Japanese honeysuckle, poison ivy, and switch cane may be common.

The hardwood-dominated mesic forest type is of particular value to wildlife when mature mast (nut and fruit-bearing trees) is abundant. The wild turkey, white-tailed deer, and eastern gray squirrel make heavy use of mast and other food sources available in this habitat, as do the southern flying squirrel, cotton mouse, golden mouse, and, occasionally, the eastern chipmunk. Swamp rabbits may occur near small streams, especially where switchcane is common. Invertebrates are usually abundant on the forest floor, as are earthworms in the topsoil. These invertebrates constitute the major food sources for shrews and armadillos, both of which are common inhabitants of this habitat.

Common birds in this habitat include passerines such as the northern cardinal, wood thrush, vireos, and warblers, as well as several woodpeckers. Raptors that use this habitat, especially for nesting, are the screech owl, red-shouldered hawk, red-tailed hawk, broad-winged hawk, and Cooper's hawk.

Snakes that may utilize this habitat include the canebrake rattlesnake, copperhead, gray rat snake, and several small secretive species (e.g. ringneck snakes). Lizards most often encountered are the ground, five-lined, and broadheaded skinks, and especially around forest edges, the green anole and eastern fence lizard. Typical amphibian inhabitants are the southern toad, Cope's gray treefrog, eastern narrowmouth toad, and spring peeper. Salamanders usually encountered are the southeastern slimy salamander and, near small streams and in and around seepages, the dusky, two-lined, and red salamanders.

6.7.3.1.5 Xeric Forest - Sandhill Type

Xeric (low moisture) forests consist principally of plants that require minimal amounts of moisture and which, consequently, can grow in excessively well-drained soils. Xeric sandhill forests, as the name implies, develop in extremely dry, sandy soils, trees strongly indicative of this forest type are turkey oak and bluejack oak. Longleaf pine is the usual dominant among large tree species. Other woody species frequently occurring in this habitat type on Fort Rucker include hawthorn, southern red oak, dwarf (or sand) post oak, sand laurel oak, and occasionally, persimmon, and devilwood. Oaks in the latter category tend to be more fire susceptible than those in the former.

Low-growing species include several grasses, pineweed, several legumes (*e.g.* goat's rue, beggar tick, tephrosia, and wild indigo), milkweed, prickly pear, sensitive brier, treadsoftly, and poison oak. Patches of blackberry may be present.

Most sandhill forest occurs in small tracts within more extensive areas of mixed pine-hardwood forests on mesic sites (Section 6.7.3.1.1). Boundaries of these tracts are frequently imprecise, with broad ecotones occurring. Even where moderately well developed, the xeric sandhill forest type on most sites on Fort Rucker lacks the sharply distinctive character of this type of forest where it occurs further south in the lower East Gulf Coastal Plain. Most, but not all, of the habitat within this category is found in the eastern portion of the reservation. Much of the acreage on the reservation capable of supporting this habitat type has been cleared.

Many animals associated with sandhill forest habitat are burrowing types. Mammalian inhabitants include the oldfield mouse, southeastern pocket gopher, fox squirrel where fire is frequent, and the southern flying squirrel where tree cavities are available. Reptiles particularly well adapted to xeric conditions include the six-lined racerunner, eastern coachwhip, Florida pine snake, and gopher tortoise. Although the gopher tortoise is not confined to this type of habitat, it usually is more common in this habitat than any other type. The eastern fence lizard, southeastern five-lined skink, ground skink, and crowned snake also occur. During winter numerous other species may be found, often as hibernators either in gopher tortoise burrows or in burrows they construct themselves. Included in this group are several frogs and toads (e.g., the ornate chorus frog, barking treefrog, and possibly, the oak toad), as well as the eastern diamondback rattlesnake.

Gopher tortoise burrows also provide optimum denning retreats and nesting sites for several larger mammals in this habitat, including the gray fox, opossum, armadillo, and striped skunk. With appropriate management (*i.e.* judicious use of fire and provision of scattered clumps of brush for cover) the northern bobwhite and cottontail rabbit also utilize this forest type. Acorns produced by mature oaks, when present in reasonable numbers, are valuable winter foods for white-tailed deer and wild turkey, although they may spend a preponderance of their time in other habitat types.

6.7.3.2 Pine Plantations

6.7.3.2.1 Young Pine Stands

Even-aged pine plantations, many less than 10 years old, are frequently encountered on Fort Rucker. Most are comparatively small, 25 acres or less. Loblolly pine has been planted on most sites having heavy soils and mesic conditions. Younger stands planted on lighter, more xeric soils within recent years consist of longleaf pine.

The younger of these plantations are comparable to an old field habitat until trees become taller and the canopy closes. Thus they provide favorable habitat for species preferring open shrubby areas with abundant ground cover, such as the cottontail rabbit and northern bobwhite quail. Sprouting hardwoods and forbs provide browse and grazing for white-tailed deer. Blackberry, wild plum, and numerous grasses and forbs (herbs other than grasses) provide food for a variety of birds. Some of these plants, along with grasshoppers and other insects, are important foods for wild turkey. In this type of regenerating habitat, populations of small rodents often increase greatly within the first 2-4 yr, providing prey for carnivores, such as the coyote, fox, and bobcat, and raptors, such as the red-tailed hawk, barn owl, and American kestrel.

During the span from three to five years of age, plantations with substantial floral diversity in the form of mixed forbs, hardwood sprouts, blackberry, etc. may be used by wild turkeys for nesting. When the pines and, if present, hardwood sprouts reach four to seven feet in height, usage by many ground-dwelling birds and mammals declines, but several other species may be found in relative abundance. These include the yellow-breasted chat, northern cardinal, white-eyed vireo, prairie warbler, and indigo bunting. Forest and forest-edge dwellers, such as the summer tanager, yellow-billed cuckoo, red-eyed vireo, blue gray gnatcatcher, chuck-will's widow, and brown thrasher, feed and sometimes nest in these habitats where they come into contact with forests consisting of larger trees.

Snakes found most commonly on these plantations include the black racer, eastern garter snake, and gray rat snake. Lizards most likely to be found are the green anole, eastern fence lizard, and ground skink. The

box turtle, and in places where soil conditions are suitable, the gopher tortoise, are the only turtles likely to be found in this type of habitat, which is well away from water. Amphibians generally are scarce in young pine plantations, except in cases where plantations are adjacent to or include wetlands. However, even well away from wetlands, southern toads and southeastern slimy salamanders are occasionally encountered, and on rainy nights juvenile frogs of several other species may be encountered dispersing from breeding sites.

As is the case with other age classes of even-aged pine plantations, the ecological value of these habitats tend to vary with size, shape, tree spacing, and floral diversity. Large regularly shaped plantations with low floral diversity are less desirable from an ecological standpoint than small, irregularly shaped ones with high floral diversity. Stands with closely spaced trees and closed canopies tend to have lower floral and faunal diversity than those with good light penetration.

6.7.3.2.2 Mid-aged Pine Stands

Flora and fauna of pine stands from 10-30 years in age varies depending on tree-age classes, tree spacing, and forest management practices. Those pine stands in which intensive efforts are made to suppress other vegetation utilizing annual burning or herbicides, are not as biodiverse as those burned less frequently (three to four-year intervals). In addition to planted pines, flora encountered in mid-aged pine stands may be extremely variable, depending on light availability, soil type, moisture conditions, and history of the site.

Scattered mast-producing hardwoods, such as oaks and dogwood, growing among the pines enhance the carrying capacity of this habitat type for wildlife and contribute to faunal diversity. Similarly, the presence of certain shrubs, such as blueberry, standing dead trees and snags, and rotting stumps and tree trunks on the forest floor increase wildlife habitat.

Common fauna likely to occur in the mid-aged pine stand habitat type include several lizards, the southeastern slimy salamander, the southern toad, and snakes of several species (notably the scarlet kingsnake if rotting pine stumps and snags are present to produce denning sites, the ringneck snake, black racer, crowned snake, and, if gopher tortoises are present, the eastern diamondback rattlesnake).

Birds that characteristically breed in this habitat include the brown-headed nuthatch, pine warbler, northern cardinal, American crow, and several woodpeckers. Fox squirrels in southeastern Alabama tend to occur with greatest frequency in open stands of mature pine. Also found in mid-aged pine forests are pine voles, cotton mice, and shrews. The wild turkey and the white-tailed deer generally use even-aged pine stands to a lesser extent than they use most other forested habitats, if the latter are available.

6.7.3.3 Agricultural Lands, Including Fallow Fields and Old Fields

Fort Rucker includes substantial cleared acreage up to a four-year successional age that is devoted to grain, legumes, or grass, including fallow fields. Early successional woody invaders of abandoned fields in the area are determined by species of seed trees in the immediate vicinity and on upon their dispersal capability. In most cases, loblolly pine and/or sweetgum are the dominant invaders. Oaks (especially water oak), dogwood, and yellow poplar are common in marginal areas adjacent to forests containing mature trees. Sassafras and persimmon also are common woody invaders. Blackberries are common around some field edges. Among the most conspicuous, persistent, herbaceous invaders of interiors of abandoned fields are broomsedge and goldenrod.

These clearings can be of substantial ecological value because they enhance the carrying capacity of the land for many of the region's wildlife species. Game species that utilize these habitats include cottontail rabbit, northern bobwhite, white-tailed deer, wild turkey, and mourning dove. Nongame species preferring to feed and or nest in one or more of these habitats include numerous passerine birds, such as the eastern bluebird, eastern meadowlark, yellow-breasted chat, chipping sparrow, field sparrow, purple martin, common ground dove, and loggerhead shrike. Inhabitants of brushy areas include the northern mockingbird, gray catbird, dark-eyed junco (winter), and rufous-sided towhee. In addition, a wide variety of forest-dwelling birds spend much time in ecotones between fields and forests. Several raptors, including the American kestrel, red-tailed hawk, and northern harrier, hunt for prey such as insects and small rodents primarily in old fields.

Reptiles which frequent old fields and field-forest ecotones include the eastern fence lizard, six line racerunner, glass lizard, eastern hognose snake, black racer, corn snake, eastern diamondback rattlesnake, Florida pine snake, and eastern coachwhip. Common small mammals in these habitats include the hispid cotton rat and oldfield mouse.

6.7.3.4 Badly Eroded Sites, Waste Areas, and Quarries

Several badly eroded sites, waste area, and quarry habitats occur on Fort Rucker. Most are less than five acres and are of ecological importance only to breeding populations of insects, small rodents, and the animals that feed on them, such as snakes and lizards. Active quarries have little or no ecological value unless they accumulate water and are left undisturbed for several months during the rainy season.

Some badly eroded, sparsely vegetated areas provide good habitat for lizards, such as the six-lined racerunner. Bare, high, vertical sides of road-cuts and vertical faces of some quarries might provide for nesting burrows of belted kingfishers or northern rough-winged swallows.

6.7.3.5 Developed Areas

6.7.3.5.1 Residential Lawns

Residential lawns, especially those with trees and shrubs, provide habitat for a number of native animals. The mockingbird, northern cardinal, rufous-sided towhee, Carolina wren, blue jay, brown thrasher, American robin, and ruby-throated hummingbird are among native birds that are well adapted to living in residential areas during the breeding season. Winter residents may include a variety of bird species, depending on the nature and amount of cover available and on whether bird feeding is practiced. Among mammals, the gray squirrel, eastern chipmunk, southern flying squirrel, eastern mole, cotton mouse, and opossum are frequent permanent residents or visitors to residential areas, especially if forested habitats are nearby.

6.7.3.5.2 Golf Courses and Similar Relatively Open, Developed Areas

Golf courses and similarly vegetated habitats are used frequently by a number of breeding birds, including the American robin, blue jay, orchard oriole, northern mockingbird, and brown-headed cowbird. Given individual large trees and sufficient food, the gray squirrel may be present. The eastern bluebird and other cavity-nesting species, such as the purple martin, may use these habitats if provided with nesting boxes.

When these habitats include permanent pools or ponds, watercourses, or depressions that contain rainwater for periods of four weeks or longer during the year, these habitats can be used by several species of toads and frogs such as the southern toad, squirrel tree frog, green tree frog, gray tree frog, upland chorus frog, narrowmouth toad, bronze frog, and bullfrog.

6.7.3.5.3 Bridges and Overpasses

Undersides of bridges and overpasses are primary breeding sites for the barn swallow and the eastern phoebe. The Carolina wren also occasionally uses these structures for nesting, and small rodents and snakes of several species may take shelter in habitat provided by these structures.

6.7.3.6 Lowland Areas, Wetlands and Aquatic Habitats

6.7.3.6.1 Floodplain Forests

Floodplain forests occur along larger streams on Fort Rucker, such as Claybank and Steep Head creeks. Fallen leaves and other organic matter in these forests are frequently washed away at flood stage, and the soil is alluvial in origin. Deciduous hardwood species dominate with ash, tupelo gum, red maple, and river birch commonly present. Coniferous trees common in this type of forest include spruce pine, which is a large evergreen and bald cypress, which usually is found at the edge of water. Characteristic shrubs and herbs include palmetto, sebastiana, mountain laurel, atamasco lily, spindle lily, and partridge berry.

Depressions often are present in floodplain forests, and when filled with water, they provide important breeding habitats for amphibians, including frogs, toads, and salamanders. Floodplain forests also provide habitat for many other wildlife species. Mammalian inhabitants of these floodplain forests include the white-tailed deer, swamp rabbit, cotton mouse, southeastern shrew, southern flying squirrel, opossum, gray fox, and raccoon. Avian inhabitants which breed in this type of habitat include the white-eyed vireo, ruby-throated hummingbird, northern cardinal, summer tanager, prothonotary warbler, hooded warbler, Carolina wren, Carolina chickadee, tufted titmouse, and green-backed heron. Wild turkey utilize this habitat throughout the year, and numerous passerine birds use it for over wintering or during migration.

6.7.3.6.2 Bay Swamps

Bay swamps are thick, evergreen forests that occur near smaller streams that lack steep slopes and deep channels. The soil is wet, deep, organic muck that is black in color. Roots of many trees are at or near the surface and are often covered with mosses and lichens. The dominant tree is sweet bay; tupelo gum and yellow-poplar are scattered. Common shrubs and vines include white titi, sweet pepper bush, gallberry, and Jackson brier. Florida anise dominates some areas near drier slopes. Characteristic herbs of this habitat include golden club, green arum, and rein-orchid. Fauna in bay swamps include numerous amphibians; several reptiles; mammals such as the cotton mouse, southeastern shrew, and raccoon; and birds such as the white-eyed vireo, hooded warbler, Carolina wren, and northern cardinal.

6.7.3.6.3 Seeps, Bogs, and Wet Meadows

Seeps occur on moist clay, siltstone, or claystone at the base of steep bluffs or along creeks with deep channels. These seeps have little soil and few places for attachment of plants. Water is constantly dripping over the surface, except during the driest of conditions, and these areas are subject to scouring by water after heavy rains. Most are in the deep shade of hardwoods.

Bogs and wet meadows occur mostly on gentle slopes that remain wet for most of the year but seldom have standing water. The soil is sand or sand-over-clay hardpan. If such areas are periodically burned, they are dominated by various grasses and sedges. However, most bogs and wet meadows on Fort Rucker are in the process of being taken over by woody vegetation.

Characteristic plant species in these habitats include white titi, wax myrtle, gallberry, yellow poplar, alder, and blueberries. Various grasses, sedges, and rushes are common, as well as yellow-eyed grass, meadow beauty, ludwigia, St. Johnswort, pipewort, sundew, lobelia, narrow-leafed sunflower, and clubmosses. Sphagnum moss also is often abundant in these habitats. Principal wildlife inhabitants of these habitats are amphibians, predominantly salamanders and frogs. Several snake species and raccoons may prey upon these amphibians.

6.7.3.6.4 Borrow Pits

Borrow pits occur in otherwise upland areas where soil has been removed to a depth that allows water to stand for varying periods of time, resulting in wetland habitats. Similarly, roadside ditches and other depressions may hold water for extended periods. Flora in such isolated habitats often is scant and composed of a few wetland species and others from surrounding upland areas. These habitats often experience extremes from wet to dry and often are in full sun and on nutrient-poor soils. Common species on such sites are various sedges and rushes, yellow-eyed grass, and ludwigia. These habitats may be of particular importance to amphibians requiring breeding sites free from fish predation.

6.7.3.6.5 Intermittent Streams

Intermittent streams usually flow only during relatively wet periods. During dry periods, these streams may retain isolated pools of standing water that support aquatic organisms, such as amphibians, crustaceans, and insects. Vegetation supported by these streams typically is very limited, though they may contain plants characteristic of seeps, such as mosses and liverworts.

6.7.3.6.6 Permanent Streams

Several permanent streams occur on Fort Rucker, with Claybank Creek being the largest. Due to shifting substrates and the scouring action of sand and water, larger streams lack vegetation in their channels, but they have associated with them oxbow ponds, seeps, beaver ponds, and floodplain habitats, as described above. Smaller streams often are vegetated with arum, golden club, yellow-eyed grass, duck potato, and alder. Some very small streams are almost filled with sphagnum moss. Animal inhabitants of these streams and their banks include invertebrates such as crayfish; amphibians such as salamanders and frogs; snakes such as the cottonmouth, eastern garter snake, and brown and midland water snakes; mammals such as the beaver, river otter, and raccoon; and birds such as the green-backed heron, great blue heron, and belted kingfisher.

6.7.3.6.7 Oxbow Ponds

Oxbow ponds occur along Claybank and Steep Head creeks where stream channels have changed due to silt deposition in bends, resulting in portions of former stream beds being cut off from channels to form ponds. Oxbow ponds either have permanent water or fill intermittently with rainwater or creek overflow. They usually are lacking in vegetation, with exception of dayflowers and cardinal flowers growing on the drying mud and silt. Surrounding vegetation is characteristic of that growing along the main channel of

the associated stream. The principal animal inhabitants of oxbow ponds are amphibians.

6.7.3.6.8 Beaver Ponds

Beaver ponds occur on several small streams, which have been dammed by beavers. These ponds vary in size and depth, but usually they are small and shallow. Shoreline vegetation varies with location but usually consists of species characteristic of floodplain forests and bay swamps. Beavers modify this environment not only by their impoundments but also by their selective harvesting of shoreline vegetation for food and construction materials. Such areas often support abundant floating, rooted-floating, and emergent aquatic vegetation. Common species include fragrant water lily, water shield, bladderwort, duck potato, green arum, golden club, yellow-eyed grass, and pondweed. Common shore plants include various sedges and rushes, panic grass, ludwigia, meadow beauty, and sphagnum moss. Common woody shrub species include wax myrtle, white titi, and willow. After beavers abandon an area and the dam is destroyed, these habitats slowly revert to their previous vegetational composition.

A wide variety of other wildlife species may utilize beaver ponds. Most species found in floodplain forests use margins of beaver ponds, and ponds provide important habitat for species such as the wood duck, green-backed heron, and river otter, as well as numerous species of reptiles, amphibians, and minnows.

6.7.3.6.9 Man-made Lakes

Man-made lakes have been formed on Fort Rucker by damming several small streams and Claybank Creek. Most of these lakes have a few floating, floating-leafed, or emergent plants. Common aquatic plants are bladderwort, ludwigia, yellow-eyed grass, green arum, duck potato, and various grasses, sedges, and rushes. Lake Tholocco, 640-acres, which is the largest of these, was refilled in 2002 after the building of a new spillway. Man-made lakes provide habitat for a variety of aquatic wildlife, including fish, amphibians, reptiles, mammals, and birds. Fish species found in lakes on the reservation include channel catfish and yellow bullhead, spotted and largemouth bass, and numerous species of minnows and sunfish. Amphibians include the bullfrog, bronze frog, and southern cricket frog. Reptiles include the common snapping turtle, common musk turtle, pond slider, brown and midland water snakes, and the American alligator. Mammals most likely to utilize man-mad lakes are the beaver and the raccoon. Birds which commonly use these lakes include the pied-billed grebe, great blue heron, green-backed heron, great egret, cattle egret, and wood duck, and the mallard, American black duck, green-winged teal, and ring-necked duck utilize this habitat primarily while over-wintering and during migration.

6.7.4 Floral Inventory

Section 6.7.3 is a discussion of terrestrial and aquatic habitats and their associated floral species. Appendix 6.7 contains an index to scientific names of floral species known to occur on Fort Rucker and which are mentioned in the habitat descriptions. The *Fauna and Flora of Fort Rucker, Alabama* (Mount and Diamond, 1992) contains an annotated checklist of flora known to occur on the post or possibly occurs, based on literature review. Unconfirmed species' probabilities of occurrence (0-25%, 26-50%, 51-75%, or 76-100%) are listed. A survey for threatened, endangered or special concern plants was completed in November 2002 by A.R. Diamond and M. Woods of Troy State University.

6.7.5 Threatened, Endangered, or Special Concern Plants

A literature search, herbarium records, and an on-site flora survey conducted by Mount and Diamond (1992) indicate no species listed as endangered or threatened by the U.S. Fish and Wildlife Service. Several former Federal Category 2 species, the incised groovebur, Flyr's nemesis, Baltzell's sedge, and Alabama anglepond, may occur on Fort Rucker, but are not confirmed despite recent surveys. The State of Alabama has no official plant list of threatened or endangered plants. The table below describes rare or sensitive plants found or possible on the Fort Rucker Military Reservation and their listing status, rank, and preferred habitats. A survey for threatened, endangered or special concern plants was completed in November 2002 by A.R. Diamond and M. Woods of Troy State University and their comments have been added to the table.

Rare or Sensitive Plants Found on the Fort Rucker Military Reservation*

Species Name	Listing Status		Rank		Preferred	Comments
Common Scientific	Federal	State	State	Global	Habitat	
Incised groovebur *Agrimonia incisa*	C2[1]	na	S2[2]	G3[3]	Open, longleaf pine scrub oak habitats	Possibly occurs
Flyr's nemesis *Brickellia cordfolia*	C2	na	S2	G2 G3	Rich, undisturbed hardwood slopes	Possibly occurs
Baltzell's sedge *Carex baltzellii*	C2	na	S1[4]	G2[5]	Rich, undisturbed, hardwood slopes	Possibly occurs
Two-spike fingergrass *Chloris floridana*		na	S1	G2?	Dry, sandy, open area	Collected in 1992 survey, Not relocated in 2002 survey.
Green-fly orchid *Epidendrum conopseum*		na	S2	G3	Epiphyte on large southern magnolias	Collected during 1992 survey; observed in 2002
Large-stem morning glory *Ipomoea macorhiza*		na	S1		Dry, sandy, open areas	Collected during 1992 survey; reduced numbers in 2002
Southern twayblade *Listera australis*		na	S2		Moist areas near streams under canopy	Collected during 1992 survey; rare in 2002
Alabama anglepod *Matelea alabamensis*	C2	na	SH[6]		Rich, undisturbed, hardwood slopes	Collected historically
Nodding nixie *Apteria aphylla*		na	S1	G3G4	On moist decaying organic matter near spring heads and seeps	Collected during 1992 survey; still present 2002
Winter grapefern *Botrychium lunarioides*		na	S3	G4?	Sandy soil and full sun	Presence unlikely; rare 2002
Soapwort gentian *Gentiana saponaria*		na	S3	G5[7]	Moist areas near streams	Collected during 1992 survey; not checked 2002
Bulbous adder's tongue *Ophioglossum crotalophoroides*		na	S3	G5	Sandy soil and full sun	Collected during 1992 survey; rare 2002
Silky camellia *Stewartia malacodendron*		na	S3	G4[8]	Moist areas near streams	Collected during 1992 survey; still present, new population 2002
Downy shieldfern *Thelypteris quadrangularis*		na	S2		Moist areas near streams, under canopy	Collected during 1992 survey

* Taken from Mount and Diamond (1992), Rust Environment and Infrastructure (1996), and Mount and Bailey (2003).

[1] Former Federal Candidate species for which USFWS has information to possibly support proposals for listing as threatened or endangered, but for which conclusive data are not available

[2] Imperiled in Alabama (6 to 20 occurrences) (Nature Conservancy State Rank)
[3] Very rare throughout range or very restricted in its range (21 to 100 occurrences) (Nature Conservancy Global Rank)
[4] Critically imperiled in Alabama (5 or fewer occurrences) (Nature Conservancy State Rank)
[5] Imperiled globally (6 to 20 occurrences) (Nature Conservancy Global Rank).
[6] Historical occurrence (Nature Conservancy State Rank)
[7] Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery (Nature Conservancy Global Rank)
[8] Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery (Nature Conservancy Global Rank)

Of these former C2 species, none have been collected as of September 1992 on the site. A literature record exists for Flyr's nemesis from near Daleville in the late 1800s. The Alabama anglepod was collected from Fort Rucker once, and this is the only collection of this species from Alabama. The exact location is unclear and attempts to relocate the population have been fruitless.

These species, except for the incised groovebur, are plants of rich undisturbed hardwood slopes. Most appropriate habitat consists of the steep hardwood north-facing slopes along Steep Head Creek and the tributaries of Claybank Creek on the east shore of Lake Tholocco and for a short distance, along the east bank below the dam. Heavy disturbance of hardwood cover would likely eliminate these species if they occur on the sites. Any intensive site preparation and establishment of plantations would also likely eliminate these species if they occur on the site. Sites on which these species occur probably have never experienced fire, and fire would probably be detrimental to these species, as would grazing. Thinning of the overstory would likely have no lasting effect if only small openings were made in the canopy and use of heavy equipment was contained in areas away from the plants. Serious consideration must be given to all these factors when any major ground disturbing activity is planned.

The incised groovebur is a plant of open longleaf pine- scrub oak areas. It is most often found in thin xeric sandy woods. It would most likely benefit from prescribed burns and the thinning of overstory as long as this was accomplished with a minimum of disturbance.

Nodding nixie is a non-green flowering plant found on moist decaying organic matter. It is associated with springheads and seeps where the ground never dries out or floods. It would be harmed by any action that removes organic matter in which it grows or changes the moisture of the soil.

Winter grapefern and the bulbous adder's tongue are winter ephemerals appearing in February or March. They are most often found in cemeteries, lawns, and roadsides and seem to prefer sandy soil and full sun. Application of herbicides when these species are present could cause their demise. Also, allowing the canopy to close would eliminate them.

The green-fly orchid is an epiphyte on large magnolias and, rarely, beeches, red cedars or bald cypress. Any change in the canopy would be detrimental to this species. It is always found near streams where the humidity is constantly high and shade is constant.

Two-spike fingergrass and longstem morning glory are plants of dry sandy areas in full sun. Thinning of overstory and fire would most likely aid these species. Intensive site preparation and establishment of plantations would likely eliminate these species.

Soapwort gentian, silky camellia, downy shieldfern, and southern twayblade are plants of moist areas near streams. Overstory is hardwoods or mixed hardwood-pine. Intensive site preparation or establishment of plantations would likely eliminate these plants. Anything affecting soil moisture would likely harm these plants. These areas most likely never burned, and fire would likely be detrimental to all of these species.

The existence of these species of concern on Fort Rucker necessitates careful planning of not only major

ground disturbing activities but also careful timing and planning for many of the ecosystem enhancement activities carried out by natural resource personnel.

6.7.6 Forest Inventory

Pure, or nearly pure, pine sites are typically found in upland areas and along ridgetops. Loblolly, shortleaf, slash, and longleaf pine grow together within these topographical areas. Stand delineation is often indistinct and irregular due to variations in age, stocking, site characteristics, and previous harvesting.

Mixed pine/hardwood sites are most frequently found along middle to lower slopes and alluvial bottoms. Pine and hardwood species grow in combination within these topographical areas. Stands vary significantly in age, stocking, and composition.

Hardwood sites are typically found along poorly drained stream bottom areas. These sites are composed of a mixture of primary and secondary hardwood crop trees. Stands vary significantly in age, stocking, and composition.

According to Parmer *et al*. per. comm, Fort Rucker has 51,936 acres of commercial forestland within the classifications listed below:

Regulated (All options for forest management): 34,921 acres
Modified (Limited timber harvest): 2,000 acres
Restricted (Little, if any, forest management): 15,090 acres

Restricted areas are comprised of the following by Land Management Unit (LMU) (Section 7.3.3:

	LMU 1	LMU 2	LMU 3	LMU 4	Total
			Acres		
Bivouac	28	301	54	0	379
Encroachment	32	0	0	0	32
Danger Area	436	0	0	0	436
Buffer Strip	59	806	270	0	1,135
Impact Area	13,108	0	0	0	13,108
Totals	13,663	1,107	320	0	15,090

The post had 6,107 acres of non-commercial forestland, of which 778 acres are non-productive and 5,329 acres comprise other classifications.
Non-productive forests include the following classifications:

	LMU 1	LMU 2	LMU 3	LMU 4	Total
			Acres		
Eroded Field	70	75	0	0	145
Observation Point	2	0	0	0	2
Borrow Pit	0	36	11	0	47
Safety Zone	0	29	362	0	391
Landfill	0	0	54	0	54

TVOR Site	0	0	64	0	64
Totals	72	140	566	0	703

As indicated in tables below, there are 37,752 acres of forested lands within Land Management Units, which comprise 94% of total land within Land Management Units (total of 40,239 acres). The impact area, cantonment area, and other restricted areas are not included. With some relatively minor exceptions, the acreage within these LMU tables represents total land managed by the forest management program. A total of 11,159 acres of pine forests are managed (29% of total managed); 13,470 acres of pine/hardwood forest are managed (36%); and 13,123 acres of hardwood forest are managed (35%). In 1996 the following estimates of timber volume were on Fort Rucker:

- Pine sawtimber 69,108,715 board feet
- Hardwood sawtimber 61,844,022 board feet
- Pine pulpwood 91,695 cords
- Hardwood pulpwood 142,772 cords
- Softwood fiber 752,545 tons
- Hardwood fiber 917,736 tons

Wood fiber weight estimates were included due to market variation in wood product use, causing difficulty in grading and classifying timber. Volume/weight conversion factors are as follows:

Pine Sawtimber:	7.0	tons/MBF
Hardwood Sawtimber:	8.0	tons/MBF
Pine Pulpwood;	2.675	tons/cord
Hardwood Pulpwood:	2.8	tons/cord.

In 2007 an inventory was conducted for training areas 1-20 by Timberland Silvicultural Services, Inc. The volumes for these areas are updated in the following table. During the period 2010-2014 the remaining areas are scheduled for inventory and numbers will be updated accordingly.

- Pine sawtimber 20,792 board feet
- Hardwood sawtimber 17,014 board feet
- Pine pulpwood 93,636 cords
- Hardwood pulpwood 162,610 cords

Estimates of forest area were obtained by interpreting photopoints of recent aerial photographs. Ground truthing was used as needed. It was important to ensure proper categorization of young pine stands which were temporarily overtopped by hardwood seedlings and saplings (McWilliams, 1992).

6.7.6.1 LMU 1

LMU 1 has 8,030 acres, of which 7,802 acres (97%) are forested. Forests in LMU 1 are 24% pine, 55% mixed pine-hardwood, and 20% hardwood. The table below describes the composition of training areas within LMU 1.

LMU 1 Forest Inventory By Training Area /Management Compartment

Training Area	Mgmt Unit	Mgmt Comp	Acreage				
			Pine	Mixed Pine-Hardwood	Hardwood	Total Forested	Total (All Types)
1	1	2	249	452	105	806	850
2	2	2	63	88	94	245	258
3	3	2	49	210	206	465	465
4	4	2	128	290	213	631	634
5	5	2	160	263	87	510	537
6	6	2	154	182	77	413	422
7	7	2	99	347	64	510	537
8	8	6	539	522	239	1300	1334
9	9	6	141	231	30	402	412
10	10	6	165	1067	436	1668	1701
11	11	6	85	755	12	852	880
	Total		1,832 (23.5%)	4,407 (54.9%)	1,563 (20.0%)	7,802 (97.2%)	8,030

6.7.6.2 LMU 2

LMU 2 has 20,525 acres, of which 19,860 acres (97%) are forested. Forests in LMU 2 consist of 25.5% pine, 40.4% mixed pine-hardwood, and 34% hardwood. The table below describes the forest composition for each training area.

LMU 2 Forest Inventory by Training Area /Management Compartment

Training Area	Mgmt Unit	Mgmt Comp	Acreage				
			Pine	Mixed Pine / Hardwood	Hardwood	Total Forested	Total (All Types)
12	12	3	158	155	149	462	469
13	13	3	108	430	104	642	654
14	14	3	267	1015	187	1469	1510
15	15	5	147	968	229	1344	1403
16	16	5	156	1294	381	1831	1893
17	17	5	233	497	0	730	741
18	18	7	281	863	511	1655	1698
19	19	7	362	458	316	1136	1177
20	20	1	129	719	107	955	989
21	21	1	614	174	1048	1836	1856
22	22	7	134	170	337	641	553
23	23	3	56	0	155	211	182
24	24	3	20	16	120	156	122
25	25	3	194	4	123	321	332
26	26	3	104	61	334	499	589

27	27	1	60	9	249	318	312
28	28	1	115	0	198	313	324
29	29	4	802	165	499	1466	1556
30	30	4	212	219	187	618	604
31	31	4	163	96	181	440	513
A1	42A	9	293	22	507	822	739
A2	49X	9	68	58	173	299	442
B	43B	9	51	246	170	467	525
C	44C	9	226	347	410	983	1058
D	45D	4	121	42	83	246	284
	Total		5,074 (25.5%)	8,028 (40.4%)	6,758 (34.0%)	19,860 (96.8%)	20,525

6.7.6.3 LMU 3

LMU 3 has 10,253 acres, of which 9,610 acres (93.7%) are forested. LMU 3 forests consist of 42.3% pine, 10.1% mixed pine-hardwood, and 47.6% hardwood. The table below describes forest composition for each training area within LMU 3. Management units 46E, 47F and 48X retain partial designation from an earlier time, during which areas A through I were designated 42 through 50.

LMU 3 Forest Inventory by Training Area /Management Compartment

			Acreage				
Training Area	**Mgmt Unit**	**Mgmt Comp**	**Pine**	**Mixed Pine / Hardwood**	**Hardwood**	**Total Forested**	**Total (All Types)**
32	32	4	292	188	190	670	790
34	34	10	656	92	640	1388	1319
35	35	10	641	37	906	1584	1714
38	38	8	569	17	432	1018	1394
39	39	8	47	0	93	140	419
40	40	8	584	31	562	1177	652
41	41	8	214	121	284	619	600
E	46	9	143	20	135	298	336
F	47F	9	168	170	314	652	640
G	33	4	38	72	234	344	770
G	48X	4	127	30	202	359	n/a
H	36	10	346	93	484	923	1070
I	37	8	236	97	105	438	549
	Total		4,061 (42.3%)	968 (10.1%)	4,581 (47.6%)	9,610 (93.7%)	10,253

6.7.6.4 LMU 4

LMU 4, Cairns AAF, has 1,431 acres, of which 480 acres (33.5%) are forested. Forests on Cairns AAF are 40% pine, 14% mixed pine-hardwood, and 46% hardwood. The table below describes acreage for each forest type on Cairns AAF. A breakdown for forest types on the other off-post aviation training sites in LMU 4 is not available.

LMU 4 Forest Inventory by Training Area / Management Compartment

		Acreage				
Training Area	**Management Compartment**	**Pine**	**Mixed Pine / Hardwood**	**Hardwood**	**Total Forested**	**Total (All Types)**
Cairns AAF	50	192 (40%)	67 (14%)	221 (46%)	480 (33.5%)	1,431

An updated forest inventory (described in Section 9.2.2) of Fort Rucker began in FY-07 and inventoried one half of Fort Rucker's forest. Completion of inventory on the remainder of the forest is dependent on funding. This inventory work is being accomplished through funding from the Forestry Reserve Account and by outside contractors.

6.7.7 Wetlands

The U.S. Congress enacted the Clean Water Act in 1972 to *"restore and maintain the chemical, physical, and biological integrity of the Nation's waters*." Section 404 of the Clean Water Act delegates jurisdictional authority over wetlands to the Corps of Engineers (Corps) and the EPA. "Waters of the United States" protected by the Clean Water Act include rivers, streams, estuaries, and most ponds, lakes, and wetlands. The Corps and the EPA jointly define wetlands as, "*Those areas that are inundated or saturated by 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.*" Most wetlands on Fort Rucker are part of the tributary system of truly navigable waters and are therefore under Corps jurisdiction. However, if a wetland is believed to be hydrologically isolated (lacking the necessary connection to navigable waters), the Mobile District of the Corps should be consulted to make a jurisdictional determination.

Wetlands are dispersed throughout Fort Rucker, mostly associated with numerous streams that traverse the reservation. The largest contiguous wetland complex is a floodplain forest in the south-central portion of the reservation. This wetland system includes floodplains of Claybank Creek, Steep Head Creek, and Black Mill Creek below Lake Tholocco dam. Claybank Creek also has a fairly extensive wetland above the old Lake Tholocco bed, along the north-northeastern reservation boundary.

Field observations of wetland habitats and their associated plant constituents were addressed in Mount and Diamond's (1992) *Survey of the Flora and Fauna of Fort Rucker, Alabama*. Three wetland systems are present at Fort Rucker:

- ***Riverine***. This classification includes wetlands and deepwater habitats that are contained within a channel, except those dominated by persistent, emergent vegetation. Riverine systems at Fort Rucker include the Choctawhatchee River, Claybank Creek, Bowles Creek, Steep Head Creek, and Blacks Mill Creek. Three stagefields are in the Pea River riverine system.

- ***Lacustrine***. This classification includes wetlands and deepwater habitats that occur in topographic depressions, lack persistent, emergent vegetation, and have an area that exceeds 20 acres. Lacustrine systems at Fort Rucker include Lake Tholocco and four small reservoirs on tributaries of Claybank Creek.

- ***Palustrine***. All non-tidal wetlands dominated by persistent or emergent vegetation are included in this classification. Palustrine wetlands have many unique and important functions. They provide critical habitat for many wildlife species, absorb floodwaters, improve water quality by removing pollutants, and provide aesthetic, recreational, scientific, and educational values. Palustrine wetlands are addressed in the Corps Wetlands Delineation Manual. Palustrine wetland habitats at Fort Rucker are discussed in the following paragraphs.

During field observations, Mount and Diamond (1992) identified the following wetland habitats: floodplain forests, bay swamps, seeps, bogs, wet meadows, borrow pits, beaver ponds, oxbows, man-mad lakes, perennial streams, and intermittent streams. A wetland (under normal conditions) must contain wetland soils, vegetation, and hydrology in order to fall under Corps jurisdiction. Based on this method of measuring wetland area, Mount and Diamond (1992) calculated the total area of wetlands on the installation to be 9,573 acres, 16.5% of the total land area of Fort Rucker.

Wetland maps prepared by Mount and Diamond (1992) were based primarily on hydric soil types identified in Soil Conservation Service soil surveys (Henry, 1960; Childs, 1979) of the reservation. These maps were deemed as inherently inaccurate by Rust Environment and Infrastructure, (1999) because of their reliance on the single parameter of hydric soils.

In 1996 the U.S. Fish and Wildlife Service completed a mapping of wetlands on Fort Rucker as part of the National Wetlands Inventory (NWI). The 1:24,000 map produced showed a total of 3,424 acres of wetlands. Wetlands were ground-truthed and classified according to *Classification of Wetlands and Deepwater Habitats of the United States* Cowardin et al. 1979). Data from this survey are available on AUTOCAD and Intergraph format. NWI maps provide valuable historical landform information, and may be useful in planning development activities. However, land-disturbing activities being considered for areas possibly containing wetlands or streams will be assessed by qualified persons, and the extent of any jurisdictional areas identified verified by the Mobile Corps office.

6.8 Fauna

Although Fort Rucker has a rich and diverse fauna, natural animal communities in the area, especially large mammals have been affected by urbanization. For example two large mammals, the panther *(Felis concolor)* and black bear (*Ursus americanus)* have been extirpated from the area. White-tailed deer (*Odocoileus virginianus)* and feral hogs (*Sus scrofa)* are common however, as are many smaller mammals which have been relatively undisturbed by urbanization. Appendix 6.8 contains scientific names of faunal species[7] known to occur on Fort Rucker (Mount and Diamond, 1992).

[7] For a complete discussion and list of faunal species known to occur, or that based on literature search, occur in the surrounding area and therefore, are likely to occur on the Fort Rucker Military Reservation, see *Fauna and Flora of Fort Rucker, Alabama* (Mount and Diamond, 1992).

6.8.1 Game Fish and Wildlife Species

The following species are actively managed as game for sport hunting or fishing:

Common Name	Scientific Name
Birds	
Wood duck	*Aix sponsa*
Eastern wild turkey	*Meleagris gallopavo*
Bobwhite quail	*Colinus virginianus*
Mourning dove	*Zenaida macroura*
Mammals	
White-tailed deer	*Odocoileus virginianus*
Feral hog	*Sus scrofa*
Eastern gray squirrel	*Sciurus carolinensis*
Eastern fox squirrel	*Sciurus niger*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Gray fox	*Urocyon cinereoargenteus*
Coyote	*Canis latrans*
Raccoon	*Procyon lotor*
Virginia Opossum	*Didelphis marsupialis*
Fish	
Largemouth Bass	*Micropterus salmoides*
Bluegill	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Redear sunfish (shellcracker)	*Lepomis microlophus*

6.8.2 Nongame Birds and Mammals

Section 6.7.3 contains a discussion of terrestrial and aquatic habitats and associated species of nongame birds and mammals. Appendix 6.8 contains a list of non-game bird and mammal species known to occur on Fort Rucker.

6.8.3 Fish

Section 6.7.3 of the INRMP contains a discussion of aquatic habitats and associated fish species. Appendix 6.8 contains a list of fish species known to occur on Fort Rucker.

6.8.4 Reptiles and Amphibians

Section 6.7.3 contains a discussion of terrestrial and aquatic habitats and associated reptile and amphibian species. Appendix 6.8 contains a list of reptile and amphibian species known to occur on Fort Rucker.

6.8.5 Insects

The Fort Rucker Entomologist has been collecting and inventorying insects on Fort Rucker for many years, emphasizing the Order Coleoptera. To date, the collection includes 590 species from 59 families of beetles. Additional species collected from the post (approximately 100) are stored at the University of Georgia. The current Coleoptera species list is within Entomology and Fish and Wildlife files. The insect collection (including some from off-post) at Entomology includes about 165,000 specimens.

6.8.6 Threatened, Endangered, or Special Concern Animals

The table below provides a summary of species that have been observed or potentially could occur at Fort Rucker that are federal or state-listed, state-protected, or ranked by the Nature Conservancy. Included are habitat preferences and comments regarding the status of each species at Fort Rucker. Of the federally-listed species, none have been recorded as being present on the Fort Rucker reservation except the American alligator, which is listed as threatened only due to its similarity of appearance to the endangered American crocodile, and the gopher tortoise which is listed as threatened within its range only west of the Tombigbee and Mobile Rivers. Mount and Bailey (2003) conducted surveys in 2002 and 2003 and concluded that no federally listed plants occur at Fort Rucker (Alabama does not have a protected plant list). Nine threatened and endangered vertebrate species were documented and include five reptiles, three birds, and one mammal. Other species potentially occur. These species' state and federal status are listed in the table below. The bald eagle, which is protected by the Bald and Golden Eagle Protection Act (BGEPA, 1940), has been observed on Fort Rucker.

The State of Alabama, Department of Conservation and Natural Resources provided a list of rare or sensitive species of Coffee and Dale counties in Alabama including their species listing of Greatest Conservation Need (GCN) that was published in Alabama's Comprehensive Wildlife Conservation Strategy (CWCS). This list also includes updated status for state protected species.

A survey was conducted specifically to locate endangered macroinvertebrates (51 listed species) on Fort Rucker (Atwood *et al*., 1994). The study failed to locate any of these species on the post and concluded that, "*...there is no reason to suspect that the listed endangered invertebrates are present at Fort Rucker, Alabama*" and "*the literature review revealed that the proper habitat conditions for the listed invertebrates are not present at Fort Rucker*". Mount and Bailey (2003) identified two mussel species requiring special attention: *Pleurobema strodeanum* and *Fusconaia succissa*. Both species are relatively common but have declined throughout historical ranges. Recommendations for preserving the current populations were made and included reducing siltation into Steep Head Creek and Claybank Creek. No listed mussel species were observed. Mount and Diamond (1992) includes information on each of the species below, emphasizing habitats on Fort Rucker. Reasons for declines and threats to each are summarized.

A Memorandum regarding Management Guidelines for the gopher tortoise on Army installations was distributed in March 2008 and identifies the gopher tortoise as a priority Army Species at Risk (SAR) for Fort Rucker. The guidelines address Army policies such as conservation, ecosystem management, education/outreach, funding and cooperation with the Gopher Tortoise Team. The management strategies include population goals, habitat management, population monitoring, burrow marking, translocation, and data records/ coordination. Installation management plans that may affect gopher tortoise habitat shall

incorporate the gopher tortoise guidelines prior to implementing management practices.

Rare or Sensitive Animals Found on the Fort Rucker Military Reservation*

Species Name	Listing Status				
Common ***Scientific***	**Federal**	**State****	**GCN Priority Rank****	**Preferred Habitat**	**Comments**
			INVERTEBRATES		
Choctaw Bean *Villosa choctawensis*	C	S[2]	P2	Permanent streams	Recorded in 2000
Fuzzy Pigtoe *Pleurobema strodeanum*	C	--	P2	Permanent streams	Recorded in 2003
			REPTILES AND AMPHIBIANS		
American alligator *Alligator mississippiensis*	T(S/A)[1]	--	--	Swamps, lakes, and streams	Three recorded in 1992
Eastern diamondback rattlesnake *Crotalus adamanteus*		--	P2	Upland areas	Reportedly present but suggested declining population
Eastern indigo snake *Drymarchon corais couperi*	T[3]	S	P1	Pine woods, turkey oak, and palmetto stands near water	Presence unlikely; population drastically reduced throughout range
Gopher tortoise *Gopherus polyphemus*	C	S	P2	Dry, sandy, open areas	Several colonies on reservation. Listed as **T** Federally west of Mobile and Tombigbee rivers
Florida pine snake *Heterodon simus*	--	T	P2	Dry sandy areas dominated by long leaf pine and scrub oaks	Historical record Likely resident
Alligator snapping turtle *Macroclemys temmincki*	--	S	P2	Streams, oxbows, lakes	Probable resident.
Eastern coachwhip *Masticophis flagellum flagellum*		S	--	Open dry woodland, sandy fields	Declining population
Eastern box turtle *Terrapene carolina carolina*	--	--	--		Uncommon to scarce
Gulf Coast mud salamander *Pseudotriton montanus flavissimus*	--	--	--	Damp floodplains forests	Not discovered, but possible
Apalachicola salamander *Desmognathus apalachicolae*	--	--	--		Not discovered, but in Choctawhatchee drainage
Rainbow snake *Farancia erytrogramma erytrogramma*	--	--	P2	Lakes and streams	Recorded on one occasion

BIRDS

Cooper's hawk *Accipiter cooperi*	--	S	--	Broken woodlands, river groves	Relatively common breeding population
Bachman's sparrow *Aimophila aestivalis*	--	--	P2	Dry, open ridgetops or open forest	Possible breeding resident
Common ground dove *Columbia passerina*	--	S	--	Farms, orchards, edges, roadsides	Several recorded in 1992; apparent low density breeding population
Peregrine falcon *Falco peregrinus*	--	--	--	Mainly open country	Likely occasional visitor
Southeastern kestrel *Falco sparverius paulus*	--	--	--	Open country, farmlands	Occurrence is questionable
Bald eagle *Haliaeetus leucocephalus*	--	S	--	Coasts, rivers, large lakes	Recorded 1992 as visitor to Lake Tholocco
Loggerhead shrike *Lanius ludovicianus*	--	--	--	Old fields with shrubby undergrowth	One recorded 1992 Apparent low density breeding population
Wood Stork *Mycteria americana*	E	S	P2	Cypress swamps, marshes, ponds,	Possible occasional visitor
Osprey *Pandion haliaetus*	--	S	--	Rivers, lakes, coasts	Recorded in 1992, Increasing statewide
American white pelican *Pelicanus erythrorhynchos*	--	--	--	Lakes	Unrecorded, unlikely, but possible, short term visitor if Tholocco restored
Glossy ibis *Plegadis falcinellus*	--	--	--	Lakes	Unrecorded, possible migrant
Yellow rail *Coternicops noveborancensis*	--	--	P2	Damp meadows, wet fields	Unrecorded, possible migrant or overwintering
Black rail *Laterallus jamaicensis*	--	--	P2		Unrecorded, possible migrant
Alder flycatcher *Empidonax alnorum*	--	--	--	Swamps and aquatic habitats	Unrecorded, likely uncommon migrant
Willow flycatcher *Empidonax traillii*	--	--	--	Woodlands and brushy fields	Unrecorded, likely uncommon migrant
Warbling vireo *Vireo gilvus*	--	--	--		Unrecorded, likely migrant
LeConte's sparrow *Ammodramus leconteii*	--	--	--	Dry thick grassy areas	Unrecorded, possible uncommon

					to rare winter resident
Red-cockaded Woodpecker *Picoides borealis*	E	S	P1	Mature pine forests	Unrecorded
Henslow's sparrow *Ammodramus henslowii*	--	--	P1	Slightly damp grassy meadows and savannas	Unrecorded, possible winter resident
			FISH		
Choctawatchee darter *Etheostoma davisoni*	--	--	--	Streams	Recorded in 1992, Apparently common
			MAMMALS		
Southeastern pocket gopher *Geomys pinetis*	--	S	P2	Areas with dry to moderately dry sandy soils	Recorded in 1992. Declining statewide population
Southeastern myotis *Myotis austroriparius*	--	S	P2	Caves and culverts	Possible resident
Northern yellow bat *Lasiurius intermedius*	--	--	P2	Mosaic of forest and cleared areas with open water	Unrecorded, possible resident
Rafinesque's big-eared bat *Plecotus rafinesquii*	--	S	P1	Hollow trees, caves, and rock cavities	Migrants or transients possible
Brazilian free-tailed bat *Tadarida brasiliensis*	--	--	P2	Attics, other manmade structures	Known to occur in structures

* From Mount and Diamond (1992), Rust Environment and Infrastructure (1996), and Mount and Bailey (2003)

** State of Alabama lists these as protected. Individual categories are taken from *Vertebrate Wildlife of Alabama* (Alabama Agricultural Experiment Station, 1984)

*** Greatest Conservation Need ranking from the Alabama Comprehensive Wildlife Conservation Strategy, Wildlife and Freshwater Fisheries Divison, Alabama Department of Conservation and Natural Resources (2005)

[1] Federal-listed as Threatened due to its similarity of appearance to an endangered or threatened species

[2] State Protected, etiher by Rule 220-2-.92, Nongame Species Regulation or Rule 220-2-.98, Invertebrate Species Regulation

[3] Federal-listed as Threatened; species is likely to become endangered in the foreseeable future

7.0 LAND MANAGEMENT AREAS

7.1 Impact Area and Training Areas

7.1.1 Impact Area

The Fort Rucker impact area (Map 4.1) has 13,108 acres. The impact area is surrounded by firing ranges (described in Section 4.1.3 and shown on Map 4.1.3). Nonfiring use of this area is very restricted due to dangers involving unexploded ordnance.

7.1.2 Training Areas

Fort Rucker has 49 training areas (1-32, 34, 35, 38-41, A-1, A-2, B-I) shown on Map 4.1. These training areas encompass about 38,576 acres. Facilities to support training within training areas are described in Section 4.1.2. Training areas are used to control ground training and operations involving the conduct of the military mission.

7.1.3 Stagefields and Basefields

The Fort Rucker has three basefields, two stagefields, and a forward arming and refueling point that are used to support aviation training. These facilities comprise about 3,857 acres. Off-post stagefields, basefields, and Cairns AAF are described in sections 2.1 and 2.2.

7.2 Cantonment Area

The cantonment area is located in the extreme southern portion of Fort Rucker (Map 4.1). It has about 2,180 acres. Cantonment area facilities are briefly described in Section 4.1.

7.3 Natural Resources Management Units

7.3.1 Agricultural Lease Units

Fort Rucker has 92.8 acres leased for hay. Leasing is done using three lease units (Hanchey basefield, High Bluff stagefield (east), and High Bluff stagefield (west). These lease units are forced landing zones around airfields and stagefields. Section 8.3 describes the agricultural outleasing program.

7.3.2 Forest Compartments and Treatment Units

Forestry operations are on a 10-year management and three year prescribed burn cycle at Fort Rucker. There are 10 forest compartments, portions of which are managed using various ecosystem enhancement, consumptive, and non-consumptive forestry practices, as their place in the cycle occurs. Compartments are subdivided into 51 total treatment units (Map 7.3.2).

7.3.3 Land Management Units

Fort Rucker is divided into four Land Management Units (LMU). Major state highways transecting the main reservation serve as boundaries between three LMUs. The fourth LMU consists of areas located outside the boundaries of the main reservation. LMUs contain training areas, as shown in tables in Section 6.7.6. LMUs also contain forestry compartments and treatment units, discussed in Section 7.3.2. Hunting area boundaries (in LMUs 1-3 only since LMU 4 is closed to hunting and most outdoor recreation) are identical to training area boundaries. Total acreages fluctuate as new areas are leased and old areas are dropped from the lease program.

7.3.3.1 LMU 1

LMU 1 contains 22,630.2 acres north of Alabama Highway 27, including the reservation's highest elevations. Its main components are the Molinelli Forward Arming and Refueling Area (126.4 acres), Tabernacle Stagefield (102.7 acres), the impact area and associated ranges (13,159.4 acres), and ground maneuver training areas 1 through 11 (9,241.7 acres) which encircle the impact area, acting as a buffer zone from 0.25 to 3 miles wide, depending on location (DPTMSEC, 1994; 1204 Engineer Company, 1995).

7.3.3.2 LMU 2

LMU 2 contains 24,130.8 acres south of Alabama Highway 27 and west of Alabama Highway 85. Most tracked vehicle training takes place in LMU 2 because of the relatively lower erodibility of its soils. LMU 2 includes ground maneuver training areas, 12-31 and A-D (20,517.2 acres); Guthrie (55.3 acres) and Lowe (280.4 acres) basefields; Ech (185.6 acres) and Hooper (82.9 acres) stagefields, and the ammunition supply point (90.8 acres). The cantonment area (2,180.1 acres) and Lake Tholocco (679.3 acres) with its associated picnic area (55.3 acres) and east (51.3 acres) and west (43.4 acres) beaches are also included in this LMU (Parmer, pers. comm. DPTMSEC, 1994).

7.3.3.3 LMU 3

LMU 3 contains 11,010 acres south of Alabama Highway 27 and east of Alabama Highway 85. LMU 3 includes the ground maneuver training areas 32-41 and E through I (10,252.6 acres). Most wheeled vehicle and dismounted training takes place in LMU 3. Aviation training in LMU 3 is conducted from Hanchey Basefield (276.5 acres) and Knox (98.7 acres) and Hatch (154.0 acres) stagefields (Parmer pers. comm.; DPTMSEC, 1994).

7.3.3.4 LMU 4

LMU 4 is comprised of 2,000+ acres not located on the main reservation. LMU 4 is largely devoted to aviation training and contains Cairns AAF (1,431 acres), Shell Basefield (396 acres), and the many stagefields/remote tactical training sites described in Section 2.2 of this INRMP (McGee, 1987; Higginbotham/Briggs and Associates, 1991; DPTMSEC, 1994, Rust Environmental and Infrastructure, 1999). It also contains forest management unit 50, which is the forested area within Cairns AAF.

Ideally, one common ecological management unit, based on ecosystem types or watersheds would be best for natural resources management. However, often it is more critical that field personnel, troop units, recreationists, and others be able to easily identify area boundaries than it is to use more scientifically based boundaries. Besides, due to the difficulty of determining at what level ecosystems should be identified and managed, it would be difficult to get agreement on a common ecosystem management unit designation that meets the needs of all users and managers.

8.0 NATURAL RESOURCES MANAGEMENT

This chapter includes management practices that directly affect soil, water, vegetation, and fauna. It includes forest management, habitat management, grounds maintenance, training land management, erosion control, and direct manipulations of wildlife. Other programs include fire management, agricultural outleasing, special interest area protection, wetlands protection, water quality programs, game harvest, pest management, and Training Requirements Integration.

8.1 Objectives

- Conduct natural resources management in a manner consistent with the needs of the military training mission.
- Manage the forest ecosystem at Fort Rucker to support military training, maintain ecosystem integrity, and to provide a sustainable forest ecosystem while restoring historic communities such as the longleaf pine forest. Rehabilitate damaged training areas and provide improved troop training environments that can sustain training indefinitely.
- Protect water quality and its associated values on Fort Rucker watersheds and on watersheds that drain from the installation.
- Protect soil integrity and enhance soil productivity.
- Manage wetlands to ensure "no net loss".
- Improve the quality of habitat for game and nongame species.
- Manage game on a sustainable, carrying capacity basis to support hunting and fishing programs.
- Manage wildlife to ensure sustainability and native diversity of ecosystems.
- Maintain an aesthetically pleasing cantonment area landscape that maintains natural ecosystem functions as much as possible.
- Control noxious plants and pest animals in a manner that supports the military mission, promotes sustained ecosystem functionality, favors native species, and adds to the quality of life of the Fort Rucker and surrounding communities.
- Integrate Fort Rucker's training requirements for land use with the sustained capability of the land to support such use.
- Provide protection for lands from wildfires.
- Use fire to manage natural resources.
- Provide protection for areas of special ecological concern.

8.2 Forest Management

The purpose of Fort Rucker's forestry program is to support the military mission, enhance ecosystem integrity, promote biodiversity, sustain renewable forest resources, protect forest watersheds, manage wildlife habitat, and provide outdoor recreational opportunities to improve quality of life for the Fort Rucker community. The decades have witnessed dramatic change in the forest program at Fort Rucker. Management objectives have changed from early forest restoration, to intensive management of all available acreage for commercial products, to a unified ecosystem management approach. Within this framework, the generation of revenue from commercial forestry activities is a tertiary consideration.

The Fort Rucker Natural Resources Branch is currently in the initial process of developing an updtated integrated forest management plan that will focus on an adaptive ecosystem management approach to forest management. This plan will consist of multiple tools that will aid in the appropriate matching of species to specific sites. An historic fire regime and vegetation map is currently being developed that will describe and display precolonial ecological information for Fort Rucker and the Southern Red Hills portion of Alabama. Another component of this plan will be the 2009 Vegetative Community Survey, which used LIDAR to determine suitable habitat for gopher tortoise and other related species. ArcGIS will be the record keeping format for all forest management activities on Fort Rucker. This will allow up-to-date record keeping that can be stored in text and map formats. All information recorded with ArcGIS will also be stored using Excel spreadsheets and other documentation. Thinning schedules will be developed that will ensure full advantage is taken of growth and yield for pine dominated stands. Timber Stand Improment activities will be matched appropriately to specific sites and will be prioritized in order to maximize growth and yield. An Access-based timeline will be developed based on all activities for the next 10 years. A less detailed timeline will be developed for long-term (50-100 years) management. Longleaf pine ecosystem recovery is a primary concern and will be addressed specifically in this plan.

Undoubtedly, future years will bring about more change. It is important to maintain options to implement changing society views on the management of our nation's forests, such as found on Fort Rucker. Goals during the life of this plan include restoration of native longleaf pine ecosystems over a wide range of slope, aspect, and soil conditions. The Fort Rucker Forestry Section also plans to use various timber stand improvement (TSI) strategies to improve the value of numerous Training Areas and bivouacs to the training community. Foresters will also assist in the maintenance of safe areas around training sites. Management strategies will stress improved forest health and environmentally sound decisions.

Once mission constraints are met and forest health issues addressed, thoughtful and sustainable timber management activities may be carried out. Quality forests yield better habitats while allowing higher returns from less ground disturbing activities.

8.2.1 History of Forest Lands on Fort Rucker

Historically, longleaf pine was wide-ranging, covering much of the coastal plains from southeastern Virginia to eastern Texas, as well as the northern two-thirds of the Florida peninsula. The species was also found in the piedmont and mountain areas of Alabama and northwestern Georgia. In pre-settlement times, longleaf pine grew in extensive pure stands occupying approximately 90 million acres. Less than 5 million acres of this forest remains. Its valuable timber and production of naval stores led to widespread exploitation. Later land use patterns in the Fort Rucker area, before acquisition by the United States included the production of agricultural and forest crops. Most ridge tops and many bottomlands were cleared and cultivated. When the land was acquired by the Department of Agriculture, a land utilization plan was prepared. This plan was put into effect a short time prior to designation of the area as a military reservation. Before transfer to the Army, Department of Agriculture lands were leased to the State of Alabama for administration of the forest area. Following establishment of Camp Rucker as a military post in 1942, the reservation was used for training of both armored and infantry division troops until 1946. Area requirements for troop training were such that large areas had to be cleared. Firing was done in many remaining timber areas. Part of the timber removed from cleared areas was used by the post Engineer. A post sawmill was operated by prison personnel.

During this period, wildfires burned at will, damaging or killing stands of trees. After cessation of intensive troop training, the post was put on a standby basis. A caretaker force was left to protect the installation against wildfires. After reactivation in 1950, all lands were intensively used for training

infantry division troops until 1954 when aviation training commenced. Between 1942 and 1946, an estimated 4,800,000 board feet were cut into lumber for military purposes. The woodland area was placed under intensive forest management in 1953; the first professional forester was hired in 1954; and a woodland management plan was approved in 1954. Total volume removed during 1950 through October 1996 was 149,108,000 board feet of sawtimber and 351,096 cords of pulpwood. Methods of reforesting areas have included planting, direct seeding, seedtrees, and shelterwoods.

Between 1953 and 1996 there were 541 wildfires affecting 4,747 acres of woodlands, exclusive of the impact area. Wildfires have been greatly reduced in recent years as shown by the table in Section 8.12.1. Environmental conditions are such (e.g. high relative humidity, rapid fuel decomposition, and light prevailing winds) that relatively few stands require salvage operations. An active prescribed burning program greatly reduces the threat of wildfires. The current prescribed burning program is on a three year rotation with an acreage target of approximately 12,000 acres being prescribed burned each year. This aggressive approach has reduced wildfires to almost zero with only one to two reported each year consisting of very small acreage with no resulting damage.

By 1987 the Forestry Section staff included two foresters, three technicians, and two equipment operators. In 1994 one forester and one technician position was eliminated. Forest management activities are currently performed by one forester and four forestry technicians. The forestry technicians perform all equipment operations such as, but not limited to, road construction and repair, firebreak construction and repair and boundary line maintenance.

Because For Rucker is predominately an aviation training facility, timber harvesting/silvicultural practices have a somewhat limited adverse impact on training. Harvesting operations are viewed favorably because they provide emergency landing areas as well as improve and promote ground training opportunities. Ground troop training has increased due to S.E.R.E. training as well as expanded land navigation course training and the Fort Rucker Forestry Section cooperates with trainers to insure that harvesting/silvicultural practices do not negatively affect any training missions.

8.2.2 Forest Management Strategy

Past forestry practices have classified forest communities on Fort Rucker as upland forests (dominated by pines and hardwoods), pine plantations, and lowland forests (wetlands or floodplains). Due to the influence of past cutting and other human disturbance, few acres are old enough to be considered climax, and general fire suppression has changed the character of climax forest. Woodlands at Fort Rucker consist of stands that vary considerably in species, types, condition class, site indices, stocking levels, and operating conditions.

DoD and DA philosophical changes, as well as public interest have moved toward the restoration of the longleaf pine-wiregrass ecosystem in the coastal plain. This has caused a re-evaluation and adjustment of Fort Rucker forest management strategies. Fort Rucker is located in the historical transition zone between the longleaf pine pyroclimax of the gulf coast plain and the more rugged southern mixed hardwood forest. Generally, forests will be managed on an ecosystem scale for longleaf pine restoration in all practical areas, healthy loblolly pine forest, mixed pine-hardwood forests, and bottomland hardwood forests.

Fort Rucker's forest management plan attempts to meet diverse objectives. Forests will be managed to provide adequate emergency landing and over-run areas at airfields and stagefields, optimize forest stand stocking for ecosystem and wildlife health, and the restoration of more natural, native community types. These objectives will be accomplished by appropriately reforesting harvested areas according to slope,

aspect, and soil conditions. Uneven-aged management and Timber Stand Improvement (TSI) practices will be used to promote forest health, biodiversity, and sustainability. Even-aged management will be used as appropriate in marginal sites. Clear-cutting small areas is an appropriate silvicultural tool for species conversion or the removal of diseased or insect infested trees. It is also an appropriate silvicultural tool for salvaging timber that is affected by natural disasters and/or construction projects. A well-timed prescribed burning program is vital to maintaining healthy, diverse forests, as well as to the longleaf pine restoration efforts. A longleaf resoration plan is currently in the initiation phase. The general objectives and timeline for this plan are included at Appendix 8.5.2

8.2.3 Scope of Forest Management

Almost all of Fort Rucker (including Cairns AAF) is classified as forest (58,043 acres). Of this forest land, 8,259 acres (14%) are managed for pine (intensive even-aged management); 19,194 acres (33%) are managed for pine/hardwoods (using even and uneven-aged management); 10,498 acres (18%) are managed for hardwoods; and the rest is relatively unmanaged (such as the impact area - 23%) or within the cantonment or other restricted areas (12%). In light of the change in management strategies, these acreages and percentages are likely to change over the life of the plan.

8.2.4 Management Units

Section 7.3.2 describes forest compartments and management units. Section 6.7.6 includes acreages of each management unit as well as a general summary of forest types and volumes based on past inventory data. A forest inventory for training areas 1-20 was conducted and numbers for these areas were updated. Section 9.2.2 describes the new forest inventory procedures that are being implemented.

8.2.5 Commercial Forest Products

Fort Rucker produces a number of forest products:

- Pine sawtimber - Minimum merchantability is 10 inches diameter outside the bark at breast height (4 1/2 feet above the ground) to a 6-inch top outside the bark.
- Hardwood sawtimber - Minimum merchantability is 12 inches outside the bark at breast height to an eight-inch top outside the bark.
- Pine Chip-N-Saw – An intermediate product that revolves around a market that is often volatile and sometimes non-existent. Minimum merchantability is seven inches outside bark at breast height to a four inch top outside the bark. Log specifications can vary and are somewhat mill specific.
- Pine pulpwood - Minimum merchantability is five inches diameter outside the bark at breast height to a four-inch top outside the bark. All timber taken tree length shall have a minimum of five bolts.
- Hardwood pulpwood - Minimum merchantability is 6 inches diameter outside the bark at breast height to a 4-inch top outside the bark.
- Pine straw – as stands of longleaf pine become older and more numerous, sales of pine straw will become more important, with the added benefit of being a non-consumptive use. No pine straw is being sold at the present time.

8.2.6 Income/Cost Projections

The operating budget for 2010-2014 is expected to be as follows:

2010 $547,000
2011 $601,700
2012 $610,000
2013 $615,000
2014 $620,000

Total projected operating costs are $2,993,700. In addition, about $600,000 will be required for equipment during the five-year period, for a total cost of $3,593,700.

Total projected income is:

2010 $800,000
2011 $650,000
2012 $600,000
2013 $550,000
2014 $600,000

Above costs do not include costs by the Mobile District, U.S. Army Corps of Engineers for contracting services. These costs will reduce actual excess income (profit), of which 40% is distributed to counties including Fort Rucker in their land base.

8.2.7 Emphasized Stands and Species

That portion of Fort Rucker east of Alabama Highway 85 bears close phisiognomic and edaphic similarity to traditional coastal plain longleaf forests and represents a significant opportunity for re-establishing longleaf pine acreage at Fort Rucker. Vegetation in the area consists of hardwood scrub overgrown due to the exclusion of fire, poorly stocked loblolly or hardwood stands, poor quality stands, or acceptable stands on sub-optimal sites. Additional opportunities for longleaf pine reforestation on the west side of the installation include ridgelines with deep sandy soils. Areas where sands are shallower and those areas farther down slope are more appropriate for loblolly pine. In addition, a clay lens in the center of the installation creates a marginal site for longleaf that requires significant mechanical manipulation for success. This site may be more appropriately planted in loblolly pine. Both loblolly and longleaf pine were historically significant in the area, and current management strategies should yield high quality forests more closely resembling native ecosystems. Priority will be given to propagating longleaf pine stands on upland sites and southern and western slopes. Means of reforesting will include both artificial and natural regeneration. Principal species and reasons for selection are listed below.

8.2.7.1 Pine Species

Longleaf pine (*Pinus palustris*) - produces high quality timber and native to most soils on Fort Rucker.
Loblolly pine (*Pinus taeda*) – good growth potential and native to some soils on Fort Rucker.
Slash pine (*Pinus elliotti*) - good growth potential.
Shortleaf pine (*Pinus echinata*) - resistant to fusiform rust and produces high quality timber.

8.2.7.2 "Hard" Hardwood Species

White oak (*Quercus alba*) - High market value and quality mast producer.

Chestnut oak (*Quercus prinus*) - High market value and quality mast producer.
Red oak (*Quercus falcata*) - High market value and quality mast producer.

Note: Due to their high quality mast production and value to wildlife, these hardwood species are typically not harvested, even when located within sale unit boundaries.

8.2.7.3 "Soft" Hardwood Species

Yellow poplar (*Liriodendron tulipifera*) - High market value.
Sweet gum (*Liquidambar styraciflua*) - High market value.
Black gum (*Nyssa sylvatica*) - High market value.

8.2.8 Management Cycle

Fort Rucker timber compartments (1-10) are on a 10-year management cycle. Thus, one compartment is treated each year (thinned, herbicide applied, and/or otherwise managed) on a 10-year rotation. Tables in Section 6.7.6 indicate management units within each compartment. The schedule for 2005-2015 is listed below.

COMPARTMENT ORGANIZATION

COMPARTMENT NUMBER (FY)		CUTTING UNITS (TA'S)	MANAGED ACRES	TOTAL ACRES
One	FY 2013	20,21,27,28	3,128	3,429
Two	FY 2014	1,2,3,4,5,6,7	3,462	4,110
Three	FY 2015	12,13,14,23,24,25,26	3,426	3,781
Four	FY 2006	29,30,31,32,G,D	3,976	4,800
Five	FY 2007	15,16,17	3,570	3,945
Six	FY 2008	8,9,10,11	4,303	4,747
Seven	FY 2009	18,19,22	3,194	3,475
Eight	FY 2010	38,39,I,40,41	3,393	3,928
Nine	FY 2011	A1,A2,B,C,E,F	3,824	5,198
Ten	FY 2012	34,35,H	3,462	4,110

8.2.9 OMITTED

8.2.10 Harvest Management

Harvest management is done by a variety of methods as set forth in 8.2.2. as appropriate to stand health, vigor, species and stand prescription. Uneven-aged management is a preferred biodiversity enhancing as well as TSI tool. In marginal areas and those managed with even-aged or clearcut strategies, a mature stand is approximately 50 years old. However, these strategies can be used earlier for species conversion or to remove diseased trees. Greater emphasis is being placed on low thinning management strategies and preserving uneven-aged natural stands. Timber harvesting management strategies are affected by natural disasters and construction salvage operations which will increase scheduled harvest acres and volumes.

8.2.11 Timber Stand Improvement

Timber stand improvement includes those forest management activities where the object is to improve the quality of a forest stand. Those activities include, but are not limited to, chemical and mechanical treatments to reduce competition, and intermediate commercial harvests or non-commercial thinnings. These are important tools, not only to improving forest health, but also in increasing biodiversity.

8.2.11.1 Thinning

A thinning is a harvesting operation in an immature or mature stand or group of trees to increase the rate of growth of residual timber, to improve biodiversity, to foster higher quality forest environments, to improve spacing, and to promote sanitation. The least promising dominants and co-dominants competing with the most promising individuals of these classes are removed. Trees 6-16 inches in diameter, measured 4 1/2 feet above the ground, will be thinned, when necessary to give growing space to better trees. Larger, mature and over mature trees are selected individually for removal.

Fort Rucker's thinning efforts becoming more focused on conversion of existing pine stands to longleaf pine. Removing intermediate and/or suppressed undesirable pines and increased fire frequency and intensity encourage desired longleaf pines.

TSI thinning has traditionally been accomplished using low thinning methods and single-tree selection on Fort Rucker. This technique is still used in pine/hardwood stands. In these stands, the following criteria are used to mark trees for removal:

- ***Sanitation trees:*** Trees in which the presence of wood-destroying fungi are unmistakably evident. Trees infected with fusiform rust are removed when multiple infections will result in timber that will not reach sawtimber class. Trees heavily infested with bark beetles are marked for removal.
- ***Poor risk trees:*** Included are those in which the loss of marketable wood exceeds the annual growth of new wood; those which are overmature and suppressed, unthrifty due to insect or fungus attack, or weakened mechanically and subject to windthrow; and those damaged by fire, lightning, logging, or insects.
- ***Pine wolf trees:*** Pine trees with large heavy limbs or spreading crowns that occupy a large area and suppress thrifty young trees around them.
- ***Poorly formed trees:*** Trees not suitable for sawtimber because of form.
-

8.2.11.2 Chemical Treatments

Chemical treatments are sometimes economical means to remove undesirable tree and brush species that compete with preferred species. At Fort Rucker sweet gum, laurel oak, turkey oak, and red maple are primary hardwood species that are undesirable on pine sites. On the other hand, preferred mast producers are very valuable and are protected from herbicide use.

Chemical treatments in the form of herbaceous spraying are commonly used for TSI on Fort Rucker. An herbaceous treatment following seedling planting or occurring in the second growing season greatly increases survival and growth rates of newly planted longleaf and loblolly pine seedlings. This procedure usually consists of band spraying over the top of seedlings using backpacks or machine spraying. A tank mix of Velpar-L and OustXP or a mix of Arsenal and Oust XP at the recommended rates and with sufficient amounts of carrier are the preferred chemicals.

Chemical treatments in the form of site preparation and/or pine release are currently being used and will continue to be used in the future due to high cost and ineffectiveness associated with the sole use of mechanical methods. Chemical site preparation, in recent years, has shown to potentially cause less negative environmental degradation than mechanical methods. One of the primary negative effects caused by mechanical methods is the issue of sedimentation into streams and bodies of water. Chemical site preparation, when correctly conducted, has shown to cause less direct effects from sedimentation.

Chemical treatments in the form of kudzu and cogongrass control and eradication are currently being conducted and will continue to be a consideration in future land management planning. Transline, Tordon, Arsenal, and Escort would be probable chemicals used on such applications.

Kudzu and Cogongrass are the non-native plant species that are of primary concern to Natural Resources professionals on Fort Rucker. Without control, these species have the potential to negatively affect military training.

Cogongrass has been positively identified and treated, through the use herbicides, on approximately 8 acres on Fort Rucker. We feel confident that further investigation will lead to the indentification of more cogongrass-infested acreage. It is of high priority by Fort Rucker Natural Resources Staff to quickly treat these areas as soon as possible. This species has the greatest potential of any non-native invasive plant to negatively affect military training on Fort Rucker and to eliminate wildlife habitat.

Kudzu currently occupies approximately 500-1000 acres on Fort Rucker. These infestations have little to no use for any type of activity or wildlife habitat. Kudzu infestations alongside rights-of-way are being treated in order to limit the spread. Additional funding will be required to effectively eradicate these infestations.

The Forestry Section has three DoD certified pesticide applicators. All chemical applications are coordinated with the pest management personnel present on Fort Rucker.

8.2.11.3 Prescribed Burning

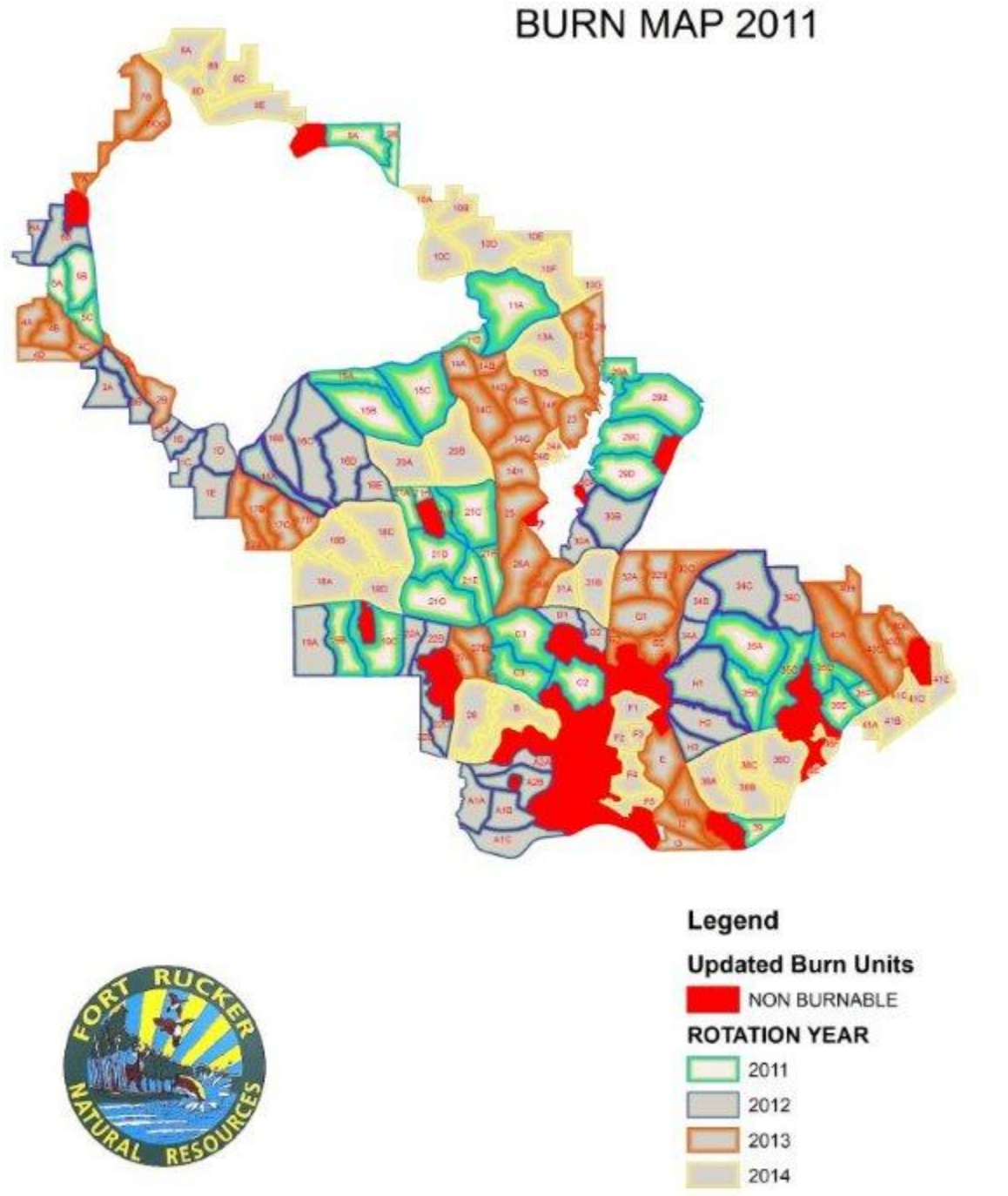
Prescribed burning is the most important and the most cost effective tool for managing and improving forested ecosystems. The trend to the exclusion of fire over the last fifty years played a key role in the reduction of biodiversity in our forested ecosystems. In the past, fire served to eliminate shrubby competition, return nutrients to the soil, and aid in some seed germination. These fire-maintained ecosystems supply significant browse for wildlife thereby enhancing biodiversity. Present settlement patterns make wildfires highly undesirable. Prescribed burning provides a mechanism for the reduction of fire fuel loads in forested areas, reducing the likelihood wildfires will occur.

Because of the potential impact of prescribed burning on helicopter training, coordination must be accomplished between the Forestry Section and Airfield Air Space Management and Range Control. The Fire Department must be informed, on a daily basis, of prescribed burning activities prior to commencing a burn, the location of the burn area, and when securing from a burn area.

These parameters do not apply to burning in conjunction with chemical and mechanical site preparation. Prescribed burning is carried on as a range fire control activity when necessary and is coordinated through the Range Control Officer. (see Section 8.12)

Normal burning is on a three-four year rotation. Burning rotation during 2010 - 2014 is shown on the

map below:


BURN MAP 2011
Legend
Updated Burn Units
NON BURNABLE
ROTATION YEAR
2011
2012
2013
2014
FORT RUCKER
NATURAL RESOURCES

Prescribed burning is a scheduled and approved forest management activity budgeted for and funded by the Forestry Reimbursable Account. With the exception of a small number of growing season burns and site preparation burns, the prescribed burning program at Fort Rucker is predominately dormant season burning which begins around the first of December and continues through April. Some of the March and April burns are technically growing season burns. An increase in growing season burns is anticipated during the next five years to promote stand conversion to longleaf pine and to improve gopher tortoise habitat. Due to weather and military training constraints there are typically 20 to 24 acceptable burn days within each year.

As required by IMCOM the Fort Rucker Forestry Section is currently developing an Integrated Wildland Fire Management Plan (IWFMP) (Section 8.12) with a suspense date of 30 September 2011. This integrated plan will coordinate plans and actions between the Forestry Section and the Fire Department and Emergency Services. The prescribed burning program will be an integral and essential part of this plan as an aggressive prescribed burning program is the most important and effective tool in minimizing wildfire potential.

8.2.12 Harvest

Site condition and overall strategy for managing a particular type of stand are considered prior to determining the type of harvest. Harvest may vary from single-tree selection in pine and pine/hardwood stands to shelterwood or seedtree cuts in pine and pine/hardwood stands to clearcuts in pine and pine/hardwood stands. Damage resulting from natural disasters, insect/disease or construction projects may require salvage or sanitation cuts. Seedtree or shelterwood cuts require an adequate stocking of high quality seedtrees and soils with high clay content.

When these conditions are not present, which is often the case, clearcutting with subsequent artificial reforestation will be prescribed. The decision criteria to clearcut a stand will be based on the following stand condition factors:

- The stand occurs in one of those areas which have been identified as prime locations on Fort Rucker for longleaf pine re-establishment;
- timber less than 50 years of age when stand analysis shows an average of more than five annual rings in the last one-half inch of radius;
- understocked stands which will never achieve the sites optimum wood producing potential, which may have resulted from any number of environmental factors such as storm damage, insects, or disease; and
- stands consisting of predominantly low quality timber that will never meet end-of-rotation objectives.

Clearcuts will not normally exceed 25 acres to maintain age diversity and a high edge (ecotone) effect. However, clearcuts may sometimes be larger if indicated for conversion of non-native stands to longleaf pine or if other silvicultural, construction or military factors dictate.

Harvest schedules will be developed through the use of density management diagrams and will be placed on a timeline in the integrated forest management plan that is currently being developed.

8.2.12.1 Volume Computation

Timber volume will be computed using the following guidelines:

Sawtimber: *Tables for Estimating Board Foot Volumes of Timber*, published by the United States

Department of Agriculture, Forest Service. Volumes will be computed using Scribner Log Rule and the appropriate form class for the timber marked.

Pulpwood: *Operation Procedure for Timber Harvesting Projects* published by the Corps of Engineers, U.S. Army Office of the District Engineer, Savannah District, Savannah, Georgia and prepared by the Management and Disposal Branch, Real Estate Division. Volumes will be computed using the appropriate table for the pulpwood marked.

8.2.12.2 Timber Cruising and Seed Tree Marking

Timber Cruising: Where practical, areas to be cleared will be cruised using a 10% cruise using 1/10th acre plots with cruise baselines across terrain features. Areas unsuitable for prism cruising or plot sampling will be marked and tallied with a 100% cruise.

Seedtree Marking: Using seedtree regeneration methods, a specified quantity and quality trees per acre (based on species) will be left for seed production. Once reproduction is established, seedtrees can be harvested.

8.2.13 Regeneration

Intensive site preparation and planting are necessary when there is a lack of an adequate seed source needed for natural regeneration. Approximately 250-400 acres per year will be site prepared and planted during the 2010-2014 period.

Chemical site preparation is the primary method of site preparation. Mechanical site preparation will be used only in areas not feasible for chemical site preparation. . Types of mechanical site preparation include shearing, raking, subsoiling/plowing, bedding, or combinations of these, depending on site requirements.

Approximately 2000 acres will be planted the next five years with containerized longleaf and/or containerized loblolly pine seedlings originating from an acceptable seed source. Planting of loblolly and longleaf pine will be limited in the near future due to funding restrictions. Containerized seedlings will have sufficient size root plugs and will come from nurseries that are recommended and approved by The Longleaf Alliance. Spacing will vary depending on the desired stocking levels. Both hand and machine planting will be used, but most planting will be performed by hand. Planting will be done during December through February. Small reforestation projects may be accomplished in-house while the bulk of the tree planting will be accomplished through outside contracts.

The table below indicates the reforestation record at Fort Rucker since 1964.

Reforestation Record

Year	Acres Planted	Acres Successfully Reseeded
1964	0	0
1965	0	0
1966	154	52
1967	80	0
1968	70	220
1969	155	265

1970	147	80
1971	22	100
1972	20	80
1973	290	0
1974	226	0
1975	259	0
1976	134	0
1977	65	0
1978	312	0
1979	181	0
1980	86	0
1981	14	0
1982	0	0
1983	319	0
1984	286	0
1985	330	0
1986	270	0
1987	384	0
1988	406	0
1989	313	0
1990	365	0
1991	477	0
1992	197	0
1993	145	0
1994	268	0
1995	268	0
1996	338	0
1997	303	0
1998	361	0
1999	325	0
2000	310	0
2001	242	0
2002	0	0
2003	256	0
2004	244	0
2005	194	0
2006	300	0
2007	225	0
2008	0	0
2009	0	0

8.2.14 Timber Sales

8.2.14.1 Markets

There are forest product markets readily available in the Fort Rucker area. Markets are generally relatively strong and reasonably stable. . There are limited markets for metal-contaminated timber. It can be sold for pulpwood. Metal contamination is not a significant problem on Fort Rucker, but it is found during clearing of areas within the Aerial Gunnery Range complex for erosion control projects. Timber

Availabilities incorporate an Environmental Record of Consideration and cultural resource surveys and are reviewed and approved by the Fort Rucker Environmental Office prior to sale.

Below is a list of commonly used markets for Fort Rucker forest products:

Note: PP = Pine Pulpwood, HP = Hardwood Pulpwood,
PS = Pine Sawtimber, HS = Hardwood Sawtimber

Andalusia Wood Products, River Falls, AL – PP, PS, HP, HS
Balfour Lumber Co., Mill- Thomasville, GA - PS, HS
Bracewell and Grant Timber Co., Clayton, AL - PP,PS,HP,HS
Canal Wood Corp., Marianna, FL- PP, PS, HP, HS
Carter Pulpwood and Timber Co., Abbeville, AL – PP, PS, HP, HS
Coastal Lumber Co., Mill -Havana, FL –PS,HS
Dale Timber Co., Ozark, AL – PS, PP, HP, HS
Dry Creek Logging, Elba, AL – PS, PP, HP, HS
Elberta Crate and Box Co., Bainbridge, GA –PS, PP, HP, HS
Eufaula Pulpwood Co., Eufaula, AL – PS, PP, HP, HS
Flint River Timber Co., Cairo, GA – PP, PS, HP, HS
Georgia-Pacific Corp., Mill – Cedar Springs, GA - PS, PP, HP, HS
K and A Logging Inc., Cuthbert, GA – PP, PS, HP, HS
Mead Coated Board Inc., Mill- Cottonton, AL – PS, PP, HP, HS
Money Pulpwood Co., Abbeville, AL –PS, PP, HP, HS
North Florida Lumber Co., Bristol, FL –PS, PP, HS, HP
Pea River Timber Co., Elba, AL – PP, PS, HP, HS
Randolph Logging Co., Cuthbert, GA –PP, PS, HP, HS
Rocky Creek Logging Co., Chapman, AL – PP, PS, HP, HS
Southern Timber Co., Ozark AL – PP, PS, HP, HS
Spann Timber Co., Geneva, AL – PP, PS, HP, HS
T. Kennedy Pulpwood Inc., Shorterville, AL – PP, PS, HP, HS
Weyerhaeuser Co., Oglethorpe, GA – PP, PS, HP, HS
Wiregrass Wood Inc., Columbia, AL – PP, PS, HP, HS

8.2.14.2 Planning

NEPA documentation is required for timber harvests and is performed on an annual or multi-year basis prior to the submission to the IMCOM–SERO forestry POC of the master availability for that year. Archeological records are also checked prior to planning for timber sales. Environmental and cultural impacts are given priority in planning of timber harvests. Coordination is maintained between the Installation Forester and Mobile District Forester (Resident Forester) in planning harvestable areas. The Resident Forester is informed of any metal-contaminated timber, and harvest areas are assessed by both foresters and the Range Control Officer to ensure safe and orderly conduct of harvesting operations. Harvesting within the confines of the range perimeter road must be with permission of the Range Control Officer on a daily basis. Coordination is also maintained, as necessary, with the Range and Training Branch to avoid conflict with training exercises and other activities occurring in proposed timber sale areas.

8.2.14.3 Contracting

At the present time Corps of Engineers (COE), Mobile District, administers timber sales for Fort Rucker. This District charges a rate of about 18% for services provided. After timber has been marked and volumes tabulated by Fort Rucker forestry personnel, a Report of Timber Availability is prepared and forwarded to the COE. The COE incorporates this information into a timber sales prospectus that is distributed to potential bidders. The COE inspects sales in progress. The COE Forester takes official action to correct violations.

The Resident Forester has primary responsibility for timber sale inspections. Inspections are made as often as possible and as time permits. The Installation Forester, or his representative, will also make inspections of sale areas. Inspections by the Resident Forester and the Installation Forester are coordinated on an informal basis, ensuring that harvesting operations on each timber sale are conducted in an orderly manner and that compliance with contract specifications is properly maintained. Areas of concern in contract specifications include roads along haul routes, loading points, skid trails, areas that are aesthetically sensitive, and areas in close proximity to military training facilities. The Installation Forester shall have the primary responsibility for inspecting the sale area prior to contract clearance.

The Mobile District Resident Forester notifies the Installation Forester when the harvesting of a sale area is complete. The Installation Forester, or his representative, then makes a final inspection of the sale area. The Resident Forester is informed of discrepancies that warrant withholding a clearance report for the sale until the discrepancies are corrected. Emphasis on contract inspection include: (1) maximum utilization of wood products, (2) harvesting timber not included in the contract or outside designated sale area boundaries, (3) removal of slash from roads, firebreaks, and streams, (4) maximum stump heights, and/or (5) trash in area. Once discrepancies are corrected, the Fort Rucker Forester then signs contract releases. Finally, the COE closes out contracts.

Guidance for Installation handled timber sales through the local Directorate of Contracting has been approved by the Department of Defense and may provide a more efficient and economical way to dispose of forest resources in the future.

8.2.15 Reporting

At the beginning of each fiscal year, Fort Rucker submits a declaration of availability to IMCOM-SE for planned timber harvest during that fiscal year. After notice of approval, individual reports of availability to the Mobile District Engineer are made as preparations for each sale area are completed. An information copy of the letter to the District Engineer is sent to IMCOM-SE. Quarterly reports of income and expenses are forwarded to the IMCOM-SE by COE district. An end of year report is sent to IMCOM-SE summarizing annual forestry activities, using COE data.

8.2.16 Management Records

The following permanent records are maintained by the Forestry Section:

- timber harvesting reports for current and previous fiscal year (FY),
- timber sale contracts in progress,
- contract completion and release reports completed during current and previous FY,
- income summary by FY,
- cost summary by FY, and
- plantation establishment records by FY.

8.2.17 Special Considerations

Outside environmental influences (i.e. economic, social, or political) may alter various aspects of this plan. Additionally, upon completion of a forest inventory, best information available may necessitate a revision of elements of this plan. Harvesting and forest management strategies will be altered as needed to accommodate these changes. Guidelines have been established by DoD for Installations to administer their own timber sales. Fort Rucker will pursue this option within the next five years in order to secure a more efficient and productive forestry program.

8.2.17.1 Timber for Installation Use

Timber harvested for installation use as training course material, parking lot borders, posts, range materials, etc., will be marked, tallied and recorded for inclusion in end of year reports. Troops training in the field are permitted to use trees for training activities, provided such use is small scale.

8.2.17.2 Wildlife Considerations

Forestry management is one of the primary activities that impacts on wildlife habitat. Many forestry management practices are beneficial to wildlife habitat. Methods of harvesting timber, such as clearcutting and thinning, are beneficial to many wildlife species, providing benefit for 6-8 years after harvesting. Location, shape, size, type, and distribution of timber cuts are analyzed from the standpoint of wildlife habitat management, to provide a series of vegetative stages that are beneficial to both forestry and wildlife. In addition, controlled burning is a vitally important tool for improving forest stands to support diverse wildlife populations. The Fort Rucker Forestry Section is working closely with fish and wildlife personnel in ongoing gopher tortoise and associated species' habitat restoration projects.

8.2.17.2.1 Clearcuts

Clearcuts can offer temporary improvements in wildlife habitat for deer, rabbits, and other species that benefit from early stages in forest succession. Clearcuts are most productive the first several years following harvests. As the stand matures and thickens, many valuable understory species grow above a usable height. Grasses and legumes are shaded out by the maturing forest. However, the canopy of longleaf pine stands is much less dense, allowing for plentiful browse in the understory. Mechanical thinning in sapling and pole stage clearcuts increases the productive period by encouraging re-sprouting, disturbing the soil, and allowing light to penetrate to the ground. To be effective for wildlife management, new clearcuts should be irregular in shape, average less than 25 acres, and not adjoin recent cuts or non-productive habitat. Large clearcut areas conflict with the overall training needs of a major mission at Fort Rucker and will be restricted in use to those areas that will not impact the training mission.

8.2.17.2.2 Thinnings

Dense pine stands provide poor habitat for most wildlife species, except for some shelter and escape cover. Thinning of pine stands is primarily a forest management tool; however, it also improves game habitat. Soil is disturbed by logging operations, and germination of desirable plants is stimulated. Removal of trees creates openings in the forest canopy, which allows light to penetrate to the forest floor and encourage growth of desirable vegetation.

8.2.17.2.3 Integrated Wildlife/Forestry Plan

The following actions have been agreed to by both Forestry and Fish and Wildlife sections:

- Decrease the individual size and number, and increase distribution of clearcuts unless being initiated for conversion of stands to longleaf pine. Young pine stands following clearcuts are excellent wildlife habitat and increasing the distribution of these throughout the installation creates variety and maximizes edge areas.
- Use prescribed fire on young, fire-tolerant (longleaf) plantations when herbaceous vegetation becomes rank and impenetrable (2-6 years).
- Use prescribed fire on a three-year cycle on thinned pine stands. Regular burning of these areas increases the quality and quantity of food available to wildlife species on Fort Rucker.
- Improve inferior hardwood sites by removing a portion of inferior hardwoods and planting preferred mast-producing species. This also releases preferred mast producers.
- Gopher tortoise and associated species' habitat restoration
- Increase Timber Stand Improvement through chopping and prescribed burning to improve RCW and gopher tortoise habitat

8.2.17.3 Best Management Practices

Alabama's Best Management Practices for Forestry (Alabama Forestry Commission, 1993) (BMPs) are included within Corps of Engineers contracts for forest harvest on Fort Rucker. BMPs include recommendations for streamside management zones, stream crossings, access roads, timber harvest, site preparation, reforestation, prescribed burning, wildfire suppression, chemical treatments, and wetland management.

8.2.18 Forest Diseases and Pests

Fort Rucker forests have relatively minor forest disease and insect problems. The greatest economic damage is caused by bark beetles, primarily Ips (*Ips avulsus*, *I. grandicollis*, and *I. calligraphus*) and the southern pine beetle (*Dendroctonus frontalis* Zimm.).

Disease losses are subtle, but occasionally significant. Fusiform rust (*Cronartium fusiforme*) affects slash and loblolly pines. Fusiform rust causes stem swellings in which a canker forms with a sunken area of rotten wood surrounded by a callus. This increases the chances of damage due to winds. This latter disease is especially prevalent in pine plantations where tree density is higher than natural. Genetically resistant pines are being planted to reduce effects of fusiform rust.

Longleaf pine, in general, is less susceptible to diseases and pests than are loblolly or slash pine. Loblolly pine is more susceptible to southern pine beetle than are slash or longleaf.

8.2.19 Mitigation for Loss of Managed Forest Lands

The primary impact from construction projects is the loss of acreage from a fixed land base. Over a period of years, construction projects have had a significant impact on a natural resource program in terms of less land available for wildlife habitat, outdoor recreational opportunities, and the production of commercially valuable timber. The following actions will be taken to mitigate the impact of construction projects on forestry operations:

- initiate action to reclaim encroachment areas;
- convert low quality, upland hardwood sites to commercially valuable pine sites; and
- convert non-productive land (i.e. eroded fields, landfills, inactive borrow pits) to pine plantations.

8.2.20 Biodiversity Conservation

Fort Rucker provides considerable species richness in its forests, especially compared with conditions found on neighboring lands. Pine plantations probably provide the least desirable habitat for most plant and animal species, especially after initial growth. Pine/hardwood managed areas provide more natural habitat for many species, but old growth is almost nonexistent in these areas. Hardwood bottoms provide an excellent component of biodiversity, including old age hardwoods. However, the re-introduction of longleaf pine on a measurable scale on Fort Rucker with attendant management strategies, including growing season burns, will yield huge returns in biodiversity enhancement. These strategies are addressed throughout the forestry section of this plan. There are at least two, and potentially three, areas where this critical ecosystem component can be developed.

8.2.20.1 Impact Area

The impact area is the most natural major ecosystem on Fort Rucker. Virtually no forest management activities have occurred for many years, and burns occur mostly during warm seasons. Frequency of fire is, however, higher in the impact than would naturally occur. Fires are rarely suppressed in the impact area.

The result of this may be similar to presettlement conditions as this large (13,000-acre) area moves toward a more climax situation. The impact area contains many hardwoods and a relatively good mixture of pines, not just the fire-resistant longleaf pine. The impact area offers the greatest biological diversity opportunity for old growth pine-favored species on Fort Rucker.

8.2.20.2 Bivouac Sites

Fort Rucker has bivouac sites, which are not managed except for removal of storm-damage and other special treatments. These areas include TA 6, TA 14, TA 15, TA 16, TA 17, TA 18, TA 21, TA 32, TA 34, TA 38, TA-A1, and TA-H. These sites offer considerable potential for management for an old growth pine component of the forest ecosystem. Training units may request in bivouac in any of the 39,444 acres of training area.

Fort Rucker is experimenting with mature pine management on some of these bivouac sites. Areas will be thinned to allow release of preferred pine trees (longleaf will be favored) using individual tree marking. Longleaf will be managed for mature timber, with no intended harvest except that of thinnings. The end goal will be longleaf in the 150-200 year class. Where possible, a three-year, growing season burn regime will be instituted, with burning throughout the warm season. Results will be monitored, and the program will be adjusted as needed to meet biodiversity objectives, consistent with adaptive management.

A significant additional benefit of this type of management will be the improvement of the bivouac area for military use. The park-like condition in old age pine areas that are regularly thinned and burned is ideal for many military training activities.

8.2.20.3 Survival, Evasion, Resistance and Escape Training (S.E.R.E.)

Survival, Evasion, Resistance, and Escape (S.E.R.E) Training has increased significantly at Fort Rucker. Originally S.E.R.E training affected Training area 38 but has since grown to affect Training Areas 13, 14, 15, 16, 17, 18 20, 21, 25 and 26 for a total acreage of 13,092 acres. At the request of S.E.R.E Trainers these areas were originally excluded from any forest management practices. During 2008 Fort Rucker Natural Resources personnel and SERE personnel and Training Division personnel met and agreed that forest management should be conducted within SERE training areas in order to ensure sustainability. Coordination is conducted between the Natural Resources Branch and Range Control to ensure all forestry activities within these TA's is scheduled and carried out appropriately.

8.2.21 Summary

The Fort Rucker forest management program is continuing to change to meet the needs of managing its forests to provide quality military training lands, produce forest products, provide quality wildlife habitat, and provide all components of the forest ecosystem for biological diversity conservation. Products include commercial forest products, recreational opportunities, and other less tangible items. It is difficult to balance these requirements, but Fort Rucker continues to adapt to meet changing needs.

8.3 Agricultural Outleases

Agricultural outleasing is used on Fort Rucker to maintain forced landing zones around airfields and stagefields. Soils in leased areas are generally very sandy and formerly supported a vegetative cover of prickly-pear cactus, broom sedge, red sorrel, yellow thistle, and a variety of other undesirable weed plants. These areas required the annual expense of fall mowing to reduce fire hazards, control weedy growth, and provide a safer landing area in the event an aircraft experienced engine failure. Leasing these areas for hay production eliminates the annual expense of mowing and generates revenue.

Preparation for leasing began in 1992 when two fields (about 50 acres total) were planted in Tifton 78 bermuda grass. Beginning in 1993, these fields were leased to local farmers for hay production and two additional fields were added for a total of 112.2 acres leased for hay. Leasing was done using four lease units (Hooper stagefield, Hanchey Air Heliport, High Bluff stagefield [east], and High Bluff stagefield [west]). A 19.4 acre field just south of Hoopeer stagefield was leased until it became inaccessible to the private sector due to the construction of the perimeter security fence south of State Highway 27 in 2004. Today Fort Rucker's leased hay land totals 92.8 acres.

The lessee is responsible for the application of required fertilizers, based on soil test recommendations (done by lessees). Lessees may apply additional fertilizer to improve the growth of grass. However, the lessee is responsible for reporting and using only approved chemical herbicides and methods on Fort Rucker. Lessees generally cut leased areas 2-3 times each growing season. At the discretion of the government, additional work requirements, such as soil and water conservation projects, wildlife habitat improvements, etc., may be required. In this case, lessees may be reimbursed for a portion of the cost by abatement of rental due the government.

Fort Rucker itself does not normally receive funds from agricultural leases. The agricultural leasing program is handled thru the Mobile Districct Corps of Engeneers and their administrative costs in handling the program consume all monies that are generated as a result of the leases.

Fort Rucker is continuing to evaluate other potential lease sites. Inactive airfields and stagefields have considerable potential. Other potential areas include Molinelli FARP and the northern and southern sides

of Hanchey stagefield. There is a potential to lease up to 400 acres.

8.4 Habitat Management

It is difficult to address habitat management separately from forest management, training land rehabilitation, and erosion control as all four complement each other. However, the following sections describe vegetation management programs specifically to benefit wildlife. Wildlife habitat management is used to produce sustained populations of game and non-game species.

Wildlife is a product of the land. Food, water, and cover must exist at the right time and in the right place to meet the needs of each species. Limiting factors can be adjusted through habitat management to increase wildlife populations.

8.4.1 History of Fish and Wildlife Management

The State of Alabama administered this land until the 1940s, and certain areas were in a wildlife refuge and fish hatchery. The land was transferred to the War Department in 1942. At that time, wild game was scarce (Barkalow, 1949), and only three deer were believed to inhabit the entire area. During 1946-1947 ten male and six female deer were stocked on the installation from state sanctuaries in Clarke County, Alabama (Allen, 1965). Fish and wildlife management projects prior to 1965 were accomplished by the Wildlife Association, affiliated with Fort Rucker's Rod and Gun Club. Deer and turkey obtained from state agencies were stocked on the installation by Wildlife Association personnel.

AR 210-221, published in 1962, outlined policies for fish and wildlife management. The fish and wildlife program began in earnest in 1965 under direction of the Installation Conservation Committee. This committee appointed a Wildlife Coordinator (military) to assist in developing an effective fish and wildlife management program. In 1966 the military Wildlife Coordinator was replaced with a permanent civilian Fish and Wildlife Administrator, who had operational control of the fish and wildlife management program. In 1989 a wildlife technician was added to the Fish and Wildlife Section staff. A Cooperative Plan was established in 1963 with State and Federal agencies for protection, development, and management of fish and wildlife at Fort Rucker. This plan was approved and signed by the Commanding General, Fort Rucker; Regional Director, Bureau of Sport Fisheries and Wildlife, Department of the Interior; and Director of Conservation, Alabama Conservation Department. The Cooperative Plan Agreement was revised in 1982 and again in 1990. This INRMP is the latest version of this agreement.

8.4.2 Terrestrial Habitat Management

Fort Rucker has a diversity of habitat available to wildlife species. Open fields (covered with native herbs and forbs and interspersed with sparse woody growth) occur throughout the installation, especially in LMUs 1 and 3. Many upland sites, once managed on a 50-year timber rotation, and comprised of a multitude of individual even-aged stands of various age classes, are now being converted to Longleaf pine, managed on an ecosystem basis. Along streams, larger hardwoods and dense shrubs and vine understory are prevalent. The rapid growth of plants, moderate temperatures, and long, snow-free conditions combine to provide a good wildlife food supply. Habitat trends are largely determined by military use, development, forestry practices, and prevailing climate. The harvesting of timber, creation of open areas for flight safety strips, and prescribed burning alter the successional trend in wildlife habitat.

8.4.2.1 Hardwood Tree Management

Forest mast production is an important source of food for deer, turkey, quail, squirrel, and other wildlife species. Acorns are considered by many to be the most important game food in the South, and cavity or den trees are vital to support squirrel populations as well as many nesting birds. Mast and den trees will be retained in pine/hardwood areas on Fort Rucker. A minimum of 200 square feet of basal area in mast-producing species per 40 acres will be left. Eighty square feet of basal area will be in trees 15 inches or greater dbh, when available. In bottomland hardwood areas and streamside management zones, no commercial harvesting of hardwood mast-producing species will be done. Large hardwoods, particularly so-called "wolf trees," provide den trees for squirrels, raccoons, and many species of birds. When available, one or two defective trees per acre will be left as den trees.

Fort Rucker has a program to improve the quality of hardwood mast producers in bottomland areas. Competing trees and midstory may be removed to release the best quality hardwood trees.

Fish and Wildlife Section personnel are planting hardwood mast producing tree seedlings in areas with no adequate seed supply. In 1996 1,000 seedlings were planted. This program will be continued during 2010-2014.

8.4.2.2 Nest Boxes

Fort Rucker has an abundant bird population. Nest boxes have been constructed for bluebirds, wood ducks, and purple martins. Purple martin boxes are maintained on an annual basis. In 1993, 72 bluebird boxes were constructed. Records are kept by the Fish and Wildlife Section. In 2008 50 Bluebird boxes were constructed and placed throughout the installation in suitable habitat.

There are no specific plans for additional purple martin boxes. During 2010-2014 Fort Rucker will construct 25 bluebird boxes annually (including replacement boxes), and a major effort will be expended to maintain the bluebird trail.

Wood duck boxes are placed on ponds and beaver dams, but most were on Lake Tholocco. The loss of Lake Tholocco was a major blow to the wood duck box program, which had about 90 boxes. When the lake was restored, wood duck boxes were constructed/repaired on this lake, coordinated with ADCNR and the USFWS. In 2008, 50 wood duck boxes were constructed and placed on installation lakes and ponds. These and previously erected boxes are cleaned and/or repaired annually prior to nesting season.

Fort Rucker Fish and Wildlife personnel plan to begin a bat house program in FY 2011. Ten boxes will be constructed and deployed annually. These boxes will be constructed, placed and maintained in keeping with recommendations from Auburn University.

8.4.2.3 Supplemental Plantings/Wildlife Openings

Fort Rucker has 74 wildlife clearings, including those used for supplemental wildlife plantings. These clearings total about 500 acres.

8.4.2.3.1 Wildlife Openings

Deer and other browsers, such as cottontails, mice, and squirrels, usually prosper following any event that produces new growth vegetation within their reach. This is accomplished by using rotary mowers and harrows in wildlife clearings and surrounding wildlife habitat. Mowing stimulates the sprouting of choice hardwood browse and grasses. Numerous wildlife clearings are maintained by mowing, thereby improving browse quality. On Fort Rucker natural foods that grow in more open areas, such as honeysuckle and native shrubs and forbs, are fertilized to increase growth rates and forage value. Besides specific clearings for wildlife, other areas treated include road shoulders, erosion control project sites, and similar areas of opportunity.

Mowing (bush-hogging) is done on an annual basis, primarily to keep airfield overruns clear, but at the same time clearing these areas benefits wildlife. Mowing is also used to clear food plots prior to planting and for maintenance of bicolor lespedeza. Food plots that are to be left idle are mowed to stimulate desired vegetation growth.

Disking and/or plowing of wildlife openings and existing food plots, using standard agricultural practices, are performed annually on a rotational basis.

An annual tree planting program comprised of both soft and hard mast bearing trees was implemented in 2009. These trees allow the establishment of an annual food source as well as provide wildlife corridors, escape cover and habitat for a variety of wildlife species. The following table lists the species and quantities planted in 2009. In 2010, the same species will be planted in wildlife openings throughout the installation; quantities may vary.

Trees Planted at Ft. Rucker in 2009

Species	Quantity
Callaway Crab Apple	55
Yates Apple	79
Arkansas Black Apple	92
Common Persimmon	58
Sawtooth Oak	92
Gobbler Sawtooth Oak	24

8.4.2.3.2 Cover Crops

Cover crops, such as crimson clover, hairy vetch, Austrian winter pea, wheat, Pensacola bahaia grass, and Abruzzi rye, are planted for winter food crops, cover crops, and erosion control.

8.4.2.3.3 Planted Wildlife Food Areas

Wildlife food plots are planted to supplement natural food sources, thereby increasing wildlife population carrying capacity. Conversion of many areas to longleaf pine is augmenting these food plots as wildlife find the understory vegetation associated with these forests highly desirable. Other factors pertaining to habitat and reproductive success also limit wildlife populations; however, in most situations, food quality and abundance can be improved. From late spring through early fall, natural foods are usually plentiful, and these meet the majority of requirements for wildlife in most years. Food plots benefit wildlife most during winter months when wildlife food is scarce. Planting food plots near cover helps ensure optimum use of food plots during critical winter months.

Food plots high in nutritional value attract game even when natural food is abundant. Food plantings make hunting more productive and allow for a better harvest. The non-hunter also has a better chance to observe or photograph wildlife at food plots.

The following crops are planted on Fort Rucker. A map of these plots will be produced when the GIS becomes operational.

Grain sorghum: About 50 acres are planted in 5-10-acre plots during April-May each year. These plots target dove and quail.

Winter green crop mixture: Approximately 200 acres are planted in a mixture of winter wheat or rye, crimson clover, Austrian winter pea, and hairy vetch. This mixture is planted in 28 separate utility rights-of-way, totaling 100 acres. One hundred acres of this mixture are planted in numerous wildlife openings throughout the post. This mixed planting provides a high quality supplemental feed for deer, turkey, and many small game species during winter.

Bicolor lespedeza: Numerous patches have been planted throughout Fort Rucker. Each patch is 1/8th to 1/4th acres. Bicolor is primarily planted for quail; however, mourning dove and turkey also find the fruit highly desirable. A three-year maintenance cycle has been established. Cutting and fertilizing every third year aids bush growth, seed production, and overall development of bicolor. Fort Rucker realizes that bicolor lespedeza is a non-native species and can become a problem if allowed to spread unchecked. The value of this heavy seed producing legume to bobwhite quail and the fact that plots can be controlled if maintained offset this risk in our opinion.

Chufa: Twenty acres of chufa are planted throughout Fort Rucker. Fields vary from 3/4th to two acres. Chufas are planted as a supplemental food for wild turkey, although deer and other wildlife are known to feed on them.

Browntop millet: One hundred acres of brown millet are planted throughout Fort Rucker. Fields are 1-10 acres. Primarily planted to attract quail and dove, other species are known to benefit from this planting. These fields provide excellent dove hunting during the early portion of the hunting season.

Browntop is also added to mixtures planted for erosion control outside of the cantonment area. In this manner, an additional 150-200 acres of wildlife feed are provided.

Kobe lespedeza: Kobe lespedeza is planted annually in strips comprising 15 acres of wildlife openings. This plant is a highly preferred food of bobwhite quail and is also used by rabbits and deer.

Egyptian wheat: This variety of sorghum is planted in 1/8-1/4 acre plots, totaling 50 acres. Bobwhite quail, mourning dove, and various songbirds utilize this food supplement.

Chickasaw plum: Plum tree seedlings are planted within wildlife openings and open areas to create travel corridors and escape cover. Additionally, Chickasaw plum produces a fruit that is widely used by game and non-game birds and other wildlife species.

Lab lab: Lab lab, an annual tropical legume, has shown considerable promise as a high quality supplemental forage for deer. This legume has 31% crude protein, available in later summer, an important wildlife stress period. This species has been recommended by Auburn University. Fort Rucker is planting about three 4-acre plots to experiment with this species. This project will continue, depending upon results, during 2001-2005.

DQP: DQP is a perennial legume, which shows promise as deer forage and a seed producer for birds. Fort Rucker is experimenting with DQP, planting about five acres annually in strips.

Austrian winter pea; Austrian winter pea is a viney cool-season annual legume. It has a high nutritional value and is very attractive to whitetail deer, providing excellent fall, winter, and early-spring forage. Doves, quail and turkey will also feed on seed. This has been added to the cool season mixture for planting on Fort Rucker.

Chicory: Chicory, a perennial herb, has been proven to provide an excellent late winter early-spring forage for whitetail deer. It begins rapid growth in the spring and is planted as a companion plant for white and ladino clovers.

Iron & Clay Pea: Iron and Clay pea is an annual, viney, summer legume. It is planted to provide forage from July to until the first frost and is highly preferred forage of deer and rabbits. Quail, doves, turkeys and a variety of other bird species feed almost exclusively on the seed when available. It is planted as a companion plant for lab lab and is used as a warm season planting.

Sunflower: Sunflowers are an important summer annual. They are planted on Fort Rucker to provide cover and food for a variety of game and non-game birds as well as providing attractive summer forage for whitetail deer.

Dove proso millet: Dove proso millet is an annual panic grass native to central Asia. It is planted on Fort Rucker as a summer wildlife planting. The seeds produced are a choice food for upland game and non-game birds and waterfowl.

Soft mast trees: Soft mast seedlings such as Callaway Crab Apple, Yates Apple, Common Persimmon, and Arkansas Black apple are planted within open areas, wildlife openings, and in larger (> 2 acres) food plots containing both cool and warm season plantings. These trees create travel corridors, escape and screening cover. The masts produced by these trees also provide an abundant and natural food source for a variety of wildlife and bird species.

Hard mast trees; Hardwood seedlings such as ; Gobbler Sawtooth oak, Sawtooth oak are also planted within open areas, wildlife openings and larger food plots. These seedlings when planted with various soft mast species provide a permanent food source as well as creating travel corridors, escape and screening cover for a variety of wildlife and bird species (game and non-game). Fort Rucker realizes that these oaks are non-native and only uses them in upland food plots as travel corridors. The fast growing, speedy mast production characteristics of this tree provide excellent cover as well as a food source that is not matched by native hard mast producers.

Fort Rucker uses a no-till drill to obtain optimum benefits from its supplemental food plots. This equipment allows overseeding of natural forage without the need of disking or plowing. The table below indicates seeding rates and planting dates for wildlife feed planted on Fort Rucker. Fertilizer rates are based on soil tests.

Wildlife Planting	Seeding Rate	Planting Date
Egyptian wheat	8 lbs/ac.	April-July
Grain sorghum	20 lbs/ac.	June-July
Browntop millet	25 lbs/ac.	May-July
Florida beggar weed	12 lbs/ac.	April-June
Chufa	40 lbs/ac.	Mid-June
Alfalfa	25 lbs/ac.	October 1
Lab lab	10 lbs/ac.	March 1 - April 1
Bicolor lespedeza	8 lbs/ac.	1 March-15 April
DQP	8 lbs/ac.	1 March – 1 April
Winter mixture:		
Winter wheat	40 lbs/ac.	September-October
Crimson clover	15 lbs/ac.	September-October
Hairy vetch	15 lbs/ac.	September-October
Austrian winter pea	25 lbs/ac.	September-October
Chicory	10 lbs/ac.	September-November
Summer mixture:		
Iron and clay peas	25 lbs/ac.	May
Lab lab	15 lbs/ac.	May
Grain Sorghum	15 lbs/ac.	May
Upland bird Mixture:		
Mammoth Sunflower	15 lbs/ac.	May-June
Brown top Millet	15 lbs/ac.	May-June
Dove Proso	15 lbs/ac.	May-June
Grain Sorghum	15 lbs/ac.	May- June

8.4.2.4 Prescribed Burning

Prescribed burning, in cooperation with burning for forest management (Section 8.2.11.3), results in improvement of game habitat. Habitat improvement burning includes rough reduction and control of undesirable plant species. Prescribed burning will be conducted on a 3-year cycle on upland pine sites older than 20 years. Young, fire-tolerant pine stands will be burned when they become thick and rank (generally between 2-6 years). Prescribed burning is coordinated through the Directorate of Plans, Training, Mobilization, and Security. The benefits to wildlife derived from prescribed burning include:

- increased forage by keeping hardwood sprouts short, tender, palatable, and abundant;
- reduced competing undesirable species;
- stimulated growth of herbaceous plants, especially legumes;
- improved soil fertility; and
- increased aesthetic quality and accessibility of the land.

Prescribed fire is the most cost effective method to set back succession over large acreages. Featured game species with regard to prescribed burning are quail, turkey, and deer. Prescribed fire is the most important tool utilized in quail management. In pine habitat, prescribed fire benefits deer by improving the palatability and nutritional level of understory plants; reducing large, woody understory stems; encouraging production of new sprouts; reducing roughs that suppress forbs and grasses; keeping browse within reach of deer; and encouraging understory fruit and mast production. Section 8.12 discusses the use of controlled burning for the prevention of large wildfires.

While most burning on Fort Rucker is now done during December through early March. As described in Section 8.2.20, Fort Rucker is also conducting growing season burning to stimulate the restoration of longleaf pine ecosystems. This burning will more closely mimic natural burns.

There are concerns from a wildlife viewpoint regarding growing season burns. These include effects of such burns on legumes during their seed production phases as well as effects on hardwood soft mast production. It will be necessary to protect areas within burning plots to maintain cover during these burns. This will be more manpower-intensive than traditional winter burning. Effects of growing season burns will be qualitatively monitored for wildlife effects.

8.4.2.5 Brush Pile Construction

Brush cutting is used to create windrows and brush piles. These provide escape cover, nesting cover and travel lanes for various wildlife species, especially the cottontail rabbit. This is an opportunistic program that uses debris from tree trimming projects.

8.4.3 Fish Habitat Management

Aquatic habitat can undergo physical or chemical change via natural succession or via land use practices by man. Type and manner of change can vary, and each process may impact the other. Physical changes may involve silting, filling, dredging, draining, fluctuations in rainfall, ground water levels, etc. Physical changes may also be in the form of structure placed in or removed from a body of water as a means of enhancing fish habitat or improving angler access. Chemical changes may involve variations or shifts in acidity, alkalinity, hardness, dissolved oxygen, salinity, phosphorus, nitrogen, sulfur, and other elements such as iron, zinc, copper, in addition to pesticides and other man-made effluent. Cumulative effects of these changes may alter the biota in terms such as species composition, species diversity, and population densities.

8.4.3.1 Pond Fertilization

Buckhorn, Parcours, Beaver, and Ech lakes are fertilized to promote a phytoplankton bloom for increasing fish pond productivity and shading out bottom muds to control aquatic vegetation. Lakes are fertilized starting the last week in February, and a regular schedule is continued throughout the summer. 10-34-0 liquid fertilizer at 1 gallon per acre is applied, generally in 13 separate applications.

8.4.3.2 Aquatic Weed Control

Aquatic weeds are usually not a problem due to shoreline development done in the past. However, many anglers find their fishing more difficult due to aquatic weeds. When a problem does develop, it is corrected by cultural, mechanical, or, as a last resort, chemical means.

Chemical control involves herbicides, applied and used in accordance with label instructions and EPA and DoD requirements. Herbicides (Rodeo®/glyphosate [53.5% active ingredients]) are applied during spring and summer when plants are most actively growing and flowering.

Biological control of weeds has been included as an element of the integrated pest management program. The grass carp (white amur) (*Ctenopharyngodon idella*) is an herbivorous fish, primarily stocked to control submerged weeds. Triploid fish are stocked, ensuring 100% sterility, preventing natural reproduction of the species. Once stocked, grass carp can provide long-term control of noxious aquatic weeds. They are capable of eating two to three times their body weight per day in aquatic vegetation and can gain 5-10 pounds in one year. Grass carp stocking, in most circumstances, is meant to augment other weed control actions. Rarely is carp stocking a sole solution. Use of grass carp should result in the decrease of aquatic herbicide usage. Grass carp may provide control for as long as 10-15 years. Grass carp have been stocked in four small ponds.

The primary means of aquatic weed control is implementation of a consistent and effective pond fertilization program, as discussed in Section 8.4.3.1. Pond fertilization stimulates phytoplankton growth, increasing plankton blooms, which, in turn, reduce sunlight penetration, shading out submerged vegetation.

8.4.3.3 Liming

When soil tests indicate that a pond's pH is below 6.5-7.0, agricultural (dolomitic) limestone is applied at a standard rate of one ton per acre. Ponds are tested at least every three years to determine lime requirements. Bulk limestone is most easily applied from a pontoon boat with a barge-like platform. Limestone is loaded onto the barge with a front-end loader, and it is spread by hosing the material off the platform as the boat is motored, distributing it as evenly as possible over the pond.

8.4.3.4 Pond Maintenance

After an impoundment is completed, filled with water, and stocked, maintenance and repair of the facility is required for its long-term preservation. Pond maintenance constitutes a wide array of activities with emphasis on mechanical actions. Dam maintenance is foremost to maintaining the integrity of the facility. Shoreline clearing and deepening of shallow edges are both utilized on Fort Rucker whenever needed. Topsoil is hauled in to fill low spots around the shoreline. The dam, spillway area, and improved shoreline are planted in bermuda grass and fertilized to obtain a thick protective sod. A contractor

regularly mows shorelines around lakes during summer. Picnic facilities are emphasized during maintenance. Maintenance and repair of water control structures and spillways are accomplished as needed.

8.4.3.5 Fish Attractors

Fish attractors in ponds can benefit all species of fish. Benefits include the aggregation of baitfish, additional substrate for aquatic invertebrate production, increased spawning habitat, and shelter. The primary purpose of fish attractors is to concentrate fish for anglers. Numerous fish attractor designs have been utilized in Fort Rucker lakes, including sunken Christmas trees, car tires, wooden pallets, etc. Hazardous materials, if any, are removed before placement. Attractors using trees, pallets, and brush are refurbished periodically to replace those that decompose. Fish attractor site selection is based on the amount of naturally occurring structure, water depth, pond size, and angler use.

8.5 Fish and Wildlife Population Management

8.5.1 Game Management

Game management is considerably different from management of other fish and wildlife species in that production of harvestable surpluses on a sustained basis is the major objective. Other objectives include "fair chase" and quality recreational opportunities. Chapter 13.0, *Outdoor Recreation*, includes recreational aspects of game management.

Other than the antlerless deer quota, there has never been a need to establish quotas on game harvest on the reservation. The annual harvest of game, other than antlerless deer, is relatively self-adjusting to population levels and does not, by itself, significantly affect the following year's game populations. If, in the future, new quotas need to be set, the Fort Rucker Wildlife Biologist would consult with the Alabama Department of Conservation and Natural Resources game biologists as to the maximum harvest allowable.

Hunting pressure has been dropping in recent years. USAAVNC Regulation 215-1 requires every hunter to contact Hunt Control to reserve a hunting area at Fort Rucker. The hunter is also required to check out of his assigned hunting area and report his kill for the day except during February, the end of quail and rabbit seasons. A record of hunting harvest has been kept since 1964. Records include the number of each species harvested plus the number of man-days spent hunting the species. Data are summarized and analyzed at the end of the hunting season by Fort Rucker wildlife biologists. This information is furnished to the District Wildlife Biologist, Alabama Department of Conservation and Natural Resources for comparison with other state wildlife management areas.

8.5.1.1 White-tailed Deer

Deer population and harvest data are maintained in the Fish and Wildlife Section files. During the mid-1960s it was hypothesized that Fort Rucker's deer population had approached or exceeded the maximum carrying capacity, evidenced by several years of hunting data. An antlerless deer hunting season was instituted in, or about, 1966 as a management tool to control the population. In the early 1980s health checks indicated overpopulation (epizootic hemorrhagic disease, poor weights, poor antler development, etc.).

Webb (1996) summarized historic notes on the Fort Rucker deer herd and selected deer harvest data collected from 1984 through 1995. In 1985 Fort Rucker became part of the Deer Management Assistance Program with the ADCNR. Harvest was increased (up to 633 in 1987 and 625 in 1988), and up to 10 dog deer drives were used annually to harvest more deer. Harvest gradually declined to 162 deer in 1994, and antlerless harvest was greatly decreased in 1995 when only 74 deer were bagged. Dog deer drives ceased in 1995. Throughout this herd reduction, there were obvious gains in physical condition, particularly body weight.

A White-Tailed Deer Management Plan for Fort Rucker (1999) was prepared by the Directorate of Public Works, Natural Resources Branch. The management goal for the Fort Rucker deer herd is a healthy and productive deer herd with natural sex and age structures while producing optimal sustained yield. There is some uncertainty as to the reasons for the continued low harvest. Reduced hunting pressure (affected by increases in permit cost) is probably part of the answer, but fawn recruitment appears to be below normal levels.

Corpora lutea counts from harvested females indicate normal reproductive rates for white-tailed deer in this part of Alabama, but fawn survival/recruitment appears to be low, perhaps indicating high fawn mortality. Coyote predation is suspected, and this factor has been shown to be important in other areas of the nation. Fort Rucker is currently conducting a research project on fawn survival in cooperation with Auburn University and the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries. This may yield information on ways to improve fawn recruitment.

A deer herd health check is conducted in cooperation with the Southeastern Cooperative Wildlife Disease Study Group every five years. This will continue during 2010-2014 as another means to monitor deer population size in relation to range carrying capacity.

A six-year cooperative research project was done on Fort Rucker in cooperation with the ADCNR and Auburn University to determine the preferred foods of white-tailed deer on Fort Rucker. Results of this study have been incorporated into habitat management programs on the post.

Fort Rucker is implementing quality deer management program (QDM) on the entire Installation. This program will require antlered bucks to have at least 3 points on one side to be harvested. Antlerless deer harvest will continue during this program.

Fort Rucker hunts deer from 15 October through January. Some areas are archery-only throughout the season due to safety concerns. However, in general the early part of the season through about 20 November is archery-only, with gun or bow the rest of the season. Fort Rucker follows State of Alabama guidelines on harvest dates and bag limits, with the exception of the QDM program restrictions.

8.5.1.2 Eastern Wild Turkey

Turkey populations are dependent on habitat requirements and hatching success. Weather conditions during the hatching season, availability of mast, and severity of winters also affect turkey populations. The turkey population on Fort Rucker is increasing, reflecting recent good hatching seasons and the availability of suitable habitat. The turkey seasons are currently mid March through the end of April and approximately 10 days during the latter part of October with a limit of five gobblers per year.

Management techniques, such as controlled burning, maintenance of openings, and planting have contributed to good turkey habitat. A walk-in wild turkey hunting program has been instituted, with

assistance from the National Wild Turkey Federation, to provide hunters with areas where vehicles do not interfere with hunting. These areas are closed from 1 March through July to vehicular traffic to also include the nesting season, which will decrease nest disruptions.

A Memorandum of Agreement is being considered between Fort Rucker and with the Alabama Chapter of the National Wild Turkey Federation (ACNWTF). The agreement is being considered in an effort to establish a partnership to improve the habitat and population of wild turkey on the Fort Rucker Installation. Under this agreement, the ACNWTF would provide various quantities of seed and fertilizer to Fort Rucker through DCFA who in turn would provide these items to the DPW Fish and Wildlife Section to plant in food plots.

8.5.1.3 Feral Hog

Feral hog numbers are increasing on Fort Rucker, as reflected in the 1995 harvest of over 100 hogs. Fort Rucker began requiring a tag to harvest hogs in 1995, and this practice will continue during 2010-2014. There is no closed season on feral hogs except during spring turkey season for safety purposes. During deer archery season, hog hunters must also use archery equipment. There is no daily bag limit. Due to competition with native wildlife species, it is the strategy to harvest as many hogs as possible from the installation.

8.5.1.4 Bobwhite Quail

Quail populations on Fort Rucker are dependent primarily on the amount of open land, quality of weed growth in these areas, weather, predation, and successful nesting. Improvement of habitat through bush-hogging, fertilizing, liming, and planting of various wildlife foods is important (Section 8.4.2). The thinning of dense pine stands followed by controlled burning creates desirable quail habitat. Historically, Fort Rucker's quail population has been light to medium, and presently that trend still exists. However, a more intensive management effort is being directed towards quail habitat improvement (especially in LMU 3, which has more available open land) through increased controlled burning and thinning, cover interspersion, and establishment of a balanced variety of annual and perennial preferred food crops. This program has resulted in more higher-quality quail habitat, and quail numbers are increasing in these areas.

A study was conducted on effects of releasing pen-raised bobwhite quail on wild populations of bobwhite quail. Results of this study provided information concerning population dynamics and limiting factors of wild bobwhite populations on Fort Rucker. This study was conducted as a joint venture between Fort Rucker, Auburn University, USFWS, ADCNR, and Quail Unlimited.

Fort Rucker traps wild quail and transplants them to locations where quail habitat has developed, but there is inadequate breeding stock. Most birds are removed from the impact area, which, in general, has better quail habitat. The goal for 2010-2014 is to move about 50 birds annually. Quail that are transplanted are banded to provide information on population parameters.

Quail season is mid-November through February. The daily bag limit is 12 birds.

8.5.1.5 Mourning Dove

Resident dove populations on Fort Rucker are low, and the number of doves that use the post during migration is also low. It is difficult to draw migrating doves due to vast amounts of farm land in the immediate area. Plantings for quail (Section 8.4.2.3) also benefit dove. Some fields have been planted

especially for doves. Outdoor Recreation could use these fields to sponsor special dove hunts.

The season for doves is split. In 1996 it was from 5 October through 22 November and 26 December through January 15, 1997. Hunting is restricted to afternoons only, and the bag limit is 12 birds daily.

8.5.1.6 Waterfowl

Fort Rucker is far removed from any major waterfowl flyway, and, as a result, any large migration of waterfowl through this area is generally attributed to major storm activity. An increased effort on wood duck management is planned and will include banding, construction, maintenance, and monitoring of nest boxes (Section 8.4.2.2), and habitat improvement through hardwood improvement (Section 8.4.2.1). Fort Rucker is investigating the construction of a greentree reservoir for wood ducks, but wetlands restrictions might preclude this project. The installation uses Alabama duck seasons and bag limits, which are within limits established by the USFWS.

8.5.1.7 Squirrels

Gray and fox squirrel populations are directly related to den accommodations and the quality of mast available. A hardwood improvement program (Section 8.4.2.1) has been initiated that will improve the quality of hardwood stands by increasing the abundance of preferred mast producers. Forest managers leave snag or den trees in place when upland sites are harvested. Squirrel populations on Fort Rucker are good, and hunting pressure on squirrels can be increased.

The season runs from mid-October through 15 February. The daily bag limit is eight.

8.5.1.8 Eastern Cottontail/Swamp Rabbit

There is very little demand for rabbit hunting. Rabbit numbers are generally depressed throughout the region. Rabbit populations benefit from much of the same management as do deer and quail. Winter food crops such as clovers, rye, and wheat are especially important to rabbits (Section 8.4.2.3). Windrows, established during silvicultural operations, and individual brushpiles (Section 8.4.2.5) provide escape cover in more open habitats.

The season is from mid-October through February. The daily bag limit is eight.

8.5.1.9 Other Species

Raccoon, opossum, fox and bobcat, hunted as game, are in excess of the pressure exerted upon them. There is extremely light hunting pressure on these species. Other species that are found on Fort Rucker, but are only lightly hunted, include snipe, rail, purple gallinule, common moorhens, and woodcock. State-established seasons and bag limits are used.

8.5.1.10 Fish

Fish sampling and creel surveys (Section 9.3.2) are used to update fish population data annually. Each lake is an entity in itself and may experience population fluctuations over the short and long term, stemming from fish harvest, enforced regulations, stocking, fish kills, pond productivity, aquatic weed infestation, etc. Primary species emphasized in the Fort Rucker fisheries program are Florida largemouth bass, bluegill, and shellcracker (redear).

8.5.1.10.1 Fish Harvest Management

Lakes, streams, and rivers are available for recreational fishing, provided they are not closed due to military training, fisheries management, renovation, or other activity. Fish harvest for each body of water will be designated by creel, possession, and length limits for each game fish species. Limits are identical to State limits except for largemouth bass, which have a 16-inch minimum length limit, and a daily creel limit of two bass. There is a daily creel limit of 10 for bream species.

8.5.1.10.2 Fish Population Control

To date, there has not been a need for direct control of undesirable species in Fort Rucker lakes. The preferred means to control undesirable species is to use a drawdown to concentrate these fish and allow bass predation to resolve the imbalance. It is illegal to use baitfish in lakes, which reduces the problem of introduced species.

8.5.1.10.3 Fish Stocking

Sterile white amur (grass carp) are stocked to help control aquatic vegetation in the smaller lakes, as discussed in Section 8.4.3.2. If a lake's fish population were to get to the point where it could not be controlled using predation, it would be necessary to remove all fish and re-establish the population. In that case, the stocking rate would be 100 largemouth bass and 1,000 bluegill per acre.

8.5.2 Endangered, Threatened, and Species at Risk (SAR)

8.5.2.1 Compliance Process

Protection and management of threatened and endangered species will be conducted in accordance with the Endangered Species Act (ESA), the National Environmental Policy Act (NEPA), AR 200-1, DoD Directive 4715.3, USFWS regulations and agreements, and other applicable laws or guidance from higher headquarters. Species of fish, wildlife, and plants that are listed as threatened or endangered will be protected and managed, but it is difficult to obtain high priority funding for species proposed for listing. Consideration will be given to species listed by the State of Alabama.

Management and protection of federally listed species will be given priority in natural resource management. In cases where endangered species management in accordance with the appropriate guidance would conflict with other mission activities, consultation with the USFWS will be initiated to avoid jeopardizing any listed species or its critical habitat. Formal consultations with the USFWS will be coordinated with the installation Staff Judge Advocate (SJA) and IMCOM-SE. Proposals to enter into formal consultation or seek an exemption will be coordinated through the installation SJA, IMCOM-SE, and the Office of the Director of Environmental Programs.

AR 200-1 states that the Army has five primary requirements under the Endangered Species Act:

- to conserve listed species in an ecosystem manner,
- not to "jeopardize" listed species,
- to "consult" and "confer,"
- to conduct a biological assessment, and

- not to "take" listed fish and wildlife species or to remove or destroy listed plant species.

Fort Rucker is committed to these five primary requirements.

8.5.2.2 Status of Endangered Species

Section 6.8.5 discusses the status of species of special concern at Fort Rucker. No federally-listed species have been recorded on Fort Rucker except for the American alligator, listed as threatened only due to its similarity of appearance to the endangered American crocodile. The bald eagle, formerly listed as threatened, does occur on Fort Rucker. The bald eagle is still protected under the Bald and Golden Eagle Protection Act. State-protected species that have confirmed populations, or have been sighted on the reservation, are the gopher tortoise, osprey, bald eagle, common ground dove, and southeastern pocket gopher (Mount and Diamond, 1992). There is no reason to suspect that endangered macroinvertebrates exist on Fort Rucker (Atwood *et al*., 1994; Mount and Bailey 2003).

Situated in the eastern Red Hills of Alabama and surrounded by privately owned lands devoted for the most part to intensive agriculture and commercial forestry, Fort Rucker contributes substantially to the biodiversity of the region.

As has been indicated in the faunal list, population levels of several animal species are low. Reptilian species, terrestrial species especially, appear to be far lower, generally speaking, than would be suggested by an inspection of the habitat types available. Declines in a variety of reptiles in Alabama have been noted by herpetologists (Mount and Diamond, 1992). Low population densities on Fort Rucker probably reflect general declines in southern Alabama.

Numerous hypotheses (as referenced in Mount and Diamond, 1992) have been advanced to account for reptile declines, among them:

- Deliberate killing and accidental road-killing. Snakes apparently suffer most, and the incidence of such killing varies directly with accessibility of their habitats to humans.
- Collecting for food, for the pet trade or for other commercial and/or recreational purposes.
- Certain forestry practices, especially those emphasizing short-term rotation pine monocultures. Abnormal fire regimes, such as frequent burning, especially in winter and spring, are believed to be detrimental to a variety of ground-dwelling reptiles and amphibians, due to death of the animals themselves and the destruction of microhabitats (litter, rotting stumps, logs, etc.). Lower densities of southeastern five-lined skinks in forests burned at 1-2-year intervals compared to densities in habitats burned at 5-7-year intervals are probably indicative of impacts on numerous other small forest-dwelling species.
- Fire ant predation on eggs and young. Fire ants are known to prey upon eggs and young of reptiles and are considered by some to be a serious threat to species that nest or give birth in habitats likely to be fire ant-infested.
- Chemical contamination, especially with pesticides. Insecticides can be harmful to vertebrate animal life, either as a result of direct exposure or by ingesting contaminated food (*e.g*. poisoned insects) or water. Killing of target and/or non-target organisms can result in food shortages or other disruptions in ecosystems. Herbicides can be harmful to both plants and animals, directly or, in the case of the latter, indirectly. Aerial applications of harmful chemicals are probably more detrimental than ground applications or injections, because the former are, in general, more likely to be applied by accident to non-target areas. The potential for environmental damage depends on chemicals used, the area of coverage, the frequency of application, and habitats affected. Relatively little research has been

conducted on the impacts of pesticides on Southeastern ecosystems and on native plant and animal life.

- Loss of habitats due to development, road construction, etc. With exception to the cantonment area, this has probably not been a major factor on much of Fort Rucker. Forested habitats of several types and a variety of successional stages occur in relative abundance, as do several wetland types.

Fish populations in streams and lakes on Fort Rucker are composed of expected species in relative densities anticipated.

Breeding bird species on Fort Rucker are those anticipated, in population densities generally similar to those in comparable habitats in the eastern Red Hills. Several breeding-bird species have experienced declines similar to those noted elsewhere in southern Alabama in recent years. Notable among these declining species are loggerhead shrikes, common ground-doves, northern bobwhite, field sparrows, eastern meadowlarks, common nighthawks, and southeastern American kestrels. Nighthawks may still be seen in migrating flocks in spring and fall, and over-wintering kestrels are common.

Reasons for declines in kestrels and loggerhead shrikes are not apparent, although pesticides could have played a role. In the case of some of the others, fire ant predation on young could be a factor. Except for bobwhites, the young are altricial or semi-altricial and subject to fire ant predation (referenced in Mount and Diamond, 1992).

Migrating transients on Fort Rucker are more difficult to assess than those that reside for long periods. They often arrive and leave unexpectedly, call infrequently, and may have dull plumage, especially in fall. A detailed ornithological assessment would require a specialist working full-time on the reservation for essentially a full year.

Mammals expected to be present from literature surveys are represented on Fort Rucker (Mount and Diamond, 1992). Mammalian studies are more time- and labor-intensive than others because many species are secretive and nocturnal. Some species, such as white-tailed deer, cottontail rabbits, and armadillos, are comparatively easy to assess because they move a great deal and are easily seen in vehicle headlights. Weasels and mink, on the other hand, are often difficult to detect even when present. Skunks are apparently at a historic low ebb on Fort Rucker, as they are, for unknown reasons, virtually throughout southern Alabama.

8.5.2.3 Management Recommendations

Mount and Diamond (1992) listed 14 recommendations to enhance biodiversity on Fort Rucker. Each is listed below with installation responses:

1. Employ a natural resources specialist who also has expertise and an interest in nongame wildlife and plants. Such an individual could fill existing gaps in current knowledge of the flora and fauna and institute an on-going program to monitor populations of sensitive species and develop strategies for their management. This individual could also keep other resource management personnel informed relative to changes, and impending and contemplated changes, in rules, regulations, and laws relating to nongame wildlife, plants, and wetlands. **Response:** Fort Rucker agrees, but new positions are virtually impossible to obtain due to Army-wide budget and personnel reductions.

2. Land management practices at Fort Rucker provide for a reasonably appropriate diversity of natural habitats for plants and animals. Several instances were noted, however, where bottomlands had been

converted to pine plantations. In view of the ecological value of bottomlands dominated by mature hardwood tress, especially mast-bearers, and declines in such habitats over much of the Southeast, this practice should be viewed with skepticism and perhaps discontinued. **Response:** This has been discontinued. See Section 8.2.

3. Whether or not practices of "sanitation cutting" and removal of den-trees ("wolf-trees") are being employed on Fort Rucker was not determined. Den-trees and other trees having cavities are extremely valuable to a wide variety of animal life and should be preserved whenever practicable. "Sanitation cutting" should be restricted to harvesting for southern pine beetle control. "Lightning struck" trees should be allowed to stand. **Response:** Hardwood wolf trees and other den trees are generally protected. Snags are generally not cut unless there is a safety concern. There is very limited sanitation cutting.

4. The longleaf pine-planting program on sites to which the species is better adapted than other pine species (e.g. upland, excessively well-drained sites) is commendable. It is recommended, however, that to the extent possible, longleaf should be managed as uneven-aged stands, using natural regeneration and, when necessary, summer fire in preparation for seed-drop. **Response:** Fort Rucker, in conjunction with Auburn University, is implementing a large scale program of longleaf pine re-forestation and uneven-aged management.

5. It would be desirable to set aside an area of 100 acres or more, dominated by large pines, to be managed as a potential reserve for red-cockaded woodpeckers. This species apparently does not now occur on the reservation, but some pine stands should, within the next 15-30 years, be capable of supporting the species given proper management. **Response:** As stated in Section 8.2.20.4, it is unlikely that Fort Rucker, by itself, can support a viable red-cockaded woodpecker population, and surrounding land use is not conducive to supporting this species. Fort Rucker will not set aside an area as a potential reserve for this species. However, as stated in the response to Recommendation #4, the installation is and will continue to allow some areas to develop into mature longleaf pine. These acreages are in excess of the recommended 100 acres.

6. Lake Tholocco, especially the upper portion dominated by vegetated shallows, provides optimal habitat for a variety of aquatic birds and other animal life. Disturbance by humans could be and quite likely is a limiting factor in the case of some of the birds. It is understandable and reasonable that during hunting season, disturbance is unavoidable if hunting of waterfowl is to be permitted. On the other hand, reasonable restrictions on human access to some portion or portions of the habitat during the non-hunting season, especially when certain shy birds may be nesting and brood-rearing, may be warranted and would be desirable to any extent practicable. One osprey was seen, and the lake could probably support a family of ospreys. Some of the large pine trees around the lake appear suitable for nest construction, but a nesting platform would probably be more suitable. Plans and specifications for osprey nesting platforms should be readily available through the State's nongame wildlife program. **Response:** This option is being considered.

7. Common ground doves are fully protected under state and federal law and have declined in recent years. These small doves occasionally flock with mourning doves and are sometimes mistakenly, or in some cases, perhaps deliberately, killed by dove hunters. An educational leaflet should be distributed to Fort Rucker dove hunters pointing out the differences between the two species and informing them that ground doves are fully protected against killing**. Response:** Fort Rucker does not believe that illegal shooting of ground doves during mourning dove season is a problem but will provide an educational leaflet.

8. Gopher tortoises are fully protected by Alabama game regulations and are declining. According to some locals, taking gophers and gassing their burrows were at one time permitted activities on Fort Rucker. In view of the facts that (1) some people who might visit Fort Rucker or travel across the reservation may be unaware that gophers are protected by law, (2) that tortoises are extremely valuable for shelters they provide other animal life, and (3) that the population level is probably at no more than 10% of carrying capacity, every reasonable effort should be made to enhance the species' welfare on the reservation. Measures that could be taken include:

(1) Strict enforcement of regulations against taking.
(2) Distribution or posting of leaflets, signs, posters, and such to inform the public.
(3) Using fire to stimulate growth of grasses and legumes and to inhibit shrubby undergrowth in areas of prime gopher habitat (areas having excessively well-drained soils).
(4) Avoiding or minimizing off-road vehicular traffic in areas of prime habitat.
(5) Avoiding mechanical site preparation as a forest management practice, especially during nesting season (May-September) in areas where gophers occur.
(6) Strictly prohibiting the practice of introducing gasoline or other harmful substances into gopher burrows.

Response: Suggestions 1, 3, 4, and 6 have been implemented. Suggestion 5 has been implemented to some degree, but not on a large scale in pine sites. Suggestion 2 has not been implemented. The need for such materials will be evaluated during implementation of the Environmental Awareness component of ITAM (Section 12.2) as well as other less structured environmental awareness programs. Public awareness slides in regards to Gopher tortoises status are provided via digital pucture frames in various public locations by the ITAM program throughout the Installation.

9. Bluffs and steep ravine slopes of the type that overlook Steep Head Creek should receive especially high priority in management decisions. Such habitats, especially those facing north or east and that are relatively undisturbed, are likely to support populations of plants scarce or absent in other habitats in the eastern Red Hills. **Response:** This is being implemented.

10. Three sites warrant attention because of floral assemblages scarce elsewhere on the reservation. These are:

(1) The "bay swamp" below the beaver dam on Brooking Mill Creek, south of the southeastern perimeter road (sector 38). The swamp lies along the eastern side of the creek and contains several plants (e.g. white arum) that are infrequently encountered elsewhere. Changes in the water regime there, cutting, or mechanical disturbance could alter the habitat to the detriment of the plant assemblage.
(2) A seepage bog containing several species of plants uncommon to scarce elsewhere on the reservation occurs in Sector 21 between the stream crossing the Ech Airfield Road and Ech Airfield. The bog lies to the south of the road. The bog's unusual (for Fort Rucker) characteristics would be enhanced by periodic burning during the dormant season, preferably before February.
(3) The northeastern quadrant of sector H (W 1/2 of SE 1/4 of Sector 31, T. 5 N, R. 24 E) has gopher apples, which were not found elsewhere, and a number of other xerophytes which combine to make a floral assemblage worthy of maintenance. Periodic fire to keep it relatively open will promote its welfare.

Response: This has been accomplished and will continue. Section 8.13.1 includes these provisions.

11. The sewage lagoon southwest of Hanchey Field is notable for the wood duck population it supports. The lagoon is good brood-rearing habitat, and the nesting boxes erected are enhancing the value of the habitat for wood ducks. It is recommended that other sites on the reservation that provide good brood-rearing habitat, such as beaver swamps and the upper portion of Lake Tholocco, be identified and provided with nesting boxes. The latter also appears to meet the needs of hooded mergansers if nesting boxes were provided. **Response:** The sewage lagoon is no longer present. Nesting boxes are being erected (Section 8.4.2.2), and the boxes in Lake Tholocco restored.

12. Growth of roadside wildflowers may have been, and may continue to be, inhibited by use of herbicides. Mowing rather than applying herbicide is recommended for road right-of-way maintenance if biotic diversity is a goal. Mowing should be timed to prevent cutting prior to seed maturation. **Response:** A specific wildflower program on Fort Rucker was discontinued due to cost and results. Herbicides are no longer used on road shoulders. Rather, these are mowed in early spring, mid-summer, and late fall.

13. Maintenance of the integrity of some upland habitat types (e.g., sandhill longleaf-dominated type) requires periodic fire. It is recommended that acreage subjected to burning at 3-5 year intervals be increased by roughly 50%. **Response:** This has been accomplished. Most of the post is either burned naturally (impact area) or on a three-year rotation (Section 8.2.11).

14. The investigators were impressed by the frequency of use of "woods roads" on the reservation. The reason(s) for the frequent use was (were) not ascertained, and the necessity for such use, if indeed a necessity exists, was not apparent. Restrictions on recreational use of the roads should be instituted to the extent practicable, especially during the period April through October. **Response:** As stated in Section 8.5.1.2, this has been done from March through July. Fort Rucker policy prohibits operation of ORVs on post except in authorized duty-related circumstances.

8.5.2.4 American Alligator

Alligators are now locally common in much of south Alabama. On Fort Rucker, Lake Tholocco provides the best habitat, although alligators are capable of living and conceivably reaching maturity in some swamps, larger streams, and other lakes. Dispersants from the Choctawhatchee River and possibly other breeding habitats outside Fort Rucker could appear in lakes, streams, and swamps on the reservation.

Although one or more lakes other than Lake Tholocco could conceivably support a breeding alligator population, those lakes are unlikely to do so because of their size, the extent of human activity, and surrounding habitat. Lake Tholocco, on the other hand, provides the combination of situations conducive to alligator breeding. Adult males prefer open water, while females tend to inhabit vegetated shallows, especially those surrounded by thick terrestrial vegetation. After mating occurs in open water, females retreat to shallows and construct nests in thick areas. After hatching, young alligators move to vegetated shallow waters, where they grow an average of 10-12 inches per year. As adults, males move to open water, where they spend the vast majority of their time. Female alligators seldom exceed eight feet, while males may grow to 12-15 feet and longer.

It is not known with certainty, but it is believed that the vast majority of unprovoked alligator attacks on man have been by relatively large adult males. The likelihood of attacks on humans by alligators is greatly increased if humans feed the alligators. Feeding alligators is forbidden, and any alligator larger than 10 feet that is attracted to boats or swimmers or that does not retreat when approached during the day is considered a menace. Signs warning of alligators' presence will be installed at boat landings and other

human use areas on Lake Tholocco as needed. Warning signs are in place at other locations where alligators are more likely to be encountered. Section 8.11.4 discusses procedures used to deal with nuisance alligators.

Night searches in the 1992 study revealed three alligators on the reservation. One was in Ech Lake and appeared to be a juvenile or sub-adult 5-6 feet in length. The other two were seen in the upper portion of Lake Tholocco. One was obviously a juvenile, in the 4-5 foot range and the other appeared to be a juvenile or sub-adult in the 5-7 foot range.

8.5.2.5. Species at Risk

Gopher tortoises, which occur in sandhill forests and pine plantations, have been identified as a priority Army Species at Risk (SAR) for Fort Rucker. A Memorandum regarding Management Guidelines for the gopher tortoise on Army installations (Appendix 8.5.2.5) was distributed in March 2008 and identifies the gopher tortoise as a priority Army Species at Risk (SAR) for Fort Rucker. The guidelines address Army policies such as conservation, ecosystem management, education/outreach, funding and cooperation with the Gopher Tortoise Team. The management strategies include population goals, habitat management, population monitoring, burrow marking, translocation, and data records/ coordination. Installation management plans that may affect gopher tortoise habitat shall incorporate the gopher tortoise guidelines prior to implementing management practices. The FY 10 submission of information for the Gopher Tortoise Candidate Conservation Agreement Annual Report immediately follows the management guidelines.

No other species at risk have been identified at Fort Rucker.

8.5.3 Furbearer/Predator Management

8.5.3.1 Predator Control

Under normal conditions, predators are an asset to a well-managed wildlife program. If a rabies problem develops, a trapping program will be initiated after coordination with the Post Veterinarian, the Alabama Department of Wildlife and Freshwater Fisheries, and the U.S. Department of the Interior, U.S. Fish and Wildlife Service. If a predator problem develops, a control program will be carried out by the Fish and Wildlife Section that is equipped with traps and other supplies necessary to conduct control measures.

8.5.3.2 Trapping

Trapping for beavers and coyotes is permitted year-round on Fort Rucker. Other furbearers (bobcat, civet cat, fox, mink, muskrat, nutria, opossum, otter, raccoon, skunk, and weasel) may be taken in State-prescribed seasons, usually running from mid-November through late February.

8.5.4 Other Nongame Species Management

The taking of birds, except for English sparrows, crows, and starlings, is prohibited by State law except during prescribed hunting seasons for game species. In addition, the Migratory Bird Treaty Act protects all but the European starling, English sparrow, and rock dove. Other nongame species are protected by nongame species regulations. Enforcement of these protective measures for nongame is the primary management tool for most nongame species on Fort Rucker.

Proposed neotropical bird surveys (Section 9.3.4) should provide some feel for trends in populations of some species of neotropical birds, as well as the group of birds as a whole. There is the possibility of developing a neotropical bird management plan during the 2010-2014 planning period.

As stated in Section 8.5.2, there are concerns over declining numbers of amphibians and reptiles. Fish predation is a major limiting factor for some of these species. Fort Rucker has borrow pit ponds that could be stocked with fish. However, they will be kept fish-free, using fish control if needed, to provide habitat for these species.

There is also a great need for the management of the feral hog population on Fort Rucker. These animals, once introduced for sport, do tremendous damage to young, tender vegetation and exacerbate erosion in areas already prone to severe erosion. Frequent hunting can place significant pressure on the population; however, eradication is difficult due to their high reproductive rates.

Habitat protection measures in Section 8.13, wildlife considerations during forest management (sections 8.2.17.2 and 8.2.20), wildlife habitat programs (Section 8.4), sensitive species management (Section 8.5.2), wetlands management (Section 8.6), water quality management (Section 8.7), LRAM (Section 8.12), soil resources management (Section 8.13), and cantonment area management (Section 8.14) will benefit non-game species in general, consistent with ecosystem management strategies.

8.6 Wetlands Management

The Clean Water Act and Executive Order 11990, Protection of Wetlands requires wetlands protection. As defined in Section 6.7.7 and described in Section 6.7.3, the wetlands survey indicates Fort Rucker has 3,424 acres of wetlands. Protection and maintenance of existing habitat are the primary thrust of wetlands management on Fort Rucker. The quality of wetlands affects the quality of downstream wetland plant and animal communities. The greatest threat to wetlands on Fort Rucker is siltation associated with erosion from a variety of military and nonmilitary activities.

8.6.1 Wetlands Protection

Section 8.13, *Special Interest Area Protection*, includes provisions to protect quality of wetlands at Fort Rucker using project review during NEPA documentation. These include using NEPA review to identify wetland conflicts with regard to planned actions and review of projects and activities involving wetlands. If necessary, projects with potential impacts are referred to the Corps of Engineers to determine if jurisdictional wetlands are implicated and to establish mitigation procedures.

Certified jurisdictional wetland delineations (and permit application, if necessary) are required before construction can take place in a suspected wetland area. Activities in wetlands which require federal permits include, but are not limited to: placement of fill material, ditching activities when the excavated material is sidecast, levee and dike construction, mechanized land clearing, land leveling, most road construction, and dam construction. The Corps permit process requires coordination with the USFWS and the State Historic Preservation Office (SHPO) to allow for the assessment of potential impacts to protected species and cultural resources. Permits have been obtained for sediment control projects in the Aerial Gunner Range Complex (Section 8.9.2).

8.6.2 Best Management Practices

Best Management Practices for forestry are intended to protect, maintain, and improve various wetland functions and potential uses. *Alabama's Best Management Practices for Forestry* are being implemented as part of the forest management (Section 8.2.17.3).

8.6.3 General Wetlands Protection/Restoration

Efforts will be made to mitigate or restore impacted wetlands. The most significant impact upon wetlands on Fort Rucker stems from watershed erosion and subsequent silting of low-lying areas and streams. Other sections of this INRMP have provisions to protect water quality and, therefore, wetlands. Provisions are found within *Training Requirements Integration* (8.14), *Water Quality Management* (8.7), *Land Rehabilitation and Maintenance* (8.8), and *Soil Resources Management* (Section 8.9).

8.7 Water Quality

Water quality reflects environmental pollution, including sedimentation. Thus, maintenance of high water quality is an important goal of this INRMP. Fort Rucker has its own drinking and other-use water supply system and reasonably high quality surface and ground water (sections 4.3 and 6.5), and it intends to preserve that quality. Section 9.5 describes water quality monitoring.
AR 200-1 establishes the following objectives for water resources on Army lands:

- Conserve all water resources.
- Control or eliminate sources of pollution to surface or ground waters through conventional or innovative treatment systems.
- Demonstrate leadership in attaining the national goal of zero discharge of water pollutants.
- Provide drinking water that meets applicable standards.
- Cooperate with federal, state, and local regulatory authorities in forming and implementing water pollution control plans.
- Control or eliminate runoff and erosion through sound vegetative and land management practices.
- Consider non-point source pollution abatement in all construction, installation operations, and land management plans and activities.

Attainment of most of the above objectives is not the responsibility of Army installation natural resources programs, but some of them, especially the last two, are clearly natural resources management concerns. The following sections specifically deal with actions taken by Environmental and Natural Resources Division personnel with regard to water quality. The Environmental Branch is responsible for monitoring pollution levels, pollution control, and stormwater. Erosion control is the responsibility of the Natural Resources Branch.

Fort Rucker holds a National Pollution Discharge Elimination System (NPDES) Phase I permit (No. AL0002178) for all stormwater inlets. All contractors on the installation must obtain a separate appropriate NPDES permit if applicable and follow the stormwater Best Management Practice guidelines provided in "Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas."

Use of Fort Rucker waters includes human consumption, military training, and recreation. Laws and regulations associated with pollution control and abatement in U.S. waters include:

a. Clean Water Act of 1972, 1977, and 1987
b. U.S. Fish and Wildlife Coordination Act
c. Rivers and Harbors Act of 1899
d. National Environmental Policy Act of 1969
e. Coastal Zone Management Act of 1972
f. Executive Order 11990, Protection of Wetlands
g. Executive Order 11752, Prevention, Control, and Abatement of Environmental Pollution
h. Executive Order 12088, Federal Compliance with Pollution
i. AR 200-1, U.S. Army Environmental Protection and Enhancement
j. TB 55-1900-206-14, Control and Abatement of Pollution by Army Watercraft

Most of these laws and regulations are applicable at Fort Rucker, but many are not the responsibility of the Natural Resources Branch and are thus not within this INRMP. Groundwater management consists of restoration projects associated with individual sources of pollution. These projects are not considered as natural resources management and are not included within this INRMP.

Erosion is not a significant threat to overall water quality, but it does produce locally significant impacts. For example, prior to 1992 there had been virtually no erosion control efforts on lands within the impact area, putting the installation in a high risk of violating Alabama water quality standards that specifically forbid elevation of surface water turbidity more than 50 Nephelometric units. This led to the development of expensive mitigation, which is still ongoing (Section 8.9). The implementation of the LRAM component of ITAM (Section 8.8) as well as implementation of the soils management program (Section 8.9) will improve Fort Rucker's ability to protect water quality.

There are other provisions within this INRMP, which will specifically reduce negative impacts to water quality or mitigate such damage. These are found in sections 8.13.3 - *Training Restrictions*, 8.2.17.3 - *Best Management Practices*, 8.6 - *Wetlands Management*, 8.11 - *Pest Management*, 12.2 - *Environmental Awareness*, and 15.0 - *NEPA*.

8.8 Land Rehabilitation and Maintenance

Land Rehabilitation and Maintenance (LRAM), a component of ITAM, involves repair of training-damaged lands and use of land construction technology to avoid future damage to training lands. LRAM uses technologies such as revegetation and erosion control techniques to prevent site degradation, soil erosion, and water/wetlands pollution. These efforts 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 component on Fort Rucker, under the management of Range Branch, Training Division, DPTMS, prioritizes projects and manages ITAM funds. The extent to which the ITAM program can be implemented is subject to the availability of funding from DA and IMCOM Headquarters from year to year through MDEP TATM. LRAM is responsible for the repair of maneuver damage, but cannot be used to perform routine range maintenance, range modifications, or other Sustainment, Restoration and Modernization (SRM) responsibilities. ITAM funds may not be used to support environmental conservation or environmental compliance requirements.

8.8.1 Planning and Execution

LRAM projects will be largely planned in-house, but Fort Rucker may also use COE expertise. COE standards will be used to help develop projects, and this agency's information on land rehabilitation technology may be used to design projects. Projects will be designed on a site-specific basis. There is no need to close entire TAs for LRAM work at Fort Rucker. Each site-specific project will be coordinated through Training Division, via the ITAM Coordinator.

The training area rehabilitation process will begin with identification of potential LRAM projects by the Fort Rucker ITAM team. RTLA data (Section 9.3.1) and GIS technology (Section 9.6) will be used to help identify projects as will direct communications between Range Division and troop units. The ITAM Coordinator (DPTM) and the DPW Agronomist will ensure that projects can be accomplished without interference with the military mission. In some cases, specific sites might need to be off-limits to training for the duration of the project. Coordination with the Fish and Wildlife Section and the Cultural Resources Manager will ensure that wildlife and cultural resources considerations are addressed. Appropriate NEPA documentation will be provided.

Revegetation is the critical stage of training area rehabilitation. Commonly used techniques for erosion control and establishment of vegetation include seedbed preparation, seeding, mulching, fertilizer application, and protection from runoff until vegetation is established. Techniques will be specific to each project. The use of native species will be emphasized in accordance with the Presidential memo on the subject (Office of the President, 1994).

Fort Rucker has devised a cost-effective means to execute LRAM projects. Where practical, the installation purchases materials for each project and uses contractors to provide the labor and equipment to implement the project. This has proven to be considerably more cost effective than contracting for complete project implementation. Cost/benefits of this type of project planning and implementation were first evaluated during a 1995 project on erosion control at the Ammunition Storage Point.

8.8.2 Types of Projects

8.8.2.1 General Rehabilitation

Large area rehabilitation is most commonly used on military installations where large mechanized units maneuver over large areas. This type of LRAM project is less important on Fort Rucker due to its aerially-oriented mission.

8.8.2.2 Rotor Wash Sites

The act of hovering helicopters over a site creates a tremendous downwash that is a special type of wind eroding agent. The training of helicopter pilots requires intensive hover-type training, which occurs repetitively over the same open sites. As training aviators perform low-altitude hover exercises 3-10 feet above ground level or take-off after landing on grassed areas, the force of wind that is generated by the rotor blades is at least 150 miles per hour (a Category 4 hurricane). This dehydrates vegetation and soils causing the loss of both through erosion. As operations continue, dust clouds can adversely affect the pilot vision, a safety hazard that is known as "brown out" or "red out", depending on the color of the soil. Continued training on these sites can result in formation of large depressions that become unsafe for training in addition to causing accelerated soil erosion, decreased soil fertility, and stream sedimentation.

Fort Rucker asked Waterways Experiment Station (WES) to develop an economical fix for this problem. The three-year study, initiated in 1988, assessed the utility of various species of vegetation, supplemented

by various types and amounts of soil amendments, sand grids, and soil stabilizers for preventing rotor wash erosion.

In 1987 the Fort Rucker Agronomist and Operations Officer began experimenting with rock (ALDOT #4 dolomite) to control rotor wash. Initial cost of materials appeared to be high, but maintenance costs were virtually eliminated. This method of controlling rotor wash was compared with the agronomic approach used by WES. The use of #4 dolomite proved to be the more effective approach because it provides a permanent fix.

Using this approach, eroded areas are filled with soil within two inches of natural grade. Lime, fertilizer, and seed are then applied. Finally, a two-inch blanket of #4 dolomite is spread evenly over the area. Training can resume immediately, because the dolomite protects the restored area and is too heavy to be displaced by rotor wash from most aircraft. As time passes and seeds germinate and grow, grass covers the rock and restored area. Since grass cutting in most flight training areas is conducted at six-inch minimum mowing height, tractors and mowers can travel over the restored area without adverse affects to the site, nearby aircraft, or other fixed real property. Should drought occur, and the grass decline, the dolomite remains in place protecting the site until the grass thrives again. This treatment is used extensively on government-owned lands and, where permissible, on privately-owned, leased lands. The WES agronomic approach is used on privately-owned lands where the land owner will not allow the use of dolomite.

This rotor wash repair technology has application elsewhere. Fort Rucker has produced two video tapes on use of the technique. These were presented to other military installation land managers at various meetings.

8.8.2.3 Hardened Sites

Hardened sites are an important aspect of LRAM at Fort Rucker. Hardened sites are areas, which have been resurfaced with good 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. Such locations include bivouac sites, hover sites, firing points, and troop assembly areas.

Helicopter slope landing areas suffer continuous maneuver damage due to frequent, repetitive, and protracted practice landings. Slope landing areas are subjected to the same rotor wash forces as those sites described in Paragraph 8.8.2.2 above, but also sustain significant damage from helicopter landing gear lateral movements while in contact with the slope surface. Although effective against the erosive forces of rotor wash, applying dolomite to slope surfaces does little to reinforce against landing gear stress. More recent emplacements by the ITAM program of a matted cable concrete application have proven to be a best practice for this type training environment. This very innovative approach created by the Fort Rucker ITAM program has proven both cost effective and less intrusive on the environment over the extended period of the training site. Little to no sustainability maintenance is required and dangers to sediment runoff or dust pollution are virtually eliminated.

8.8.2.4 Gully Erosion

Since soils on Fort Rucker are extremely sandy and highly erodible, concentrated runoff results in a gullied condition. Gullies on Fort Rucker not only destroy training lands, but eroded soil is deposited as sediment in downstream waters, lakes and ponds. These occurrences are being stabilized by Fort Rucker's Gully Control Program. Gully rehabilitation principles include:

- Start high in the watershed to divert water to other streams and reduce the flow entering the eroding gully.
- Shape and grade the headcut, and construct a dam with storage area and a Higginbotham riser to store water and release it slowly over time.
- Discharge water on a stable outlet using rip-rap, brush dams, geotextiles, and vegetation to break up the kinetic energy of the water and stabilize the soil.
- Establish a healthy vegetative cover upstream from the gully to retard water flow and promote infiltration. Vegetation will control erosion and often be beneficial to wildlife.

8.8.3 LRAM Projects

The following specific and general LRAM projects are being planned on Fort Rucker during 2010-2014 period. The nature of erosion and training damage is such that it is often difficult to predict precise requirements more than one or two years in advance, and due to the cost savings in stopping erosion in the very early stages in many areas, priorities often change. Thus, the below projects are fairly general.

8.8.3.1 Combat Maneuver Trail

Formerly known as the Tank Trail, the 31.2 kilometer trail adjacent to the gunnery range complex is undergoing a reconfiguration to a combat maneuver trail. The trail was originally built to support the Alabama National Guard self-propelled Howitzer units and was maintained by state Guard assets and personnel for many years. When the artillery units converted to MLRS, our range complex proved too small for the weapon, so training exercises were relocated to Eglin AFB. Maintenance was scaled down to a caretaker status until the units were once more tagged for a mission conversion from MLRS to towed artillery. At this juncture the state no longer saw any reason to continue maintaining the trail. They abandoned the project, and since then the trail has become overgrown with vegetation including kudzu, and drainage structures have become the habitat of beavers.

Training Division saw the trail as a valuable asset for a variety of theater-relevant training scenarios from convoy operations, IED recognition and avoidance/neutralization, to mounted/dismounted engagement areas, to ambush sites, to fords and crossings, to convoy dry fire, and for segments bordering the range, live fire courses, and a multitude of additional training opportunities far into the future. The trail has been restored to limited all-weather status and will be configured to meet the ever evolving training need.

8.8.3.2 Hardened Sites

Hover pads are being constructed to minimize rotor wash erosion. Pads range in size from 100 feet x 100 feet to 200 feet x 200 feet, depending on aircraft type and training mission supported, and are essentially areas where dolomite has been spread and the area grassed. Future numbers of hover pads will be determined by funding.

Bivouac sites will be upgraded as part of LRAM based on training requirements. Each site will be analyzed, and plans will be prepared specific to each site's needs. The Training Requirements Integration program (Section 8.13) will be used to prioritize each project.

Firing points are used by artillery units for firing into impact areas as well as by other units for gathering points. These areas become rutted and may experience significant erosion. Firing points will be repaired as needed with emphasis on improvements to their access roads. As the need for firing points diminishes, one firing point is being converted into an urban operations site and others are under consideration for other missions. Priorities have not been determined, and these will be on an "as funding is available" basis.

In 2008 Fort Rucker reinforced a slope landing area by embedding articulated cable concrete at RT-47 to test the durability, safety, and training effectiveness of slopes repaired with cable concrete. Based on the positive results of this test, Training Division has employed an aggressive program to retrofit all slope landing areas located at helicopter stagefields with this innovative and highly sustainable approach.

8.8.3.3 Other LRAM Projects

Other LRAM projects are not site-specific since they occur often and are difficult to predict. Rotor wash sites will be repaired as high priority LRAM projects due to their safety issues. The most serious of these projects have been repaired, and this type of project is not as prevalent as a few years ago.

8.8.4 Summary

Fort Rucker has repaired military damaged lands in the past, but LRAM provides a more carefully managed, intensive program to accomplish this mission. The nature of military damage is such that potential LRAM projects may be created during a very short period, and priorities often change.

Land rehabilitation is not optional in today's Army. The future of the military missions on Fort Rucker depends upon achieving the capability to rehabilitate damaged lands and returning them to training status in a manner that also meets the needs of ecosystem management. The Fort Rucker LRAM program continues to play a vital sustainment role.

8.9 Soil Resources Management

Soil erosion, due to both wind and water, has been a major concern of Fort Rucker because of the highly erodible soil found throughout the installation. The primary erosion control measure has been establishment and maintenance of vegetative covers. This has been supplemented by terracing along contours into grassed waterways and water diversion facilities, such as open drainage channels, conduits, and impoundments. Water diversion outlets are maintained as required along access ways and firebreaks. Mulching, terraces and contour planting methods protect newly established sod areas. Primary areas of wind erosion occur at helicopter hover points. These areas have been maintained as grass sod areas wherever possible, and the remainder have had pentaprime (an emulsified asphalt) applied, as required, to prevent wind erosion (Section 8.8).

Erosion control began in a very significant manner in 1993 when $1 million was spent. Another $2 million was spent in 1994-96. An average of $485,000 was spent from 2001 – 2005. These amounts include both LRAM and soils management projects.

LRAM (Section 8.8) involves repair and prevention of damage to military training lands, but it specifically precludes soil erosion that is a matter of compliance. As described in Section 8.7, Alabama's

water quality standards prohibit actions that elevate water turbidity significantly. This section specifically deals with compliance aspects of erosion and soil management associated with roads and trails.

8.9.1 Roads and Trails

Shaw Infrastructure, Inc., Roads and Grounds Section, has responsibility for maintenance of main roads, and the Forestry Section is responsible for timber access roads and trails. Both categories are important to natural resources management in that they are needed for natural resources management, wildfire suppression/prevention, and recreational access.

Maintenance and upgrade of range roads is an important soils management project since drainage associated with roads often significantly affects erosion. DPTMS, Range O&M Contractor is continuing to upgrade and maintain range roads. The following guidelines will be used in 2010-2014 for construction and maintenance of these access roads:

- Whenever possible, existing roads will be used, minimizing new construction.
- Best management practices will be followed in construction and maintenance projects.
- Whenever possible, roads will be constructed at natural ground level, which is less likely to restrict natural water flow.

8.9.2 Aerial Gunnery Range Complex Project

The Aerial Gunnery Range Complex (AGRC) consists of the aerial gunnery range, several small arms ranges, tracked vehicle firing points, and their impact areas. Roads, drainage structures, target areas, and embankments erode naturally due to sandy, infertile, and highly erodible characteristics of the soil. The added stress of ordnance impacting these areas contributes to a massive problem of erosion/sedimentation that is expected to be ongoing throughout the foreseeable future of this training facility.

The AGRC erosion/sediment control project was a five-phased project to mitigate and minimize adverse effects of training in this area. The five phases were:

- ***General:*** Shape, grade, lime, fertilize, seed, and mulch to establish and improve vegetation in the vicinity of roads, drainage structures, targets, and embankments. Erosion control includes the use of a variety of conventional erosion control structures, geotextiles, brush dams, and rip-rap. Phase 1 began in 1993 and is continuing.
- ***Head-cutting Gullies:*** Sediment control structures are constructed on small drains just downstream from areas identified in Phase 1. These structures temporarily store runoff water and release it slowly, allowing sediment loads to settle out in the storage area of structures. Phase 2 began in 1993, and projects were listed and prioritized and are being implemented. Phase 2 activity has decreased as individual sites have been repaired, but it will continue indefinitely at a lower intensity.
- ***Sediment Retention Ponds:*** There are seven permanent impoundments in place to reduce warer flow, allowing sediment to settle out before the water leaves the reservoir area. Plans to build one pond just south of State Highway 27 are in a pending status. Currently, there are no plans to build any additional ponds.
- ***Major Sediment Control Structures:*** Four large sediment control structures had been considered for construction on major streams just before they exit the range area. Since phases 1-3 have reduced sediment loads that enter the streams that leave the AGRC to within acceptable levels, there is currently no need to construct these large structures. Water will continue to be tested entering the project area and leaving it via Bowles Creek. If in the future the turbidity in water flowing out of the

AGRC exceeds allowable standards, some or all of Phase 4 will be considered.

- ***Maintenance and Monitoring:*** This phase consists of maintenance of ponds and erosion control structures, monitoring turbidity in streams, and monitoring streams, ponds, and erosion control structures for training-related damage. This phase is ongoing.

8.9.3 Gullies Impacting Wetlands

Gully erosion affects downslope wetlands in some cases, thus becoming a compliance issue. Beginning in 1993 Fort Rucker started repairing gullies across the post and outlying areas, including some leased lands. Work is similar to that described in Phase 2 of the AGRC project (Section 8.9.2). This postwide project will continue during 2010-2014.

8.10 Cantonment Area Management

8.10.1 Grounds

The table below categorizes improved grounds on Fort Rucker.

	Total Acres	**Mowed By**
Improved Grounds	5,253	
Around Buildings	776	Contract
Lawns, Housing	189	Occupant
Lawns, Vacant Quarters	40	Contract
Lawns, General Officer	2	Contract
Lawns, Common Use	126	Contract
Athletic Fields	15	Contract
Post Cemeteries	2	Contract
Ammunition Storage	56	Contract
Roadways and Recreation Areas	404	Contract
Airfields	3,643	Contract

8.10.1.1 Golf Courses

At one time, Fort Rucker had one 39-acre, 9-hole golf course; a 220-acre, 18-hole golf course; a driving range; and a chipping area. These courses were constructed using projects involving troop training, contract, and in-house efforts. Fairways and roughs on the 9-hole and 18-hole courses were established with common Bermuda grass, and tees and greens were established with 328 Improved Bermuda, overseeded during winter with rye grass. Tees and greens were maintained by golf course greens keepers, and other maintenance was accomplished by DPW. In 1988 fairways were sprigged to 419 Bermuda, and all maintenance became a golf course greens keeper responsibility. Construction of nine additional holes totaling 60 acres on the 18-hole course was completed during 1993 making it a 27-hole course. At that time, the 9-hole course was planted in fruit and nut-bearing trees and converted to a Watchable Wildlife Area.

8.10.1.2 Cemeteries

There are four small private cemeteries on Fort Rucker. These cemeteries have been maintained and protected in accordance with AR 200-1. Maintenance has consisted of mowing and maintaining fences and shrubs.

8.10.1.3 Ammunition Storage Point

The Amunition Storage Point was constructed in 1999. Routine grounds mainenance efforts consist of grass cutting to reduce fire hazards and prevent the growth of woody vegetation.

8.10.2 Grounds Maintenance Operations

8.10.2.1 Landscaping

Fort Rucker has gone through several phases of landscaping operations. These include contract plantings during new construction; self-help, in-house, and contract planting throughout the cantonment; and self-help and contract planting in family housing areas. As landscapes are planned, consideration is given to the use of native vegetation as set forth in the Presidential Memorandum (Office of the President, 1994).

8.10.2.1.1 General

Establishment of trees and shrubs has been accomplished by contract and in-house personnel of the Grounds Maintenance Section. Site preparation consists of preparing a hole twice the depth and 2 1/2 times the width of the container for ball and burlap plants. Holes are backfilled with soil, tamped, and watered. For contract planting sites, a one-year plant establishment period is required. In-house planting is done with a hydraulic tree spade.

Trees, shrubs, and special ground cover plants are maintained on a year-round cycle. Fertilizing, weeding, mulching, and pruning are scheduled to meet needs of various plant species, considering available manpower. As a rule, spring-flowering shrubs are pruned in late winter or early spring. A removal and replacement program for trees and shrubs has been in effect for several years at Fort Rucker to mitigate effects of crowding, storm damage, and changes in utility services.

8.10.2.1.2 Pruning

As a general rule, shrubbery pruning is accomplished by building occupants. Screening shrubbery adjacent to family housing and in cantonment areas and shrubbery associated with two General Officers' Quarters are pruned by contract. Spring flowering shrubs are pruned following blooming. Summer and fall flowering shrubs are pruned in late winter or early spring. Trees and shrubs are usually removed in conjunction with tree pruning operations. Their removal is accomplished at other times only if requirements are submitted to DPW and approved due to dead or diseased condition. Pruning of screening shrubbery throughout the cantonment and housing areas is done twice annually by contract.

Type of Plant	Time of Pruning
Evergreens (holly, ligustrum, photinia)	Year-round
Berry-producing plants	Before spring growth and blooming

Camellias	Pruned in winter, only to shape
Crepe myrtle	Winter
Trees, in general	Winter

8.10.2.1.3 Replacement Plantings

The following species are used to replace damaged or removed trees and shrubs on Fort Rucker:

Shade Trees

Acer rubrum	Red maple
Catalpa bignonioides	Catalpa
Carya illinoensis	Pecan
Celtis occidentalis	Hackberry
Cornus florida	Dogwood
Cryptomeria japonica	Cryptomeria
Diospyros virginiana	Persimmon
Fagus grandifolia	Beech
Gleditsia tricanthos	Honey locust
Ilex opaca	American holly
Lagerstroemia indica	Crepe myrtle
Magnolia grandiflora	Magnolia
Malus spp.	Crabapples
Morus alba	White mulberry
Morus rubra	Black mulberry
Pinus nigra	Austrian black pine
Pinus taeda	Loblolly pine
Platanus occidentalis	Sycamore
Populus deltoides	Cottonwood
Populus nigra	Lombardy poplar
Prunus sargenti	Flowering cherry
Quercus alba	White oak
Quercus borealis	Red oak
Quercus nigra	Water oak
Quercus palustris	Pin oak
Quercus phellos	Willow oak
Quercus virginiana	Live oak
Ulmus americana	American elm

Shrubs

Abelia grandiflora	Glossy abelia
Azalea spp	Azalea
Bogus sempervirens	Boxwood
Calcanthus floridus	Sweet shrub
Camellia japonica	Camellia
Camellia sasangua	Camellia

Cortaderia argentea	Pampas grass
Forsythia fortunei	Forsythia
Gardenia grandiflora	Gardenia
Hydrangea macrophylla	Hydrangea
Ilex cornuta burfordi	Burford holly
Ilex cornuta burfordi nana	Dwarf burford holly
Ilex aquifolia variagated	Variegated English holly
Ilex crenata compacta	Compact japanese holly
Ilex crenata convexa	Convex japanese holly
Ilex crenata fastigiata	Upright japanese holly
Ilex crenata helleri	Holly
Ilex latifolia	Big leaf holly
Ilex vomitoria	Youpon holly
Ilex vomitoria nana	Dwarf youpon
Juniperus conferta litoralis	Shore juniper
Juniperus horizontalis	Blue rug juniper
Lagerstroemia indica	Crepe myrtle
Ligustrum lucidum	Ligustrum
Lonicera spp	Honeysuckle
Myrica cerifera	Wax myrtle
Nandina domestica	Nandina
Prunus laurocerasus	Skip laurel
Pyrancantha spp	Pyrancantha
Rhododendron spp	Rhododendron
Rosa spp	Rose
Spirea spp	Spirea
Tamarix afrinicola	Tamarix
Viburnun spp	Viburnum

Ground Cover and Vines

Hedera helix	English ivy
Vinca minor	Vinca
Liriope spp	Monkey grass
Wisteria spp	Wisteria

8.10.2.1.4 New Plantings, Specifications, and Compatible Species

For new planting specifications, Fort Rucker uses recommendations in the *Fort Rucker Installation Design Guide* (EDAW, 1987) on pages 2.6.8-3 through 2.6.8-14. Specifications and compatible species are also found in the Installation Design Guide, page 2.6.8-1.

8.10.2.1.5 Five Year Landscape Plan

General landscaping is limited to community facilities; post exchanges; theaters; BOQ's; barracks; chapels; hospitals; family quarters; administrative, school, and research buildings; Post Headquarters; Constitution Park; main entrances to the post; and areas adjacent to athletic facilities.

In general, trees, shrubs, and ground covers have been intermittently planted without the benefit of a landscape plan. The effort is commendable. However, there was no consistency in the arrangement or relationships of one area to another or to the overall theme of the landscape. In the future, special

Consideration will be given to creating a landscape with continuity and a better blend of trees, shrubs, and flowering plants.

8.10.2.1.6 Diseases and Insects

Trees and shrubs are relatively free of disease with the exception of photinias. These plants have been attacked by entomosporium leaf spot disease. These plants cannot be treated successfully at Fort Rucker, so their use has been discontinued. Insect damage is minimal and is influenced by extremes in excessive/inadequate rainfall.

8.10.2.2 Turf Management

8.10.2.2.1 Irrigation

Fort Rucker normally receives sufficient annual rainfall to support vegetation without irrigation. Temporary irrigation systems have been used for major turf establishment or renovation projects as required. Until 1987 the only permanent irrigation system was on the 18-hole golf course. In 1987 irrigation systems were installed at post headquarters and the adjacent parade field. One additional irrigation system was installed at Constitution Park in 1990. New sprinkler systems were installed at the three main gates (Daleville, Enterprise, and Ozark) in conjunction with landscaping projects during FY 91. The Service Member's Support Complex also has an irrigation system.

8.10.2.2.2 Sod Establishment

Prior to April 1988 establishment of sod areas on post was accomplished by in-house personnel of the Grounds Maintenance Section and by contract. In 1988 a reorganization of DPW transferred in-house accomplishment of all grounds maintenance to the Individual Job Order Branch, a contracting-out operation.

Turf areas on post are being established with selected grass species that will provide ground cover compatible with land use, tolerate seasonal drought conditions, afford the degree of maintenance required of the site, and benefit wildlife where possible. Planting requirements consist of preparing a seedbed 4 to 6 inches deep. Where topsoil is required, subsoil is scarified 2-4 inches for bonding with the topsoil. Lime or other amendments are incorporated into the seed bed during site preparation.

The area is then seeded by cyclone, cultipacker, or hydroseeder, depending on slope. Bermuda grass is used on lawns, and bahia grass is used on other open areas. Centipede and St. Augustine are used in shaded areas. Hay or fabric mulch is applied after planting operations. Soil tests are taken, and laboratory recommendations are followed. If soil test results are not available, fertilization consists of one ton of lime and 300 pounds of 13-13-13 fertilizer per acre. These rates were established from a trend of past soil test analyses.

8.10.2.2.3 Fertilization

Fertilization of turf areas has been accomplished by in-house operations and contract. Sod areas of

improved grounds in the cantonment, family housing, and high visibility airfields have been fertilized yearly during spring. Special areas, such as turf renovation areas of athletic fields or intensive foot traffic sites, have been fertilized at the time of planting or overseeded and top dressed 30-45 days later.

Fertilizer and lime requirements are determined by soil test analysis in most cases. When soil test data cannot be obtained in a timely manner, 300 pounds per acre of 13-13-13 or 15-0-15 fertilizer are applied, depending on plant species. Lime is applied at two tons per acre.

Soil testing is an ongoing mission using a blanket purchase agreement. One hundred and fifty soil samples are programmed annually for analysis at the Soil Testing Laboratory, Auburn University. Samples are collected in advance of programmed work to allow time for analysis and procurement/contract application of needed soil amendments.

8.10.2.2.4 Diseases, Insects, and Undesirable Vegetation

Brown patch is the only significant turf disease on Fort Rucker, and it has not occurred lately. Turf grass disease has normally been limited to golf course greens. Primary control has been preventive maintenance through a combination of chemicals, proper watering, and mowing practices. Trees and shrubs have been relatively free of disease. Most common insect pests have been Armyworms, tent caterpillars, aphids, mole crickets, and red spiders. Insect damage to turf has been minimal and influenced primarily by excessive rains or droughts. The Pest Management Section has accomplished control work.

Herbicides used to control vegetation on Fort Rucker include:

Herbicide	**Target**	**Location**
Glyphosate	All vegetation	Open area and fences
Arsenal®	All vegetation	Open areas
Bromacil®	All vegetation	Open areas
2-4-D	Broad-leafed weeds	Grassed areas
Rodeo®	Aquatic weeds	Impoundments
Cutrine®	Algae	Impoundments
2-4-D	Kudzu	Grassed areas
Tordon K	Kudzu	Open areas
Transline	Kudzu	Wooded areas
Bromacil®	Brown Patch	Grassed areas
Oust® and/or Oust XP	Seedhead	Grassed areas
Velpar L, Oustar	Woody stems, seedheads	Grassed areas

8.10.2.2.5 Mowing

Mowing requirements of Fort Rucker have evolved from a combination of in-house, contract, and family housing occupant responsibility to the most recent arrangement wherein Picerne has a 50 year lease on family housing and provides mowing as part of the lease. Most recent requirements and frequencies for all areas other than family housing are performed by contract and have been as follows:

Type Area	Responsibility	Mowing Frequency
Cantonment	Contract	Weekly, 21 cuts
Cantonment	Contract	Weekly, 28 cuts
Roadways & Outlying	Contract	Monthly, 7 cuts*
Stagefields and Airfields	Contract	Monthly, as needed in remote sections**
Remote sites	Contract	Monthly, 5 cuts

* Three times annually outside of cantonment area.

** Plant Growth Regulators (PGR) have been applied to areas away from runways on airfields and stagefields. The areas are mowed and PGR's applied in spring (April/May). Mowed and PGR's applied in July/August. Mowed a final time in November resulting in a tremendous cost saving.

8.10.2.3 Grounds Police

A continual program of policing grounds around facilities throughout the cantonment area, along roadways, around lake facilities, and picnic areas has been accomplished by troop details and building occupants. Trash cans have been located at strategic points for proper disposal of litter. These have been maintained using troop details. An anti-litter attitude by employees and residents of Fort Rucker helps keep the post clean. Spring and fall clean-up campaigns have been conducted annually. In addition to policing by employees and residents, policing of debris prior to mowing areas is required of the grass-mowing contractor.

8.10.3 Contracts

Fort Rucker uses the following recurring contracts:

Grounds Maintenance In Cantonment Areas
Grounds Maintenance at Airfields and Stagefields
Analyze 150 Soil Samples

The installation has the following requirements contracts:

Deliver and Spread Bulk Lime and Fertilizer
Control Erosion and Stabilize Gullies
Plant and Establish Hayfields (to establish new leases)

8.10.4 Cost-Effective Measures for Grounds Maintenance

8.10.4.1 Tree Planting

In-house tree planting is accomplished using a tractor-towed hydraulic tree spade. Whenever possible, trees are located in forested areas adjacent to the site to be planted. A hole is dug where the first tree is to be sited. The tree is removed from the adjacent forest and placed in the pre-dug hole. A second hole is then dug where the next tree is to be sited, and the dirt from that hole is placed in the hole the first tree was removed from. A second tree is then removed from the forest and placed in the second pre-dug hole. This process is repeated until all desired trees have been transplanted, leaving only the last hole from which a tree was removed to be filled by hand.

8.10.4.2 Outleasing

As described in Section 8.3, agricultural outleasing has a major benefit of reducing the cost of mowing. Efforts to increase leased areas are ongoing.

8.10.4.3 No-mow Areas

Reduced grounds maintenance programs involve reduction of mowing and establishment of forest, grassland, or wildflower areas to reduce grounds maintenance costs on improved and semi-improved grounds. The manicured grass tradition on military installations often makes it difficult to generate acceptance of these programs.

"No-mow" means just what it says... the dropping of an area from the grass mowing cycle. These areas are most accepted by the public when they are natural extensions of already wild lands, such as narrowing a mowed road shoulder or extension of a woody area into a field.

The major Fort Rucker "no mow" area in recent years has been the former 9-hole golf course. This area is being reverted to a wild status, and it is a potential Watchable Wildlife area. The post will continue to look for areas that can be dropped from the mowing cycle during 2010-2014.

8.11 Pest Management

Pest management activities on Fort Rucker are conducted in accordance with the provisions of AR 200-5 and the Fort Rucker Installation Pest Management Plan. The responsibility for oversight of pest management activities on the installation is the responsibility of the Installation Pest Management Coordinator (appointed by the Commander). The Forestry, Land Management and Fish and Wildlife Sections of the Natural Resources Branch of the DPW, Game Warden personnel assigned to the Provost Marshal's office and Golf Course maintenance personnel have outdoor pest management activities included in their responsibilities. Pest management is also discussed in sections 8.2.18, *Forest Diseases and Pests*; 8.4.3.2, *Aquatic Weed Control*; 8.5.2.4, *American Alligator*; 8.5.3.1, *Predator Control*; 8.10.1.6, *Diseases and Insects* (*trees*); and 8.10.2.2.4, *Diseases and Insects* (*turf*).

8.11.1 Pest Management Priority

Resources, if limited, are allocated to pest management activities on the installation according to the following set of priorities:

1. Disease vectors and medically important arthropods (mosquitoes, fire ants, wasps and bees, spiders).
2. Quarantine pests.
3. Real property pests (structural/wood destroying pests such as termites, powder-post beetles, carpenter ants).
4. Stored products pests.
5. Turf and ornamental pests.
6. Undesirable vegetation.
7. Vertebrate pests (mice, rats, bats, birds).
8. Household and nuisance pests.

8.11.2 Integrated Pest Management

Integrated pest management (IPM) is defined as a planned program, incorporating continuous monitoring, education, record keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. The IPM strategy uses targeted, sustainable, economical, environmentally sound methods, including education, habitat modification, biological control, genetic control, cultural control, mechanical control, physical control, regulatory control and, where necessary, the judicious use of the least hazardous pesticides. AR 200-5 and the Fort Rucker Installation Pest Management Plan mandate the use of IPM practices on the installation.

8.11.2.1 Installation Pest Management Plan

The Installation Pest Management Coordinator is responsible for the development and maintenance of the Installation Pest Management Plan. Review and approval of the plan is by the staff of the Army Environmental Center, Aberdeen Proving Grounds, MD. All pest management activities at the installation are covered by this plan. Revisions of the plan are conducted periodically and per directive of higher headquarters. Updates (reflecting changes in staffing, training, equipment, etc.) are conducted annually. Approval for use of pesticides is obtained on an annual basis via the submittal of a U.S. Army Pesticide Use Proposal for the installation. Any pest management requirements not specifically detailed in the plan must receive approval in writing from higher headquarters before implementation and must subsequently be incorporated into the Installation Pest Management Plan.

8.11.2.2 Use of Pesticides, Growth Regulators and Other Chemicals

All chemicals use on Fort Rucker must be EPA-approved and approved for use by incorporation in the Installation Pest Management Plan.

The Office of the President (1994) called upon heads of Federal agencies to reduce the amount of pesticide use by using IPM practices. Pesticides involve health and safety risks, target pests have developed resistance to many pesticides, and many pesticides have been used to excess and in violation of product labels.

Also in 1994 and in response to the directive of the Office of the President, the Department of the Army approved three Measures of Merit designed to address the problems of pesticide abuse and overuse. Measure of Merit 1 required the development of Pest Management Plans for all installations. Measure of Merit 2 directed that the quantity of pesticides used, measured as pounds of active ingredient applied, be reduced by 50% from FY 93 baseline levels by the year 2000. Measure of Merit 3 required that 100% of

Department of Defense (DoD) installation pesticide applicators be properly certified (certification is DoD or State as appropriate). Direct hire employees have a maximum of 2-years to become certified after initial employment. Contract employees must have the appropriate State certification when the contract is let. Fort Rucker is currently in compliance with Measures of Merit 1 and 3. Fort Rucker has never met the DoD 50% reduction target and pesticide use rates have been increasing in recent years. Clearly, additional effort aimed at reducing reliance on pesticides to manage pests is in order.

8.11.2.3 Pesticide Certification

Personnel who select, mix, or apply pesticides which are defined by Regulation as controlled or restricted-use pesticides must be certified. Contractor personnel who apply pesticides must be State of Alabama certified in the operational categories in which they work. Government employees who apply pesticides must be DoD certified in the operational categories in which they work. Pest management activities on the installation are conducted by a combination of Contractor and Government employees. Contractor employees must be State of Alabama certified before employment. DoD (Appropriated Fund and Non-appropriated Fund) employees must complete a correspondence course, *Basic Pest Control Technology* and one year of on-the-job training under the supervision of a certified DoD employee. Training records and copies of certifications are part of the Installation Pest Management Plan. At this writing, the Contractor-operated Pest Management Section of the DPW has 2 certified Pest Controllers, the Government- operated Forestry Section of the Natural Resources Branch of the DPW has 3 certified applicators and the Golf Course has 1 certified applicator.

8.11.3 Environmental Considerations

Wetlands and recreational areas may require special precautions during the application of pesticides. Compliance with precautionary statements on pesticide labels and material safety data sheets is mandatory. Recreational areas are well known, and special requirements for their protection and the protection of users of these areas are implemented as needed. The Natural Resources Branch of the DPW is responsible for maintaining maps of wetlands on the installation and these maps must be consulted whenever planning or conducting pesticide applications outdoors.

There are no endangered species resident on Fort Rucker. However, Federal law protects bird species except the starling, English sparrow and pigeon. Any bird control activity except for these three species requires coordination and approval of the USFWS, which has an office in Daphne, AL.

8.11.4 Other Fort Rucker Organizations

Herbicides are used to manage undesirable and competing vegetation on food plots to improve the quality and quantity of crops produced in fish and wildlife operations. Herbicides and other pesticides may also be used to control undesirable vegetation and other pests in aquatic habitats. The Fish and Wildlife Section of the Natural Resources Branch of the DPW is responsible for control of nuisance wildlife on rangeland, such as beaver and the American alligator.

The Game Warden is the animal control officer for the installation, with responsibility for control of feral cats and dogs and other household pets as well as nuisance wild animals, such as snakes, armadillos and raccoons.

Golf course personnel use pesticides to manage and control turf pests and diseases and undesirable

vegetation on the course.

8.12 Fire Management

Currently the Fire Department, DPW has primary responsibility for prevention and suppression of wildfires. The Forestry Section is the primary backup for range wildfires. Most controlled burning is accomplished by the Forestry Section, and this section also is responsible for the maintenance of firebreaks. The Fish and Wildlife Section conducts some controlled burns and assists with some others. Sections 8.2.11.3 and 8.4.2.4 describe prescribed burning activities for forest management and wildlife management, respectively.. Fort Rucker is currently in the initial process of developing an Integrated Wildland Fire Management Plan. This integrated plan will coordinate plans and actions between Natural Resources and the Fire Department and Emergency Services. As outlined by Army Wildland Fire Policy Guidance the Garrison Commander will appoint a Wildland Fire Program Manager who is responsible for the development of the IWFMP. The Wildland Fire Program Manager reviews and approves burn plans for prescribed fires to insure consistency with IWFMP, the INRMP and any other applicable operating instructions. The IWFMP will be developed to reduce wildfire potential, effectively protect and enhance valuable natural resources, implement ecosystem management goals and objectives on Fort Rucker. The IWFMP will directly support installation missions and be consistent with installation emergency operations plans.

8.12.1 Forest Fire Record

The table below indicates the forest fire (wildfire) record on Fort Rucker since 1951. Forest fires have become almost inconsequential since 1988, largely due to controlled burning activities. The table below does not include fires within the impact area unless they required suppression response (which is rare).

Fiscal Year	# Fires	Acres Burned	Acres/Fire	Reportable Fires	Impact Area Fires*
1951	no data	2,225	-	no data	no data
1952	no data	45	-	no data	no data
1953	24	251	10.5	no data	no data
1954	5	145	29.0	no data	no data
1955	10	515	51.5	8	4
1956	11	18	1.6	0	1
1957	20	74	3.7	0	2
1958	6	30	5.0	0	2
1959	10	89	8.9	1	3
1960	13	185	14.2	3	3
1961	5	83	16.6	1	2
1962	24	428	17.8	1	2
1963	10	106	10.6	1	2
1964	11	162	14.7	2	4

Fiscal Year	# Fires	Acres Burned	Acres/Fire	Reportable Fires	Impact Area Fires*
1965	18	29	1.6	1	2
1966	13	17	1.3	0	1
1967	31	12	0.4	0	1
1968	51	106	2.1	0	4
1969	23	32	1.4	0	2
1970	22	141	6.4	3	3
1971	23	214	9.3	3	3
1972	10	45	4.5	0	2
1973	16	126	7.9	2	3
1974	7	81	11.6	2	1
1975	7	31	4.4	0	1
1976	31	201	6.5	2	4
1976T**	3	9	3.0	0	1
1977	13	21	1.6	0	2
1978	9	111	12.3	2	2
1979	20	140	7.0	2	3
1980	5	5	1.0	0	1
1981	24	522	21.8	2	4
1982	4	11	2.8	0	0
1983	1	0.1	0.1	0	0
1984	4	46	11.5	0	1
1985	7	58	8.3	2	2
1986	20	462	23.1	2	2
1987	9	6	0.7	0	0
1988	10	145	14.5	10	0
1989	3	24	8.0	3	0
1990	2	8	4.0	2	0
1991	2	5	2.5	2	0
1992	0	0	NA	0	0
1993	3	7	2.3	0	0
1994	1	1	1.0	0	0
1995	0	0	NA	0	0
1996	0	0	NA	0	0
1997	2	4	2	1	0
1998	3	4.5	1.5	2	1
1999	2	2	1	0	0

Fiscal Year	# Fires	Acres Burned	Acres/Fire	Reportable Fires	Impact Area Fires*
2000	7	67	9.5	6	2
2001	1	6	6	1	0
2002	2	14	7	2	0
2003	1	8	8	1	0
2004	1	7	1	1	0
2005	2	19	9.5	2	0
2006	2	8	4	2	0
2007	2	15	7.5	2	0
2008	2	5	2.5	2	0
2009	0	0	0	0	0

* Requiring suppression responses.
** Change in fiscal year that added three months (Jul-Sep).

8.12.2 Fire Prevention and Suppression

March though October is the main wildfire season. Fort Rucker uses three means to limit the extent of wildfires: firebreaks, early detection, and fuel reduction via controlled burning. The primary wildfire prevention technique is reduction of fuel using controlled (or prescribed) burns.

The firebreak system is maintained on a three-year rotation, in conjunction with the three-year prescribed burning program. Boundary firebreaks are 12 feet wide, and timber plantation firebreaks are about 10 feet wide. Firebreaks are maintained with a fire plow or dozer blade. Many roads, wetlands, trails, and streams act as firebreaks.

8.13 Special Interest Area Protection

Designation of special protection status for important or fragile areas is an important management tool. It is often easier and more cost effective to put use restrictions on some areas to minimize damage or disturbance than to mitigate damage or disturbance.

As part of the NEPA process, the Natural Resources Branch reviews proposed projects at Fort Rucker. Natural resources managers can identify concerns and recommend measures to minimize damage. Examples include avoiding cultural resources and wetlands, filling excavations after exercises, and siting missions in areas suited to the mission needs and environmental considerations. See Chapter 20 for more information.

Fort Rucker has several areas with special natural features. They harbor sensitive or unique wildlife species or have unique plant communities. Following are special area categories and accompanying restrictions. Most areas either have been, or soon will be, digitized in the GIS, and maps detailing restricted areas will be available to project planners.

8.13.1 Special Plant Sites

Three sites warrant attention because of floral assemblages apparently scarce elsewhere on the reservation (Mount and Diamond, 1992):

- The "bay swamp" below the beaver dam on Brooking Mill Creek, south of the southeastern perimeter road (sector 38). The swamp lies along the eastern side of the creek and contains several plants (e.g. white arum) that are infrequently encountered elsewhere. Changes in their water regimes, cutting, or mechanical disturbance could alter the habitat to the detriment of the plant assemblage.
- A seepage bog containing several species of plants uncommon-scarce elsewhere on the reservation occurs in Sector 21 between the stream crossing the Ech Airfield Road and Ech Airfield. The bog lies to the south of the road. The bog's unusual (for Fort Rucker) characteristics would be enhanced by periodic burning during the dormant season, preferably before February.
- The northeastern quadrant of sector H (W 1/2 of SE 1/4 of Sector 31, T. 5 N, R. 24 E) has gopher apples, which were not found elsewhere, and a number of other xerophytes that combine to make a floral assemblage worthy of maintenance. Periodic fire to keep it relatively open will promote its welfare.

These three sites are being protected, or managed, as stated above. This will continue during 2010-2014.

8.13.2 Cultural Resource Areas

Fort Rucker takes special measures to protect its cultural resources. Section 14.3 discusses means that Fort Rucker will use to protect cultural resources while implementing this INRMP.

8.13.3 Streamside Management Zones

Streamside management zones are important for wildlife and protection of water quality and wetlands. Best Management Practices (Alabama Forestry Commission, 1993) are used in these areas, and forestry operations are not conducted in streamside management zones without full environmental review.

8.13.4 Wetlands

Section 6.7.7 describes wetlands on Fort Rucker. Wetland protection is required by Executive Order 11990, *Protection of Wetlands*. NEPA is used to evaluate projects for wetlands impacts. If necessary, the Corps of Engineers will be consulted to determine whether jurisdictional wetlands are involved. Wetlands management practices are discussed in Section 8.6.

8.14 Training Requirements Integration

Training Requirements Integration (TRI) is the component of the ITAM Program 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. ATTACC is the standard method used in the TRI process. The integration of all requirements occurs through continuous consultation between the Directorate of Plans, Training, and Mobilization (DPTM), natural and cultural resources managers, and other environmental staff members, as appropriate.

TRI is further supported by the natural resources management and/or environmental staff and the

Directorate of Public Works (DPW). In addition, TRI involves coordination with external agencies and Federal departments.

TRI achieves the "training-environmental" balance and interface that is key to ITAM and requires continuous interaction and coordination between the operations/ training staff and the natural resources management/ environmental staff. This ensures wise land-use planning and management decisions that meet regulatory compliance and training and testing activity requirements.

8.14.1 Identification of Training Needs

It is important to identify means in which training can be sustained or improved via land management activities on Fort Rucker. Through TRI, the DPTM provides commanders with an analysis of the recommended course of action and available alternatives for assigning and allocating training and testing requirements to available lands. The analysis of available alternatives includes relative environmental impacts to allow commanders to make decisions weighing readiness and conservation factors.

8.14.2 Mission Siting

It is important to site missions where natural resources can support them on a sustained basis. This saves rehabilitation money and provides higher quality training for troops. New mission siting is effectively implemented on Fort Rucker via the NEPA process. The coordination aspect of NEPA helps to site missions on lands best suited for supporting them. See Chapter 15 for more information. The GIS will become a valuable tool for selecting sites for virtually any combination of desired conditions.

8.14.3 Training Restrictions

Restrictions on training are sometimes necessary for long-term sustainment of training and ecosystem protection. Fort Rucker has incorporated environmental restrictions into Fort Rucker Reg 385-1 *Safety – Range and Training Area Regulation (Fort Rucker, 2010)*. Restrictions within this regulation specifically related to natural resources protection include field training and bivouacking activities, water resources protection, wetlands protection, digging restrictions, and sensitive species protection.

9.0 INVENTORY AND MONITORING

Current, quantitative data form the bedrock of resource management programs. Inventory, as used here, can be thought of as the "what's there?" aspect of managing ecosystems. Some idea of "how many of what's there?" is also useful for comparison purposes. Chapter 6 summarizes many inventory results.

Monitoring, a periodic "re-inventory," provides information on trends in the status of natural resources. Monitoring is generally done on a regular basis. Monitoring often targets species with high economic or human use values and indicator species of overall ecosystem health.

9.1 Objectives

- Inventory Fort Rucker's natural resources and regularly monitor resources that are important indicators of overall ecosystem integrity, capability of lands to support military missions, renewable product surpluses, status of sensitive species or communities, and other special interests.
- Provide inventory and monitoring data analyses to implement an adaptive management strategy, a critical component of ecosystem management.

9.2 Flora Inventory and Monitoring

9.2.1 Range and Training Land Assessment

The Range and Training Land Assessment (RTLA) component of ITAM uses a wide array of natural resources data such as soils, ground cover, above-ground vegetation/stem density, disturbance types, etc. to assess the condition of land, emphasizing effects of the conduct of the military mission. Land Condition Trend Analysis (LCTA), the predecessor of RTLA was initiated at Fort Rucker in 1997. Data collected and factors assessed included topographic features, soil characteristics, climatic variables, botanical composition, vegetative cover, wildlife diversity, and surface disturbance. However, the LCTA program was suspended in 2004 when the LCTA Coordinator position was cut. Funding was reinstated in 2005 when the program was transitioned to RTLA and mission was realigned with the intent to more specifically assess impacts of training activity on the training lands Based on the limited benefit from RTLA data collected, RTLA funding was converted to LRAM support in 2007, and prescribed assessments are accomplished by other qualified ITAM staff members and resources such as Interactive Customer Evaluations (ICE), Monthly Inspection of Training Areas (MITA) report by the 110th Aviation Training Brigade, and Quarterly Inspection of Training Areas (QITA) report by the USAF 23d Flying Training Squadron (FTS).

RTLA can provide land managers and trainers with long-term assessments of changes in vegetative cover and botanical and wildlife composition as well as estimates of associated soil loss on land under varying levels and types of use. The application of these assessments can:

- better distribute training loads on the land,
- reduce the need for expensive land rehabilitation programs,
- reduce some subjectivity from land management decisions,
- serve as a basis of use/non-use decisions for parcels of land,
- help ensure the sustained availability and productivity of Army lands, and

- provide input for implementing this INRMP and preparing NEPA documents.

Initially, plots were established in the proposed Battle Maneuver Area and on artillery firing points. These areas were perceived as probably the most important in terms of current and potential impacts of the military mission on the land. Since training has not focused as anticipated in the proposed Battle Maneuver Area and use of artillery firing points decreased RTLA assessments in the future will be based on needs, training mission, and concentration of maneuver impact miles (MIMS) using protocols contained in the U S Army Environmental Center approved RTLA Plan, and results will be used to determine if these protocols require adjustments to meet Fort Rucker requirements. Frequency of monitoring is uncertain with decisions to be made each year following data analysis for the next monitoring season.

9.2.2 Forest Inventory

In accordance with Army Guidance Procedures for Forest Inventory (April 2006) Fort Rucker is procuring a new assessment inventory of all forest lands outside the ARGC. Training areas 1-20 were inventoried in 2007. During the next five years the remaining training areas are scheduled for inventory. This assessment forest inventory will be conducted by using outside contractors.

Inventory transects (cruise lines) are laid out using aerial photographs and forest inventory maps. Data collected on transects include species, age, growth, overall timber density, timber volume, site index, regeneration, stand delineation, slope, fuel types, and other associated data. Inventory data are entered into computer databases and these databases will be linked to the GIS as this technology is implemented.

Fort Rucker will also establish continuous forest inventory plots (CFI) in all of the 48 Training Areas. A minimum of two plots will be established in each Training Area with a maximum of five plots per Training Area depending on size of Training Area. Continuous Forest Inventory plots will be established in-house by the Forestry Section and monitored and recorded at least once every three years. CFI uses changes over time on individual trees (tree growth, mortality, and removal) to estimate wood volume for the total forest. CFI allows comparisons of actual and predicted changes over time. CFI will continue throughout FY 2010-FY 2014.

Pre-management inventories will be executed by the Forestry Section in order to obtain the most current estimate of timber volume, species composition and value of a particular management unit or sale area. Pre-management inventories are used to determine an appraised value of the trees and should almost always precede normal silvicultural prescriptions. These inventories are performed for all Timber Availabilities regardless if select-cut or clear-cut in nature.

9.2.3 Flora Surveys

The existing floral survey (Mount and Diamond, 1992) is adequate for Fort Rucker needs during the next five years. Herbarium mounts are useful for identifying plants during surveys. The list of plants discovered during this survey will be updated as new species are found during other projects.

9.2.4 Wetlands

Although all installations have been surveyed, Fort Rucker was one of five TRADOC installations to have wetland surveys done as part of a cooperative agreement between the U.S. Army and the U.S. Fish and Wildlife Service. Results of this National Wetlands Inventory effort and previous studies are

summarized in Section 6.7.7. Additional wetlands surveys, except those specific to project sites that may affect wetlands, are not planned during the next five years.

9.2.5 Remote Imagery

Aerial photographs, by themselves, are not inventory items. However, they are a very useful survey tool to persons interested in managing relatively large pieces of land or analyzing long-term vegetation changes. The oldest known aerial known photographs of Fort Rucker were taken in 1962. Since then, complete post aerial photographs have been taken in 1979 (black and white at 1:15,840), 1988 (color infrared at 1:15,840), 1995 (color at 1:16,404), 2002 (color at 1:5,000), and 2005 (color at 1:5,000). Quickbird satellite imagery of Fort Rucker's entire flying area was collected in 2007 (color at 1:12,000) and 2009 (color at 1:12,000). The acquisition of LIDAR immensely improved Fort Rucker's elevation models. Fort Rucker had LIDAR collected in 2009 (60 cm).

During 1997 the installation used a contract with Kansas State University to provide color aerial photographs of five airfields and 18 stagefields. In addition, Fort Rucker's 404 permit to construct sediment control dams within the Aerial Gunnery Range Complex required annual aerial photographs of the Aerial Gunnery Range Complex during 1995-99. Coverage of the entire installation required only an additional $2,000; therefore, the post took complete annual photographs during 1998 and 1999, when the five year requirement ended.

During 2010-2014 Fort Rucker will use satellite imagery to enhance its ecosystem monitoring capabilities. Considering the size of the installation, this will be a very economical way to regularly monitor changes in the landscape. Change detection can be done by comparing two Quickbird images taken at different times. Quickbird (1:12,000) is more accurate then Landsat, which has a 1:100,000 scale. The acquisition of imagery collected in past years from National Geospatial-Intelligence Agency would facilitate change analysis over a period of time.

9.2.6 Vegetative Mapping

A vegetative community's map was completed during the Fall of 2009. This map will be utilized for implementing several phases of this Plan.

9.3 Fauna Inventory and Monitoring

Fauna surveys on Fort Rucker have involved game and nongame species. For purposes of this plan, nongame is defined as species not hunted or fished on Fort Rucker. Both inventory and monitoring (or census) are important to the Fort Rucker fish and wildlife management program.

9.3.1 Wildlife Game Species

Census of game species is required for the establishment of harvest regulations that allow for sustained use of game species. The State of Alabama provides the framework within which Fort Rucker must harvest game species. In a few cases, particularly deer, Fort Rucker imposes more restrictive regulations.

Harvest numbers provide an inexpensive means to monitor game populations. All game harvested must be reported. Combining harvest data with hunter effort provides information adequate to manage most

game species. The following sections deal with species for which additional population status data are collected.

9.3.1.1 White-tailed Deer

All legally harvested deer are evaluated at deer check stations. Harvest data collection is the primary source of information to evaluate deer herd condition and establish antlerless deer seasons. Biologists collect data on area harvested, age, and body weights from all deer and determine antler development for bucks and collect incidence of lactation data from does. Ovaries are sampled for corpora lutea data (to evaluate incidence of pregnancy). Age-specific antler measurements, body weights, and reproductive data are compared with data from previous years to obtain a trend of the herd's overall condition. Every three years Fort Rucker collects deer and performs necropsies for a general herd health check. Biological samples are sent to the Southeastern Cooperative Wildlife Disease Study Group for analysis. The United States Army Center for Health Promotion and Preventive Medicine (CHPPM) periodically conducts Lyme disease risk assessments utilizing harvested white-tailed deer.

Deer are censused using infrared camera surveys. Thirty bait sites with cameras are deployed each year to sample 3,000 acre blocks. The sample area is moved the subsequent year. Population estimates are developed using ratios of identified bucks.

9.3.1.2 Turkeys

It is mandatory to check harvested turkeys on Fort Rucker. Data are collected on area taken, sex, weight, beard length, and spur length.

9.3.1.3 Quail

It is important to monitor more precisely where quail are found on Fort Rucker. Whistling call counts are run in May through June with the objective of learning where quail are absent in spite of good habitat. These data are used to identify potential transplant sites (Section 8.5.1.4).

9.3.1.4 Mourning Doves

Fort Rucker uses the standard USFWS mourning dove call count methodology as part of a nationwide effort to monitor this migratory species.

9.3.1.5 Waterfowl

Waterfowl abundance is estimated using population data gathered through visual counts, hunter success, and nest box monitoring.

9.3.1.6 Squirrels

Besides harvest data, squirrel abundance is qualitatively estimated using nest counts.

9.3.1.7 Rabbits

Rabbit population data are collected by harvest rates, track counts, flush counts, and pellet group counts.

9.3.2 Fish Surveys

Creel surveys are an important component of managing recreational fisheries. Fort Rucker Fish and Wildlife personnel conduct creel surveys on an opportunistic basis while in the field. Angler success and degree of satisfaction with the fishery are important parameters to monitor the success of the overall fish management program.

Fort Rucker uses seine surveys in its small ponds (5-15 acres) to monitor reproduction of fish species. Electroshocking is used to evaluate overall population dynamics in each body of water. Electroshocking is used both day and night, and principal data collected include species, length, and weight of each fish. Proportional Stock Density and length-weight relationships are calculated.

Fish population data are used to make decisions regarding the need for rough fish control and stocking. Population data are also used to evaluate effects of harvest regulations on important game species, especially largemouth bass and bream species.

9.3.3 Threatened or Endangered Species

Fort Rucker supports a pair of bald eagles, and one nest has been observed at Lake Tholocco. Although the eagle is no longer listed as threatened, both the ADCNR Divison of Wildlife and Freshwater Fisheries and the U.S. Fish and Wildlife Service have been notified. The eagles on Fort Rucker are protected by the BGEPA.

The gopher tortoise is of special concern as it is a former C2 federally listed species and a Threatened species on the state listing. The gopher tortoise is federally listed as Threatened west of the Mobile and Tombigbee Rivers. If any project is planned in known gopher tortoise habitat on Fort Rucker, the site is surveyed for tortoises prior to the project start date and appropriate action is taken to protect any tortoises that may be located.

9.3.4 Neotropical Birds

There is considerable continental-wide concern over declining numbers of many neo-tropical bird species. Fort Rucker will collect information to determine the status of these birds. Fort Rucker has cooperated with the Smithsonian Institute on neotropical bird surveys on the Installation in the past and will continue to cooperate with such surveys in the future.

9.3.5 Other Species

The Fort Rucker Supervisory Entomologist has been collecting data on insects found on the installation. Results to date are reported in Section 6.8.5. This inventory will continue as a personal project of the Entomologist, assisted by the Fish and Wildlife Section.

Lake Tholocco formerly supported populations of fresh water mussels, and since the lake has been restored, the mussels are expected to re-establish themselves within a reasonably short time. Mussels are water filters and are very susceptible to pollution. Thus, they are excellent biomonitors of overall water quality. Therefore, if and the mussels return, Fort Rucker will conduct a mussel inventory for baseline data for future comparisons.

9.4 Water Quality Monitoring

Water quality monitoring is important to measuring ecosystem health at Fort Rucker. Land-based environmental degradation eventually affects water quality and aquatic ecosystems dependent upon good water quality.

9.4.1 Surface Water

As noted in Section 6.5.1.1, Fort Rucker surface waters generally are within State water quality standards. There is no particularly human health reason to regularly monitor surface waters on the post. However, knowledge of pH and the fertility of lake bottoms is important to making decisions regarding fish habitat management (Section 4.4.3.3), and Fort Rucker will continue to monitor these parameters of water quality during 2010-2014, as needed. Section 8.7 discusses Fort Rucker's water quality program from a natural resources viewpoint.

Section 8.9.2 discusses the Aerial Gunnery Range Complex erosion control project. The final phase of this project, large sediment control structures, will be implemented only if the post continues to exceed water quality standards. Water will be tested entering the project area and leaving it via Bowles Creek. If turbidity levels added, while passing through the AGRC, exceed increases allowed by Alabama water quality standards, some or all of Phase 4 will be implemented.

9.4.2 Groundwater

Groundwater is discussed in sections 4.3 and 6.5.2. Groundwater is one of Fort Rucker's most valuable natural resources. Fort Rucker uses groundwater for drinking and has seven main wells, used primarily for drinking and fire protection. Groundwater quality in the area is good, with excessive iron and hardness levels being the only problems (Rust Environment and Infrastructure, 1999). Drinking water wells are tested regularly.

Fort Rucker began monitoring groundwater in the mid-1980s, and monitoring wells are opened and closed as needed at any given time. Generally, about 35-50 monitoring wells are actively used. Examples of areas where testing occurs includes landfills, petroleum product sites, solid waste management units, a closed firefighter's burning pit, and sites where leaking underground storage tanks have been removed. Any discovered contamination that might affect groundwater is being cleaned up. Cleanup techniques now include testing bioremediation to remove petroleum products from soils and water.

9.5 Soils Inventory and Monitoring

Fort Rucker has a complete soils inventory (Henry, 1960; Childs, 1976). Due to a change in the Soil Classofication System and soil profiles being examined to a greater depth now, a new soil survey of Fort Rucker is needed. Since the Gopher tortoise is currently an At-risk species on Fort Rucker and could become endangered. Should this happen, an up-to-date soil survey of Fort Rucker would be an invaluable tool in predicting potential habitat areas and locating actual burrows and colonies of the animals. In addition, soil conditions in the lower profile greatly affect the assigning of soils to woodland suitability groups. Since soils were only examined to a maximum depth of 42 and 60 inches respectively of Dale and Coffee Counties, knowing the soil characteristics for the other 38 to 20 inches down to 80 inches

could place soils in different woodland suitability groups, thereby requiring alternative sivicultural practices. of
There is no direct monitoring of soil erosion, but as described in sections 8.9.2 and 9.4.1, surface water entering and leaving the Aerial Gunnery Range Complex is tested for turbidity, as an index to erosion occurring within the Complex watershed. This testing will continue as needed to maintain water quality within State standards, and results will be used to make soil erosion project decisions.

9.6 Data Storage, Retrieval, and Analysis

Collection of natural resources data is a virtually useless venture without the capability to store, retrieve, and analyze these data. In all too many cases, biological data are collected and stored without being used. Often this is due to inefficient data storage, retrieval, and analysis systems.

9.6.1 Microcomputer System

Microcomputers are essential to the routine operation of efficient natural resources management organizations. The volume of incoming data is too substantial to handle without computers, and routine administrative tasks are accomplished considerably more efficiently with computers.

The Natural Resources Branch has adequate automated data processing equipment and peripherals. Upgrades of hardware and software will occur as needed during the next five years. During this period all microcomputers will be networked.

9.6.2 Geographic Information System

A GIS allows users to manipulate spatial data (e.g. maps, aerial photos, satellite images) in a similar fashion as a data management program allows the analyses and presentation of mathematical data. GIS deals with data in vector (points, lines, polygons) and raster (images) formats. Data can be displayed and used to create maps.

Fort Rucker obtained its first GIS in 1994, and it was installed using support from the U.S. Geologic Survey. This system used a Unix® workstation, ArcInfo® software, a color scanner, a color plotter, and a tape backup. Appendix 9.6.2 includes databases already developed for Fort Rucker. Many of these databases were developed primarily for environmental compliance uses, and few specific natural resources databases are available.

Today, this system is managed by the Fort Rucker ITAM office. An enterprise GIS data collection repository has been established and directorates from across the installation are using and maintaining the data. A SQL Server / ArcSDE multi-user Geodatabase is connected by GIS and AutoCAD users from locations at Range Control, Environmental, Engineers, Forestry, Land Management, and Fish and Wildlife.

In the future, the enterprise GIS effort will be focused on increasing the user database.

Spatial data analysis and map presentation are primary tasks of the GIS. GIS has become an integral part of many Fort Rucker natural resources programs. The following is a partial list of uses of this technology:

- maintenance of databases for long-term comparisons of the effects of military missions on natural resources;
- spatial monitoring of controlled burning and wildfires;
- printing of hunting and fishing maps to facilitate recreation with less conflict with military operations;
- analyses to extrapolate postwide conditions from extensive smaller-scale surveys;
- categorization of wildlife habitat quality for high interest species;
- mapping and analyses of wildlife openings;
- use of habitat parameters to establish harvest objectives;
- monitoring forest inventory changes;
- modeling commercially-managed forest growth and related parameters;
- planning grounds maintenance activities;
- modeling watershed runoff and planning erosion control projects;
- planning military activities within the Battle Maneuver Area; and
- selecting sites for range-related projects.

As databases are compiled and the GIS fulfills the requirements of the Fort Rucker natural resources program, use of the GIS will expand. Programs such as hazardous materials management, spill response, and ground water quality monitoring are obvious applications for GIS support. The GIS can support other civilian and military programs on the installation, such as grounds maintenance, range road maintenance, utility corridor planning, and antenna siting.

9.7 2010-2014 Inventory and Monitoring Summary

- Maintain the Continuous Forest Inventory annually.
- Annually update the floristic survey using data from other projects.
- Obtained aerial photographs in 1998 and 1999.
- Obtain and use LANDSAT imagery for monitoring vegetative trends.
- Develop vegetative map.
- Monitor game species using harvest data.
- Annually monitor deer and turkeys using check station data.
- Conduct deer herd health surveys on a three-year interval.
- Experiment with deer monitoring using forward-looking infrared technology.
- Monitor quail and mourning doves using call count surveys.
- Continue monitoring wood duck nest boxes, squirrel nest, and rabbit pellet groups on an opportunistic basis.
- Monitor BBS routes for neotropical birds annually.
- Conduct pond and lake surveys.
- Conduct opportunistic creel survey of installation fisheries.
- Conduct site-specific surveys for gopher tortoises as required for project evaluation.
- Complete insect inventory.
- Continue surface water monitoring, emphasizing fertility of lake bottoms and pH of ponds.
- Monitor turbidity levels in Bowles Creek.
- Continue groundwater monitoring.
- Update computer hardware and software and provide operator training.
- Develop and maintain GIS databases.
- Use GIS data analyses to support training, natural resources, outdoor recreation, and other environmental programs.

10.0 EXTERNAL ASSISTANCE PROJECTS

Natural resources professions are developing so rapidly that research or special projects using outside expertise are often the only way to identify, or choose from, management options to meet particular objectives. These projects may be used to determine baselines with regard to status of ecosystems (for future comparisons) or to directly evaluate management programs in terms of meeting management objectives. Surveys, ecosystem studies, and population evaluations are an important part of the adaptive management process, which is essential to ecosystem management.

10.1 Objectives

- Provide research and other studies to support Fort Rucker natural resources management program.
- Provide special projects to support the Fort Rucker natural resources program.

10.2 Support Mechanisms

10.2.1 Other Agency Personnel and Project Assistance

The Intergovernmental Personnel Act of 1972 (IPA) provides a means by which to conduct research or obtain other personnel assistance at Fort Rucker. Any state or federal agency is authorized to participate. IPA is basically a system where a federal (or state) agency borrows other federal or state agency personnel for a limited time period to do a specific job. The installation pays the borrowed employee's salary and administrative overhead. There are two advantages: personnel would be directly supervised by Fort Rucker, and no manpower authorizations are required. In 2010-2014 Fort Rucker will consider using IPA agreements as a source of assistance with special projects and possibly for ITAM personnel support. One potential source of IPA personnel for ITAM implementation is the NRCS.

Fort Rucker recognizes the importance of cooperating with Federal and State agencies in addition to private organizations. Sections 5.2, 5.3, and 5.4 identify other agencies with whom Fort Rucker has cooperatively worked in recent years. Other agencies will assist with implementation of special projects and research within this INRMP.

10.2.3 University Assistance

Universities are an excellent source of research assistance. Fort Rucker has used several universities in recent years to help with specialized needs. Auburn University, the University of Georgia, and Kansas State University are the most likely sources of assistance with implementation of this INRMP (Section 5.6) during 2010-2014.

In addition to the sources named above, programs such as the Student Conservation Association (SCA) and ORISE exist and can be accessed to support various installation projects and program needs.

10.2.4 Contractor Support

Fort Rucker may also turn to outside contractors for studies and projects. Contractors give the installation access to a wide variety of specialties and fields. Contractors are often involved in projects such as plan preparation, surveys, grounds maintenance, NEPA documentation, aerial photography, and similar

activities.

10.3 Planned External Support

The table below outlines needed external support projects in order of priority. In 2010-2014 many of these projects will be determined by funding availability.

2010-2014 Natural Resources External Support Project Needs

Project	Priority*	Agency	Completion	Comments
Timber sales	1	COE	Indefinite	
Agricultural outleasing	1	COE	Indefinite	
Game harvest	1	ADCNR	Indefinite	
Endangered species	1	USFWS	Indefinite	As needed
Erosion Control and LRAM	1	NRCS		As needed
Grounds maintenance	1	Various contractors	Indefinite	
Soils testing	1	Auburn Univ.	Indefinite	As needed
Wetlands management	1	USFWS		As needed
GIS implementation	1	KSU, probably others	Indefinite	KSU in 1997
Law enforcement	1	ADCNR and FLETC	Indefinite	As needed
Cultural resources protection	1	SHPO	Indefinite	As needed
Aerial photography	2	KSU, probably others	1999	Required by permit
Deer necropsy	2	SE Coop Disease Study	Indefinite	Every 5 years
Environmental Awareness	2	KSU, USAETSC	Indefinite	Ongoing

*

1 Needed as soon as possible for immediate management application.
2 Useful for improving management to a significant degree over a long period.
3 Has good potential to improve long-term management.

11.0 ENFORCEMENT

Many aspects of natural resources management require effective enforcement if they are to be successful. Programs such as harvest controls, protection of sensitive areas, water pollution prevention, hunting and fishing recreation, nongame protection, and others are very dependent upon law enforcement.

11.1 Objectives

- Enforce laws and regulations pertaining to implementation of the natural resources program at Fort Rucker.
- Use natural resources enforcement as an integral part of the overall natural resources program.

11.2 History, Authority, and Operations

Prior to late 1991, the Provost Marshal had been conducting wildlife law enforcement on Fort Rucker, using contract security guards. The Fish and Wildlife Section was given responsibility for operations of the Installation Game Law Enforcement (GLE) mission in 1991. Taking on the GLE mission was a joint effort between the Directorate of Public Works and the Provost Marshal. Fish and Wildlife Section provided full-time, permanent, professionally trained officers and the Provost Marshal provided disposition channels for enforcement cases. The addition of the GLE mission increased the Fish and Wildlife staff from two to eight full time employees. The primary duty of GLE officers was game law enforcement with a secondary tasking as wildlife technicians.

GLE responsibility was returned to the Directorate of Public Safety in 1994. Although GLE officers continue to perform GLE duties, they also assist the DPS with remote area patrolling. Game Law Enforcement Officers enforce post, state, and federal regulations involving wildlife, environmental concerns, and outdoor activities where safety rules are involved.

ADCNR enforcement officers independently patrol Fort Rucker as well as working with Installation GLE Officers, based on the cooperative agreement, which this INRMP replaces. These officers have federal jurisdiction. This will continue during 2010-2014.

11.3 Jurisdiction

Concurrent jurisdiction exists on most areas of Fort Rucker north of the cantonment area. Laws are enforceable by Federal- and State-commissioned personnel. However, exclusive jurisdiction exists for the cantonment area.

Fort Rucker officers use the Federal Magistrate Court to adjudicate civilian violators who are issued 1805 and Military Police Report citations. In most cases, 1408 citations are issued to military and civilian violators of regulations and administrative procedures. These violations are administratively handled by military commanders and civilian supervisors. More serious cases are handled using the Military Police Report, DA Form 3975. State enforcement officers use District courts for case adjudication.

11.4 Enforcement Problem Areas

On a nationwide basis, hunting and fishing require the most natural resources enforcement. Fort Rucker has both activities as well as other outdoor recreation which require enforcement activities. In addition, there are cultural resources and nongame species that require protection. Related illegal activities include unauthorized dumping, off-road vehicle operation, etc.

Some users gain access through illegal entry of the installation. Such illegal entry may be the precursor to illegal range activities at Fort Rucker, which may either directly or indirectly impact efforts to protect natural resources. Unauthorized entry (no landowner permission) is not a significant problem at Fort Rucker, perhaps due to the open nature of the post. Illegal dumping is a significant site-specific problem. This is often related to access without landowner permission.

Off-road vehicle operation was a significant problem 10 years ago on the post, but it is now relatively insignificant in terms of occurrence and damage. ORV activity can create at least four significantly negative impacts from a Fort Rucker viewpoint. First, those who trespass are exposed to dangers associated with unexploded ordnance and ongoing shelling and firing. Risk increases as people get closer to the impact area. ORV trespassing is particularly dangerous due to the places these vehicles can go and their weight, making them particularly vulnerable to unexploded ordnance just beneath the surface.

The second problem associated with illegal ORV use is interference with ongoing military activities. The sighting of an ORV can disrupt military training to varying degrees depending upon the location of the sighting. The most critical factor to natural resources management and protection is damage caused to soils and vegetation. ORVs make use of places that are relatively unaffected by military vehicles. Their impact on wet and boggy areas and waterway embankments can be significant in terms of damage. Finally, illegal use of ORVs on Fort Rucker could afford easy access for other illegal activities (including theft, fish and wildlife violations, etc.). Thus, ORV use is often combined with more serious activities.

Fort Rucker has significant cultural resources. Some of these are relatively open to irreparable damage or theft. Cultural artifacts have value, both for personal enjoyment and commercial sale. Thus, protection of cultural resources is directly related to trespass control.

Poaching, especially deer, is a significant problem in many areas of the Southeast, but not apparently at Fort Rucker. Check points have been effective in curbing night hunting. The non-shooting of dummy deer is an indication that the problem is under control in terms of deer population significance. There are concerns that the growing turkey population is highly vulnerable to road shooting during certain times of the year.

Another significant issue is the checking of game at check stations. This directly affects the capability of Fish and Wildlife Section to make decisions regarding harvest regulations.

Another violation associated with game is a lack of state or post hunting or fishing licenses or permits. Creel limits are sometimes violated, which is a particularly significant illegal activity with the loss of Lake Tholocco and its potential to support fishing.

11.5 Training

Game Law Enforcement (GLE) officers are selected from individuals with prior law enforcement backgrounds and receive continuous on the job training (OJT). Military Police (MP) receive their training at the MP School, currently located at Fort Leonard Wood, Missouri.

Alabama State Game Wardens and Marine Police conduct continuous training upon requests from the Directorate of Public Safety (DPS). DPS currently has memorandums of agreement (MOU's) with surrounding law enforcement agencies for any type of law enforcement support to include training.

Enforcement personnel must qualify with individual weapons twice annually. Additional in-house training includes the use of enforcement videos and CPR training. OJT is the means used by permanent civilian enforcement personnel to train MP personnel in game warden duties.

11.6 2010-2014 Natural Resources Enforcement

GLE officers are classified within the 1812 job series, which is consistent with surrounding installations and will not change. The current GLE force consists of four civilians and is augmented by MP resources during swimming season.

12.0 AWARENESS

Conservation awareness is instrumental in creating conditions needed to conduct natural resources management. Fort Rucker's approach to awareness stresses education. It provides military personnel and the public with insights into Fort Rucker's natural environment and conservation challenges. The more people know about the installation's unique natural resources, the more responsibly they act toward them.

Education also promotes awareness of critical environmental projects and the rationale behind them. Activities such as fish stocking, erosion control, and wildfire suppression can be accomplished with little conservation awareness effort since soldiers, recreationists, and the general public naturally supports these easily understood efforts. However, issues such as protection of sensitive areas for little understood plant and wildlife species, restrictions on troop field operations, nongame management, permit fees and their uses, and timber harvesting practices require effective conservation communication to get positive support and, perhaps more importantly, avoid adverse reactions from various users. A conservation awareness program must be directed to both installation and external interests if it is to be effective.

12.1 Objectives

- Provide information to units, leaders, soldiers, civilian employees, and other installation users to improve their understanding of the impacts of their activities on the environment.
- Provide an understanding of the Fort Rucker natural resources program to installation and surrounding communities.
- Provide decision makers with information needed to make judgments that affect the Fort Rucker natural resources program.
- Provide information to the military community and general public on recreational opportunities on Fort Rucker, especially those related to hunting, fishing, and other natural resources-based activities.
- Provide the Fort Rucker community information on the wildlife and conservation benefits of longleaf pine ecosystem restoration.

12.2 Military Personnel Awareness

Environmental Awareness is a component of ITAM to foster a conservation ethic in those who use Fort Rucker lands. Fort Rucker's Environmental Awareness program was initiated with support from the Environmental Training Support Center, Huntsville, Alabama. Initial program materials included a Leader's Handbook, training video, a series of posters, and other materials including a cross reference of regulations pertinent to training on military lands. Most of these materials were generic in nature. Early Environmental Awareness materials also included videos regarding techniques to repair rotor wash and gully erosion (Section 8.8.2.2).

Fort Rucker had its Environmental Awareness component fully implemented in 1998. During 1997 through early 1998 the installation was using the services of Kansas State University to develop materials specific to Fort Rucker's needs, emphasizing aviation, armor, and infantry missions. Materials included videos, posters, handbooks, and other materials.
The National Guard has the potential to put more heavy vehicle use onto Fort Rucker than organizations stationed on the post. However, considering that Guard and Army Reserve units generally only train for a

maximum of two weeks, it is difficult to individually provide Environmental Awareness briefings to each soldier. Therefore, Training Division addresses compliance measures within FR 385-1 as well as providing awareness through various digital and hard-copy media outlets.

12.3 Printed Media

Fort Rucker's weekly newspaper, the *Army Flier*, is the most efficient way for Natural Resources personnel to access the Fort Rucker community. This newspaper is used to explain programs and gain support for their implementation. Articles target a wide range of readers, but may be designed to appeal to specific categories of readers.

Natural Resources personnel write several articles annually for the *Army Flier*, and staff writers also cover natural resources materials. Outdoor Recreation uses the paper regularly to inform users of recreational opportunities. The *Weekly Bulletin* is the official publication used to notify Fort Rucker personnel of changes in policy and regulatory matters. Outdoor Recreation uses the *Weekly Bulletin* to advertise events, hunting and fishing seasons, hours of operation, and similar information.

Other newspapers, such as the *Enterprise Ledger*, *Southeast Sun*, and *Dothan Eagle*, use information about Fort Rucker's natural resources programs. News releases and interviews with outside media are coordinated with Public Affairs Office (PAO). Use of printed media will continue to be an important part of natural resources management on Fort Rucker during 2010-2014.

As an element of the Sustainable Range Program Information Campaign, the SRP supplies to installation ITAM cells decks of playing cards displaying a different awareness message on each card. ITAM distributes the cards through the Range Control firing desk, range and training area coordination meetings, and other public forums frequented by Soldiers, trainers, and civilians. Additionally information is provided through DPTMS, Training Division, Training Support Center in the form of Graphic Training Aids available to using units conducting training on the Installation.

12.4 Television and Radio and Other Electronic Media

Fort Rucker's natural resources program in general is seldom the subject of television or radio coverage. However, special events such as youth hunts, fishing tournaments, and some research projects may attract television and radio coverage. Use of television and radio during the next five years will largely be driven by media events on the installation. It will be difficult to generate media enthusiasm over routine events, but new and innovative programs such as ITAM implementation, Lake Tholocco restoration, and similar programs have the potential to attract the media coverage.

Building on the SRA message cards, Fort Rucker ITAM has developed a series of SRA message slides that are displayed on large format digital picture frames at the AAFES mall, the Aviation Learning Center, and Range Control. Slide additions and revisions are made as needed throughout the year.

12.5 Special Events

Special events with local, state, or national significance offer opportunities to educate the public on programs of high interest. Fort Rucker hunters participate in the Buckmasters Project Venison annually. Through this program, hunters provide extra game meat to deserving underprivileged persons. These and other special event opportunities will be taken advantage of during 2010-2014 as deemed appropriate.

12.6 Hunting and Fishing Awareness

Fort Rucker puts a considerable effort into increasing the level of awareness of opportunities to hunt, fish, and otherwise enjoy the out-of-doors on the installations. These programs are the responsibility of the DFMWR, Community Recreation Division, and Outdoor Recreation program. Fort Rucker Regulation 215-1, *Hunting, Fishing, Water Safety, and Trapping*, is the primary source of information regarding regulations for these activities.

One-page flyers are frequently used to inform the Fort Rucker angling and hunting public of opportunities for participation on the post. Examples of materials available at the Outdoor Recreation Customer Service Center include:

- *Alabama Tree Stand Safety*, published by the Alabama Department of Natural Resources and Conservation;
- Alabama hunting and fishing regulations;
- 10 Commandments of Firearms Safety;
- Archery range information sheet;
- Skeet and Trap Club information sheet;
- Certified Hunter Education Course information sheet;
- Fishing lakes, ponds, and streams map and directions to get there.

The DFMWR website is continuously updated to provide current information to patrons. The website is located at www.ftruckermwr.com. During 2010-2014 Fort Rucker will update and improve its ways to inform outdoor enthusiasts of the opportunities available on the installation.

12.7 Watchable Wildlife

The Watchable Wildlife program is important to Fort Rucker. Although there are many naturally occurring opportunities to observe wildlife in and near Fort Rucker, there are special projects planned to facilitate the observation of wildlife.

One of the existing nature trails is on the banks of Claybank Creek. From this trail it is possible to observe many native species of birds and game animals. Numerous blue bird houses were constructed and placed in the rough areas of the golf course and various other locations throughout Fort Rucker. These regularly maintained houses add aesthetically to the areas and also provide residence for blue birds. Besides the nature trails, there are numerous locations on the post where one might sit, observe, or photograph wildlife.

Fort Rucker is establishing a Watchable Wildlife area on the former 9-hole golf course. The project entails tree planting, construction of wildlife feeders, development of supplemental feed plots, an interpretative nature trail, and observation blinds. Opportunities for funding will be pursued during the next five years.

Non-game wildlife will be managed to ensure the continued existence of species diversity. Artificial nest structures and plantings designed to benefit wildlife may be established and maintained at appropriate areas near campgrounds and outdoor recreation areas. In general, any hunting and fishing area that is not closed for military use will be open for any non-consumptive recreational use, with appropriate and applicable restrictions.

12.8 Youth Groups

The Natural Resources Branch is committed to cultivating a conservation ethic in local youth. Branch personnel work with youth groups on conservation programs. On occasion, Natural Resources personnel also give presentation to school groups. Scouts, in particular, need support with projects, merit badges, and conservation talks. Fort Rucker scouts often assist with natural resources management. One Eagle Scout project involved making improvements on the Claybank Creek nature trail.

The development of outdoor skills and conservation ethics among youth is a priority. Jakes, a National Wild Turkey Federation youth group, uses Fish and Wildlife personnel to provide presentations, judge turkey calling contests, and help with shooting competitions. The post has a provision to conduct special youth hunts. These annual State-approved hunts are basically an early deer gun hunt.

In 2010-2014 Fort Rucker Natural Resources personnel will continue to work with youth groups whenever possible. Such an endeavor is a good investment in the future.

13.0 OUTDOOR RECREATION

Directorate of Family and Morale, Welfare and Recreation (DFMWR) Mission
Provide flexible and diverse MWR programming, which supports ARFORGEN, and enhances the quality of life for the Fort Rucker Family.

Fort Rucker consists mostly of large, relatively undeveloped, open space. Indeed, all of Fort Rucker's open space and the outdoor recreation opportunities associated with it are perhaps the Installation's best attributes in terms of community quality of life. With ever increasing time to pursue recreational interests, the general public will undoubtedly place more demand on Fort Rucker's natural resources.

The Directorate of Family and Morale, Welfare and Recreation (DFMWR) has a *Strategic Plan*, which includes the Community Recreation Division. This division is responsible for implementation of most outdoor recreation on Fort Rucker. Most outdoor recreation programs within this INRMP are the responsibility of the Outdoor Recreation Branch, but other branches within the Community Recreation Division also assist with implementation.

Recreation activities at Fort Rucker are classified according to their essential nature in supporting the military mission. Classification is important since it affects program funding. Below are the classifications provided in AR 215-1, paragraph 4-1:

Category "A" Mission - Sustaining Activities are considered essential to sustaining readiness; these activities generally enhance and promote the physical and mental well being of Soldiers. Activities in this category have little or no capacity for generating NAF income and are supported by APFs. The only Category A activities affected by this plan are parks and picnic areas at Lake Tholocco and four other lakes on Fort Rucker.

Category "B" Mission - Community Support Activities are closely related, in terms of supporting the military mission, to those grouped in Category A. They satisfy the basic physiological and psychological needs of Soldiers and their Families and provide, to the extent possible, the community support systems that make military installations temporary hometowns for a mobile military population. These support programs should receive substantial amounts of APF support, but differ from that in Category A, in part, because of their ability to generate NAF revenues. That ability to generate revenue is limited; however and in no case may they be sustained without substantial APF support. Most outdoor recreation activities are Category B.

Category "C" Mission - Revenue-Generating Activities have less impact on readiness. They offer desirable social and recreational opportunities. Activities in this group have the capability of generating enough income to cover most of their operating expenses, but they lack the ability to sustain themselves based purely on their business activity; consequently, they receive limited APF support. The Riding Stables are a Category C activity affected by this plan.

Fort Rucker is required to have an Outdoor Recreation Plan, which is a joint responsibility between DFMWR and DPW. This INRMP, especially this chapter, is that Outdoor Recreation Plan. Other sections of this INRMP are applicable to Outdoor Recreation, particularly the following chapters and sections:

Chapter 1.0 Goals and Policies

Section 5.1	Fort Rucker (Responsibilities)
Section 6.8.1	Game Fish and Wildlife Species
Section 7.1.2	Training Areas
Section 7.3.3	Land Management Units
Section 8.4	Habitat Management
Section 8.5.1	Game Management
Section 9.3.1	Wildlife Game Species (Monitoring)
Section 9.3.2	Fish Surveys
Chapter 11.0	Enforcement
Section 12.5	Special Events
Section 12.6	Hunting and Fishing Awareness
Section 12.7	Watchable Wildlife
Section 12.8	Youth Groups

Fort Rucker is encouraged to "*develop cooperative agreements with the National Park Service and appropriate state agencies* (Alabama State Parks) *to facilitate the development and management*" of Outdoor Recreation programs.[8] Appendix 13.0 contains a draft agreement for this purpose.

13.1 Objectives

- Provide opportunities to the Fort Rucker community and the general public for high quality hunting, fishing, and other outdoor recreation.
- Manage outdoor recreation consistent with needs of the Fort Rucker military mission.
- Encourage the development of facilities that improve use and enjoyment of fishing, hunting, and other natural resources-based recreation, and increase the use of underutilized areas as a means of meeting the needs of recreational users and conserving wildlife and fisheries resources.
- Manage outdoor recreation while maintaining ecosystem integrity and function.

13.2 Military Mission Considerations

The military mission has priority over all outdoor recreation involving range access. The Fort Rucker Outdoor Recreation Advisory Council is used to help resolve conflicts between military mission requirements and hunting and fishing aspects of outdoor recreation. The impact area is off-limits for all recreation programs.

While the Army's primary goal is training soldiers to win on battlefields around the world, the Army understands the need to provide quality recreational opportunities for soldiers, their families, employees, and the general public. Fort Rucker is proud to continue this age-old tradition.

13.3 Public Access

Public access is a tradition on Fort Rucker. There are many opportunities for the general public to

[8] Army Regulation 200-3 (28 Feb 1995), Chapter 7.

participate in installation activities. Gates are manned. The requirements to enter the installation are proof of insurance, vehicle registration, photograph identification for all individuals 16 years of age and above, and valid license for driver of vehicle.

Department of Defense Directive 4715.3, *Environmental Conservation Program*, May 3, 1996, states, "*The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and other considerations such as security, safety, and fiscal soundness. Opportunities for such access shall be equitably and impartially allocated.*"

Paragraph 2-10 of Army Regulation 200-3, *Natural Resources -- Land, Forest, and Wildlife Management*, states that access by recreational users,"*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; and at such times as such access can be granted without bona fide impairment of the military mission, as determined by the installation commander*." This regulation further states that withholding public access must be substantiated by a statement in the Integrated Natural Resources Management Plan.

Fort Rucker hunting, trapping, and fishing programs will remain open to military personnel, dependents, civilian employees, and members of the outside public with an Alabama hunting, trapping, or fishing license. These individuals need only obtain post hunting, trapping, and/or fishing permits. There are no restrictions on number of permits issued to the public. More civilians than military participate in most hunting and fishing activities on Fort Rucker. The only major outdoor recreation activity that is more heavily utilized by military personnel is picnicking.

Fort Rucker's policies toward public access are within both the spirit and letter of Army and Defense policies. They will be continued throughout 2010-2014.

13.4 History of Outdoor Recreation

The Outdoor Recreation program at Fort Rucker was essentially organized around Lake Tholocco, a facility with the greatest opportunities for outdoor recreation on the post. The dam, which created Lake Tholocco, was originally constructed around 1940 by the communities of Daleville, Ozark, and Enterprise.

With the establishment of Camp Rucker in 1942 came the need for outdoor recreation for troops based and trained at the new installation. In 1946, a wooden boat pier on East Beach was built at a cost of $51,900. In 1952, a 1,797 square-foot wooden picnic shelter was built on West Beach, at a cost of $2,600. In 1957, a wooden boat marina ($2,400) was constructed on East Beach, and an 8,933 square-foot Wildlife Administration building ($56,326) was built on West Beach.

In 1958, a 625 square-foot wooden boathouse ($1,563) was built on West Beach, along with a latrine, which cost $1,000. East Beach received two wooden pavilions ($2,700) with 4,800 square feet. In 1959, a pier was constructed on West Beach for $2,400, and about that time 10 pavilions were also built with a total square footage of 6,800 at a cost of $120,000. In 1960, a small supply storage unit ($700) was built on West Beach. In 1961, a concrete equipment rental facility, complete with latrines, ($2,830) was constructed, along with a concrete snack bar with bathrooms and a picnic area ($24,300).

In 1966, a 240 square-foot minnow house ($1,500) was built. In 1970, a concrete latrine ($6,638) and a wooden boat dock ($15,417) were built at West Beach. In 1977, 18 concrete campsites ($4,300) and a wooden latrine ($11,607) were built. In 1979, a boat pier and an earthen dam cost $3,000. Other 1979 projects included another boat pier ($1,200), a 3,000 square-foot steel storage rental building ($28,576), and another pavilion in Area 1 ($3,200).

In 1981, $120,000 was spent on new construction. In 1983, two pavilions, one on East Beach and one on West Beach, cost $19,332 while a 344 square-foot wooden skinning barn cost $9,666, and a canoe storage building, cost $2,310, was built. In 1987, two wooden tollbooths cost $7,800 were built. In 1990, a 300 square-foot concrete and wire cage dog kennel ($1,000) was built on West Beach.

Total accountable money invested for construction of facilities from 1946 through 1990 totals $505,870. Lake Tholocco flooded and the emergency spillway eroded through to the reservoir and drained the lake on 17 March 1990. During the flood of 2-7 July 1994, the rebuilt emergency spillway again broke. The loss of this lake as a recreational facility was devastating to the Fort Rucker Outdoor Recreation program.

A new spillway was completed in November 2001 and Lake Tholocco refilled. The installation utilized $766,849 received from the Army Community of Excellence awards program to rebuild facilities within and surrounding the lake. Renovations included East and West Beach gatehouses, Engineer Beach bathhouse, Singing Pines cabins, restrooms on East and West Beach, Outdoor Recreation Office and Equipment Issue facility, boat ramps, and Snack Bar/Game Room Facility. New additions included a new restroom facility built in the marina area, poles for erosion on East and West beaches, 2 new fishing piers with lights (one East Beach and one West Beach), 3 new finger piers (2 Marina area and 1 East Beach), swimming enhancements and the creation of a development plan. In April 2002, Lake Tholocco once again reopened to the public with much improved facilities. The Outdoor Recreation operation was moved back to Lake Tholocco in March 2003 once the renovation of the Equipment Issue/Office facility was completed.

In September of 2003, DFMWR contracted with Parsons Engineering and Plans Company to complete developmental tasks and prepare a Lake Tholocco Area Development Plan. The development plan covered five general recreation areas based upon location (East beach; Lake Tholocco Marina; West Beach; Singing Pines; and Engineer Beach RV Park, with a proposed trail system for hiking and jogging. This plan was reviewed and updated by PBS&J from Panama City, Florida with the U.S. Army Corps of Engineers, Mobile District office.

The East Beach recreational area proposed 33 cottages, a lodge, pavilion, fishing pier, and infrastructure. The Lake Tholocco Marina area included a new marina on the water, support building, boat storage, paving, two pavilions, playground, and infrastructure. The West Beach area proposed improving the designated swimming area, adding three pavilions, two playgrounds, and infrastructure. The Singing Pines area proposed developing an area for 10 to 12 cabins, a multipurpose building, and infrastructure. The Engineer Beach RV Park area proposed adding 30 RV camp sites and infrastructure. The hiking/jogging trail is proposed to connect the five recreation areas by circling all of Lake Tholocco.

DFMWR utilized this plan to justify projects and to improve the area for outdoor recreation needs of Soldiers and Families. DFMWR began receiving approval for funding to begin construction. In 2004, 30 campsites, with electricity, water, RV camping pad and a new sewage drain field and disposal area was added to the Engineer Beach RV Park area for a cost of $750,000.

In 2006, DFMWR received approval and funding for $1,500,000 to begin construction on 12 cabins, infrastructure, and all aspects of utiliies for the Singing Pines area. The facilities opened February 2008.

In 2008-2009, a construction project was completed to provide a Marina, with boat storage slips for a cost of $348,000. This facility is in the Lake Tholocco Marina area on the west side of the lake.

In 2008, playground equipment, for a cost of $112,000 was installed at West Beach, Singing Pines, and Engineer Beach RV park areas.

In 2009, a gazebo was conststructed in the West Beach park area for a cost of $90,000. Also, the West Beach swimming areas was enclosed for a cost of $115,000.

In 2009 a renovation project was begun to pave driveways and correct erosion issues at the Singing Pines cabin location. This project cost $29,000.

In 2009, Singing Pines park area was provided a boat slip dock area for a cost of $52,000.

Outdoor Recreation operates and oversees patron use of four pond/park areas on the installation, aside from Lake Tholocco. This includes Parcours, Ech, Buckhorn, and Beaver. The areas are open for fishing and park activities.

13.5 Outdoor Recreation Branch Operations

The Outdoor Recreation Branch is open year-round. The Branch is operated by a staff of one manager and six year-round employees. Peak season for labor is April through September. The Hunt Control Office is operated from October through January by four nonappropriated fund employees and during the summer lake operation (April through September) two cooks, five lifeguards and two additional laborers are required.

13.6 Hunting, Fishing, and Trapping Programs

13.6.1 Hunting, Fishing, and Trapping Activities

Deer hunting is the most popular consumptive-use activity with the largest number of man-days. Fishing is second, although there is no accurate means of recording man-days. With Lake Tholocco opening for fishing in May 2004, fishing activity has increased and is close to by passing deer hunting as the most popular activity. Turkey hunting comes next, followed by small game hunting. Trapping has a very small participation. In general, both hunting and fishing are utilized extensively at Fort Rucker.

Four ponds (Parcours, Ech, Buckhorn, and Beaver) are open for fishing. Parcours is limited for youngsters 15 years and under.

Computer-generated records at Outdoor Recreation show sales of various hunting, fishing, and trapping permits for each sales year. Also recorded are sales by each of the 14 types of purchasers comprising the active duty, retired, and civilian communities. Individuals meeting the Alabama criteria as totally

disabled and possessing a special annual State of Alabama fishing license for totally disabled persons are permitted to fish on Fort Rucker at no cost. Personnel 65 years of age and older are permitted to hunt, fish, and trap on Fort Rucker at no cost.

13.6.2 Recreation and Game Management

Obviously, hunting, fishing, and trapping programs are ultimately tied to the success of the game management program (discussed in sections 8.4 and 8.5.1). There is potential to increase the use of some hunting, fishing, and trapping programs, but fulfilling that potential is not easy in most cases. For example, some species are not highly prized, and regardless of potential for increases, there is little reason to anticipate increased recreational participation in pursuit of such species. As another example, there is an inherent growth potential for archery hunting due to the limited space required by individual archers and their lower harvest success. However, it is unlikely to presume that enough people would be willing to take up archery hunting to fulfill that capacity.

In general, there is potential for increases in deer hunting, especially for archery and black powder hunting. Turkeys are increasing throughout Fort Rucker, and there are growth potentials for hunting. Turkey hunters require considerably more space than other hunters, so the potential is not great if quality hunting conditions are to be maintained. There is potential for increased feral hog hunting, and this would help keep hog numbers reduced. There is especially room for additional tree stand hunters for hogs. Most small game populations vary considerably from year to year due to factors largely out of control of Fort Rucker wildlife managers. Potential for growth of hunting small game is relatively unpredictable, and some of these species have little demand.

Growth potential for waterfowl hunting was limited due to a lack of waterfowl habitat, especially during the period when there was no Lake Tholocco. Since Lake Tholocco has been restored, the potential for recreational increases in fishing and waterfowl hunting will be tremendous.

13.6.3 Hunter and Angler Administrative Processes

Military installations usually have complex hunter and angler control systems. These are needed to accommodate recreational activities without interference with the military mission and to ensure safe recreational experiences.

13.6.3.1 Hunting, Trapping, and Fishing Regulations

The Alabama Division of Wildlife and Freshwater Fisheries issues regulations for hunters, anglers, and trappers in Alabama, including those who use Fort Rucker. Army Regulation 200-3, *Natural Resources - Land Forest and Wildlife Management,* and Fort Rucker Regulation 215-1, *Hunting, Fishing, Water Safety, and Trapping,* are primary means of establishing controls on hunting, trapping, and fishing as well as other natural resources-related activities on Fort Rucker. Army Regulation 215-1, *Morale, Welfare and Recreation Activities and Nonappropriated Fund Instrumentalities*, provides the regulatory framework for managing recreational aspects of hunting and fishing on Army installations.

13.6.3.2 Fort Rucker Permits

In order to participate in hunting, fishing, or trapping on Fort Rucker, individuals must obtain appropriate post permits and stamps from Outdoor Recreation. Costs of these permits and stamps are subject to

change, and there were general price increases in 2001. Permit fees are divided 50:50 between Sikes Act and Recreation fees, with 10% of Sikes Act fees also going to Outdoor Recreation to offset the cost of selling permits. Tree stand fees are an Outdoor Recreation rental service. The use of permit funds for fish and wildlife management (90% of Sikes Act fees) is described in Section 17.4.

13.6.3.3 State License Sales

Persons are responsible for obtaining Alabama hunting, fishing, or trapping licenses before obtaining post permits. The Outdoor Recreation Branch sells state licenses, but it does not sell Federal or State waterfowl stamps. The sale of State and Post licenses/permits/stamps is facilitated using a microcomputer, which reduces sales cost, administrative overhead, and printing costs as well as provides immediate access to records for safety and law enforcement purposes. Outdoor Recreation receives a $0.25 fee for each State license sold.

13.6.3.4 Check-out and Clearing Procedures

Fort Rucker Reg. 215-1 outlines specific requirements of hunters, anglers, and trappers for check-out and clearing procedures. To hunt, hunters are required to sign in and out of areas utilizing the Hunt- Trac system. However, hunters are required to call Range Control prior to hunting to confirm areas are open at times other than during deer season.

All hunting is controlled through the Hunt-Trac system, which is an automated system. No hunting is allowed during Thanksgiving, Christmas and New Years. Range Control notifies Outdoor Recreation of areas open or closed to hunting daily, subject to aircraft/training changes. Hunters are required to call the Hunt-Trac system prior to hunting and following hunting to clear the area. Harvested deer and turkeys must be registered through the weigh-in stations.

Anglers are not required to check-out or clear after fishing. When ponds or streams are closed for any reason, notices will be placed on the Outdoor Recreation web site.

Trappers are required to check with Range Control and Hunt-Trac system prior to entering areas for trapping. Trapping is only allowed in open training areas. Trappers must check with Range Control and Hunt-Trac each day to determine if areas with traps are open the following day. If they are to be closed for training, all traps in areas to be closed must be removed prior to that day. This provision is very restrictive, and it is a primary reason for the extremely limited use of traps on Fort Rucker. Fort Rucker Reg. 215-1 includes additional trapping provisions including the requirement to report take to the Fish and Wildlife Section.

13.6.3.5 Hunting/Fishing Maps

Fort Rucker maps are essential for hunter and angler use of range areas. These maps are included in Fort Rucker Regulation 215-1. These maps feature off-limits areas, hunting areas, fishable ponds and streams, and training areas. In addition, Outdoor Recreation Branch has a single-page map of ponds and streams open to fishing.

13.6.3.6 Safety Considerations

Hunters born on or after 1 August 1977 must satisfactorily complete a State-certified hunter education course before being authorized to purchase a Fort Rucker hunting permit. In addition, all persons who

hunt on Fort Rucker are required to view a safety film prior to purchasing post permits. Dogs may not be used on Fort Rucker for deer drives. Fort Rucker Reg. 215-1 contains many references to hunting, fishing, and water safety practices and requirements.

13.6.4 Privately Owned Weapons Security

The Army, in general, is concerned over the security of privately owned weapons. Many of these are used for hunting. At Fort Rucker, USAAVNC Reg. 190-31, *Crime Prevention Program*, and USAAVNC Reg. 600-1, *Prohibited and Regulated Conduct*, provide means for commanders to designate where soldiers store their privately owned weapons. Military hunters who live on post must abide by these weapons storage decisions.

13.6.5 Organized Hunts and Fishing Tournaments

The Outdoor Recreation Advisory Council Hunting Chairman, along with the Fish and Wildlife Administrator, Chief Game Law Enforcement Officer, and Manager, Outdoor Recreation Branch are designated agents for the coordination, supervision, and approval of group hunts. During 2010-2014, such hunts will include youth hunts and/or disabled hunts.

13.7 Other Natural Resources Oriented Outdoor Recreation

Fort Rucker has a plethora of natural resources-related recreational activities other than hunting, trapping, and fishing. These range from more passive activities such as picnicking, wildlife watching, nut and berry picking, and nature photography to more active recreational outlets such as hiking, horseback riding, recreational shooting, and camping.

13.7.1 Lake Tholocco

On October 22, 1999 a ground restoration ceremony was held to mark the beginning of the reconstruction of Lake Tholocco. Major General Anthony R. Jones, commander of the U.S. Army Aviation Center, lead the effort to ensure the restoration of the lake and its surrounding recreational facilities. The $6.3 million restoration project included numerous fishery improvements, including construction of 10 islands and two jetties, installation of fish attractors, and the construction of ditches with adjacent concrete rubble piles. In the upper portion of the lake, where trees were not removed, navigation paths and openings were created for access and structure. Spawning areas have been created using pea gravel in four to six feet of water.

In November 2001 the gate to the lake was closed and the process of refilling the lake began. In February 2002 the Alabama State Hatchery restocked the lake with 186,000 bream, bluegill and shell cracker hatchlings. The hatchlings were supplied at no cost to the Army. In June 2002 largemouth bass, hybrid stripers and channel catfish were also placed in the lake.

On April 9, 2002, Lake Tholocco the heart of the Fort Rucker Outdoor Recreation program, reopened. The 640-acre lake provides opportunities for outdoor activities to include fishing, wind surfacing, jet skiing, canoeing, swimming and hunting. In May 2004 Lake Tholocco opened for fishing.

Lake Tholocco is critical to Fort Rucker fishing, important to hunting, and very important to the conservation of biological diversity in general.

13.7.2 Riding Stables

In 1986 a new Fort Rucker Riding Stables was opened under the auspices of DFMWR to replace an aged facility operated by a private association. The Riding Stables includes 80 stalls with paddocks, 18 box stalls, three transient barms with 72 stalls, farrier shed with a double wash rack, two hay barns, clubhouse with office and kitchen, covered arena, three lighted arenas, three pastures, two round pens, and over 50 miles of trails. About 2,000--3,000 trips on horse trails are made annually.

Retirees and "other status" users of the Riding Stables are important to the cohesiveness of the Riding Stables, probably due to the transitory nature of active duty Soldiers. It is open to virtually all members of the Fort Rucker community, and about half of the horse stalls are rented by active duty personnel. Many active duty personnel with horses at the Riding Stables consider Fort Rucker as their retirement home due to the importance of horses in their lives.

The Riding Stables is operated by one full-time Program Manager and a staff supportive of the needs of the patronage. Funds for operations come from stall rental (currently $65 monthly), feed service income, feed store income, contract lessons, and special events. Special events include nationally-sanctioned shows, U.S. Combined Training Association Event of Southeastern Circuit, North American Trail Riding Club trail rides, American Quarter Horse Association shows, tri-state gymkhanas, dressage shows, hunter-jumper shows, open horse shows, and fun days.

13.7.3 All Terrain Vehicles

All Terrain Vehicles (ATV's) have great potential to damage natural resources. Army Regulation (AR 200-1) is very restrictive on the use of ORVs for recreation. No off-road driving is allowed on Fort Rucker. Vehicles commonly used as ORVs must remain on gravel or paved roads. Exceptions to this policy include handicapped hunters, military use, law enforcement, retrieval of deer by Area Guides, and Natural Resources Branch activities.

13.7.4 Camping and Picnicking

Fort Rucker has one travel camp with 18 rustic and 30 modern campsites for recreational vehicle or tent camping. Sites have water and electrical hookups. A rest room with showers and a recreational vehicle dumpsite are also available at the camp.

There is a one-way loop access road that generally follows the existing outer loop of the facility. The existing latrine, pump-house, and lake-front pavilion are to be preserved. The RV sewage dump station will remain in the existing location with improved access (asphalt) and increased capacity (1,000 gallon). The park includes 16 drive-through and 14 back-in campsites.

The post has five picnic and playground areas with an annual usage by 120,000 military and civilian personnel. Areas around fishing ponds are maintained and mowed. There are plans for latrines at Beaver and Buckhorn lakes, both of which are popular recreation sites.

13.7.5 Watchable Wildlife Program

The recreational pursuit of wildlife watching is obviously dependent upon wildlife abundance and observability. Section 12.7 describes the Watchable Wildlife program on Fort Rucker. Outdoor Recreation plans to build a combination jogging/walking trail during the next five years around Lake Tholocco.

13.7.6 Boating and Canoeing

Boating and associated water activities are important aspects of the Outdoor Recreation program and have increased tremendously with the restoration of Lake Tholocco. The post has four concrete boat launch ramps at Lake Tholocco. Repairs to the ramps were completed in 2001 by the 46th Engineers prior to the refilling of the lake. Ramps at the Marina and Engineer Beach were extended for improved access.

A canoe trail has been developed along Claybank Creek and Blacks Mill Creek. This canoe trail still needs work, but it can be used following rainfall.

Since the restoration of the lake Outdoor Recreation has added 4 pontoon boats, 4 fishing boats and 4 wakeboard to the fleet that are available for issue. An 18-boat covered slip marina, with electricity is available for customers for boat storage.

13.7.7 Recreational Shooting

Recreational shooting is an important aspect of the Fort Rucker outdoor recreation program. The post has a skeet range and an archery range. The skeet range is the responsibility of DFMWR, but it is rented and operated by a private organization, the Fort Rucker Skeet and Trap Club. The facility includes six skeet ranges, two trap ranges, and a clubhouse. In FY 95 the post spent $7,000 for new trap machines for this facility. It is generally open weekends and holidays.

The archery range is operated and maintained by an appoved private organization, the Southeast Alabama Archers club. The facility has a National Field Archery Association style range with an 80-yard practice/zero range. The club has field, hunter, animal, and 3D shoots. The facility is located at Lake Tholocco.

13.7.8 Outdoor Equipment Checkout

Outdoor Recreation operates an outdoor equipment checkout center. For reasonable fees personnel may obtain camping, boating, jet skiing, and other assorted outdoor recreation equipment for designated time periods. Funds received from the Army Community of Excellence were utilized to acquire new equipment and needed items for the checkout facility. Equipment is now updated each year with items desired by Army patrons. With the reopening of Lake Tholocco, boats have been procured for patron use. Boats, camping equipment and canopies are presently the most popular requested items.

13.8 Youth Recreation

Fort Rucker attempts to meet the needs of scouts, school and college classes, and other youth groups for recreation. Section 12.8 summarizes these programs. These groups occasionally use the post for camping and hiking.

13.9 Recreation and Ecosystem Management

A basic tenet of ecosystem management is the "human values and use" component. Fort Rucker's outdoor recreation program affects ecosystems in terms of both products (fish and game species harvested and plant products) and disturbance associated with recreationists. Fort Rucker is well aware of the over-riding need to ensure these activities do not significantly impact overall ecosystem integrity. Activities such as game harvest, horseback riding, recreational shooting, water sports, etc. will be monitored for impacts on ecosystem integrity. Special consideration will be given to protection of critical areas (nesting sites, highly erodible areas, etc.) from negative impacts due to outdoor recreation.

14.0 CULTURAL RESOURCES PROTECTION

14.1 Governing Regulations

Cultural resources protection programs at Fort Rucker are provided in accordance with Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. Section 470, as amended), the Archeological Resources Protection Act (16 U.S.C. Section 470aa-47011), the American Indian Religious Freedom Act (42 U.S.C.), the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. Section 3001 *et seq.*), DoD Directive 4710.1 (*Archeological and Historic Resources Management*, 1984), and AR 420-40 (*Historic Preservation*). Management of cultural resources on Fort Rucker is a mission of the Environmental Division, DPW. The primary source of outside assistance is the State Historic Preservation Officer (SHPO) who is also the primary regulator with regard to cultural resources in Alabama. The SHPO will provide Section 106 guidance as the INRMP is implemented.

14.2 Cultural and Historic Resources

Fort Rucker has completed its Historic Preservation Plan (Harvey *et al.*, 1996). This Plan will be used to guide the protection of historic and cultural resources on the installation during implementation of this INRMP.

14.2.1 Prehistoric and Pre-military Historic Land Use

The East Gulf Coastal Plain has been inhabited by humans for at least 12,000 years. During that long span, incremental adaptation to changing natural and social environments resulted in the evolution of complex cultural systems. Earliest inhabitants probably based their economy on hunting the last of the Pleistocene megafauna, such as mastodon and mammoth. Following their extinction, smaller game animals were exploited. Through time, as human populations increased and natural resources decreased, there was an added emphasis placed on plant foods. By the time the first European explorers made contact with southeastern Native Americans, major segments of the population depended on a variety of agricultural products supplemented with wild foods for their sustenance (Southeastern Wildlife Services Inc., 1984)

Evidence of prehistoric human occupation of the Fort Rucker Military Reservation is generally confined to diffuse scatters of chert flakes, projectile points, and some pottery. The number of artifacts at each site is usually less than 37, but a 10% stratified sample of the Reservation in 1984 identified 226 prehistoric sites - at least one on nearly every knoll overlooking a creek. Laboratory analysis of these artifacts indicates that humans first occupied the area during the Paleo-Indian Period, 12,000-11,000 years ago (Southeastern Wildlife Services Inc., 1984).

The heaviest prehistoric human use occurred between the Late Archaic and Middle Woodland Periods, 4,000 to 1,500 years ago, culminating about 1,500 years ago in what apparently was a major village or base camp on high ground overlooking Steep Head Creek. The village was typical of the late Woodland Period, 1,500 to 1,100 year ago when hunting and gathering were supplemented by increased use of cultivated foods, including corn and squash. Settlements in the area included large villages along larger creek and river flood plains, as well as many smaller sites in a variety of environments. The settlement overlooking Steep Head Creek was typical of the time. Little evidence of subsequent use of the Fort

Rucker area by Native Americans has been found, partly because later societies were based heavily on agriculture (squash and maize), and apparently the excessively drained sandy soils of Fort Rucker could not produce high crop yields under a system of swidden cultivation (Southeastern Wildlife Services Inc., 1984).

The subsequent Mississippian Period was marked by significant changes in the subsistence base and social order of Southeastern Native Americans. Aggregate groups living in large permanent settlements were increasingly common. Within the lower Chattahoochee River Valley, east of Fort Rucker, there are numerous sites dating from the Late Mississippian period (500 years ago) with evidence of maize culture, large villages supporting very large structures, and numerous small sites of the farmstead class. This period is not well represented on Fort Rucker (Brockington and Associates 1995).

Although the Wiregrass was once sparsely populated, it was claimed by the Muskogee linguistic branch of the Creek Indians. Most Native American villages of Georgia and eastern and central Alabama were loosely bound together in the Creek Confederacy. North and east of present-day Fort Rucker, especially along the Chattahoochee River, there was a concentration of Creek villages. During the 18th Century, following British establishment of the colony of Georgia, the Creeks gradually ceded their eastern lands to Great Britain and then to the independent United States. They continued to occupy and maintain claim to western Georgia and central and eastern Alabama until the 19th Century. As settlers from the United States encroached upon these lands, however, many Creeks became disgruntled and antagonistic toward the new American nation; some of them made common cause with the British during the War of 1812 (Higginbotham /Briggs and Associates, 1991; Dothan Progress Ltd., 1995).

In 1814 the more hostile faction of the Creek Confederacy was defeated by an army led by General Andrew Jackson at the Battle of Horse Shoe Bend in east central Alabama. In the resultant Treaty of Fort Jackson, all Creek territory in central and south Alabama and south Georgia was ceded to the United States. Between 1821 and 1832 the Creeks were forced to cede their remaining lands in western Georgia and east-central Alabama in return for new lands west of the Mississippi. As a result of the Creek cession of 1814, the Wiregrass area was opened to white settlement (Higginbotham/Briggs and Associates, 1991; Dothan Progress Ltd., 1995).

Euro-American and Afro-American settlement of the area began during the 1820s. The vast majority of the pre-Fort Rucker population lived on small farms, more or less evenly scattered along the road system. Many farmers were share-croppers who earned their livelihood cultivating cotton. Archaeological evidence indicates their material possessions were few, and meals were often consumed from serving bowls. A high proportion of food storage artifacts (canning jars and stoneware fragments) indicates a high degree of self sufficiency among these late nineteenth and early twentieth century farm families (Southeastern Wildlife Services Inc., 1984).

Alabama was admitted to the union in 1819, and the westward expansion of cotton production brought a flood of settlers into the new state. The Wiregrass region was not considered prime cotton producing land, so it was settled, for the most part, by non-slave-owning small farmers. Dale County, encompassing all of present-day Dale, Coffee, and Geneva counties, was incorporated in 1824, and Coffee County was formed from the western part of the original Dale County in 1841. By 1870 Ozark, the largest town of the two-county area, had a population of only around 600 (Higginbotham/Briggs and Associates, 1991; Dothan Progress Ltd., 1995).
Cotton agriculture became more widespread in the Wiregrass region with increased use of commercial fertilizer during the late 19th and early 20th centuries. Cotton production contributed to the further depletion of the already thin soil of the area and led to an agricultural crisis with the advent of the boll

weevil during the early 20th Century. The boll weevil caused people of the Wiregrass to turn to crops other than cotton (Higginbotham/Briggs and Associates, 1991; Dothan Progress Ltd., 1995).

Four small, incorporated farm communities, Haw Ridge, Westville, Kleg, and Douglas served the needs of these farm families. Haw Ridge, which contained 16 permanent structures, was located on the Dale-Coffee County line on land that was later converted to the ordnance impact area. Westville was located north of Steep Head Creek, west of Black's Mill Creek and east of the county line. This settlement included a store with post office, a woodshop, a smithy, a doctor's office, and a school that, based on federal census schedules of 1860, served 206 farm families. Kleg was a dispersed settlement of about a dozen families, situated on uplands south of Steep Head Creek and west of Claybank Creek. The Douglas hamlet of five structures was located on Kelly Mill Creek in the extreme southeastern portion of the post, overlooking the railroad and floodplain of the Choctawhatchee River (Southeastern Wildlife Services Inc., 1984).

When the government acquired Fort Rucker, over 400 farm families were displaced. Property that had been farmed since before the Civil War was abandoned, and houses and other structures were subsequently razed (Southeastern Wildlife Services Inc., 1984).

14.2.2 History of Military Use

Section 2.4, *Acreage and Acquisition*, and Section 2.5, *Installation History*, chronicle the history of Fort Rucker since military occupation of the land.

14.2.3 Cultural Resources Surveys

Appendix 14.2.3 (Rust Environmental and Infrastructure, 1999) summarizes the 16 cultural resources surveys on Fort Rucker. Brockington and Associates, Inc. (1995) also summarize (pages 32-36) the 15 surveys prior to their survey. Fort Rucker has completed 100% of its Phase I surveys including leased lands. Five sites on Fort Rucker are eligible for inclusion on the National Register of Historic Places, and ten sites on Fort Rucker and eight sites on leased lands remain eligible. Only one structure on Fort Rucker is potentially eligible for the National Register. The inventory includes 315 archeological sites on Fort Rucker and 27 sites on leased lands (Harvey *et al*., 1996). Brockington and Associates, Inc. (2008) reported that there are no Cold War-Era Resources (1955-1965) or Military Landscapes at Fort Rucker that are eligible for inclusion on the National Register of Historic Places. Headquarters, Department of the Army has adopted a Cultural Landscape Planning Approach as outlined in AR 200-4.2-1.b. This approach uses the principles of ecosystem management for planning and management of cultural resources within a context of the integrated management of land, resources, and infrastructure.

14.3 Natural Resources Management Implications

Early natural resources projects were overlooked as potential causes of adverse impacts to archeological sites. Activities such as vegetation clearing, wildlife food planting, timber management, and training land rehabilitation are potentially damaging. In order to prevent activities from impacting cultural resources, natural resources projects that involve ground disturbing activities will be processed through the Fort Rucker cultural resources manager.

Ground-disturbing natural resources projects in areas with known sites must have site-specific surveys prior to implementation. For example, the 1995 cultural resources survey by Brockington and Associates,

Inc. included timber sale areas and areas where erosion control projects are planned. An exception to this requirement is food plots in already disturbed sites. Unless they are deep plowed (> six inches deep), they do not require cultural resources surveys.

Determination of effect and consultation guidelines provided in implementing regulations for the National Historic Preservation Act (36 CFR 800) will be followed during Environmental Division review of projects. Any project assessed as having an effect on a cultural resource site at Fort Rucker will be coordinated with the Alabama SHPO.

Fort Rucker will address cultural resources program requirements, as well as meet goals of natural resources programs. Natural and cultural resources managers at Fort Rucker will coordinate with one another during development of natural resources projects. Through this partnership, Fort Rucker will provide both natural and cultural resources for future generations to enjoy.

15.0 NATIONAL ENVIRONMENTAL POLICY ACT IMPLEMENTATION

The National Environmental Policy Act (NEPA) requires all Federal agencies to disclose environmental concerns associated with human activities and resolve them to the best degree possible. Implementing NEPA regulations (AR 200-1, *Environmental Protection and Enhancement*) entails mitigation of significant damage to the quality of the human environment. NEPA was not legislated to stop actions; rather, it was crafted to identify environmental problems and resolve them at the early stages of project development.

15.1 Objectives

- Identify projects and activities on Fort Rucker that might impact natural resources and work with project planners to resolve issues early in the planning process using the NEPA process.
- Use NEPA to ensure this INRMP is analyzed and publicly reviewed according to the spirit and letter of NEPA.
- Help Fort Rucker comply with NEPA.

15.2 Responsibilities and Implementation

15.2.1 Responsibility

The DPW Environmental Office has primary responsibility for NEPA management at Fort Rucker. One person is assigned NEPA as the primary duty. This person reviews individual job orders, service orders, and project specifications to determine NEPA documentation requirements. Items that appear to affect natural resources are sent to the Natural Resources Branch for review.

15.2.2 NEPA Documentation

Army Regulation 200-1 (*Environmental Protection and Enhancement)* requires a proponent to prepare and fund NEPA documentation. At Fort Rucker proponents of projects generally pay for either the Mobile COE District or contractors to prepare this documentation.

The most common NEPA document prepared for projects which impact natural resources is a Categorical Exclusion (CX) often with an attached Record of Environmental Consideration (REC). This simple documentation generally works well for routine projects such as vehicle decontamination exercises, borrow sites, small digging projects, and similar actions where natural sites are not damaged.

Environmental Assessments (EAs) are required when conditions for a CX are not met. This often happens when a new military exercise or range is planned, when the action involves a wide geographic area, or when wetlands or other sensitive plant communities may be involved. Examples include major LRAM projects, major erosion control projects, or range construction. EAs often exceed 10 pages, and require the Installation Commander's approval. If the EA determines that the project will not have a

significant impact on the quality of the human environment, then a Finding of No Significant Impact (FONSI) must be published and followed by a minimum 30-day public comment waiting period

If a FONSI is not appropriate, the following options are available:

- Modify the action to remove significant impacts.
- Mitigate significant adverse impacts.
- Drop the action.
- Publish a Notice of Intent to prepare an Environmental Impact Statement.

Fort Rucker has no NEPA documentation for the natural resources program as a whole. The EA with this INRMP fulfills that requirement.

15.2.3 Mitigation

Mitigation is an excellent way to either consider less damaging options or provide means to offset damage to the environment. Mitigation needs and methods involving fish and wildlife resources on Fort Rucker will be determined by the Fish and Wildlife Section with the assistance and guidance of the U. S. Fish and Wildlife Service, Alabama Department of Conservation and Natural Resources, and other appropriate agencies. Below are five general mitigation tactics:

Avoidance: Avoid adverse impacts on fish and wildlife resources by not performing activities that would result in such impact. Confine construction to areas where no significant impact would occur to fish and wildlife resources.

Limitation of action: The extent of an impact can be reduced by limiting the degree or magnitude of the action. Minimize impacts of construction projects by arranging timing, location, and magnitude of actions so that they have the least impact on fish and wildlife resources.

Restoration of the environment: This method restores the environment to its previous condition or better. This could involve reseeding and/or replanting an area with preferred food or cover plants after it has been damaged by construction projects.

Preservation and maintenance operations: This method designs the action to reduce adverse environmental effects. This could involve actions such as monitoring and controlling pollution, contamination, disturbance, or erosion caused by construction projects that would impact fish and wildlife resources.

Replacement: This method replaces the resource or environment that will be impacted by construction projects. Replacement can occur in-kind or otherwise, on-site or at another location. This could involve creation of the same type or better quality habitat for a particular impacted fish or wildlife species or creation of habitat for another species.

Mitigation identified in a FONSI is a Class 2 for environmental purposes and is to be funded by the proponent. This provides a reliable mechanism to fund mitigation included in NEPA documents. Fort Rucker will use this feature in 2010-2014.

15.3 NEPA and Natural Resources Management

Natural Resources Branch uses the Real Property Master Plan (RPMP), Environmental Assessment to ensure its activities (as described in this INRMP) are properly planned, coordinated, publicly reviewed, and documented. It also uses NEPA to identify problems associated with other organizations' projects, which affect the installation's natural resources when it has the opportunity to review such projects. Thus, the Natural Resources Branch is both a proponent and responsible agent for NEPA.

Siting range-related projects is perhaps the most basic decision, which requires input from natural resources personnel. If this phase is done within the cooperative spirit of NEPA, most other environmental problems are generally resolved with relative ease. Decisions such as specific siting or mission planning should be cooperatively discussed prior to preparing actual NEPA draft documents. When the proponent prepares NEPA documentation, the task is greatly facilitated if the proponent is preparing the document based on ongoing discussions with environmental experts.

An important offshoot of proper NEPA implementation is that better decision tools and methods are often utilized. Siting is one of the most common examples of project enhancement. When natural resources managers understand mission/project requirements in terms of land features and requirements, they often not only offer more potential site options to mission or project planners, but also offer alternatives to avoid or reduce future environmental conflicts.

In 2010-2014, the installation will take the following steps to improve the use of NEPA to protect and conserve Fort Rucker's natural and cultural resources:

- Route all NEPA documents, individual job orders, service orders, project specifications, etc. through Natural Resources Branch to ensure conflicts with natural resources are identified as early as possible in the planning stages.
- Ensure mitigation measures are included in the NEPA document when there is a proposed action that will impact natural resources. If such mitigation is included, ensure that it is entered in the EPR process with proponent's funding code.
- Use natural resources capabilities to provide mitigation. These resources include LRAM, special area protection, wetland management, etc.
- Track projects to ensure that mitigation is accomplished and that restrictions included within RECs are followed.
- Require that routine maintenance projects are evaluated using NEPA. This especially includes any projects that disturb soil or clear vegetation.
- Require that military training missions that are not documented via NEPA have such documentation.
- Use the lowest level of NEPA analysis feasible to minimize paperwork.

15.4 NEPA and This INRMP

Effects of implementation of this INRMP are being documented through an EA. The EA and this INRMP will be available for public review and comment prior to the decision to implement the plan. This EA for the INRMP will reduce the size of future Fort Rucker NEPA documents. This INRMP can be referenced with regard to description of affected environment to reduce verbiage in other NEPA documents.

16.0 BIOPOLITICAL/UNRESOLVED ISSUES

Some issues involving Fort Rucker are not easily resolved. This section deals with these issues. The first steps to tough issue resolution are admission that answers are not readily available and a willingness to keep working toward resolution.

16.1 Competing Land Uses

Probably the most difficult issue to resolve on Fort Rucker with regard to natural resources is competing uses of natural resources. Ecosystem management is a strategy, which seeks to meet many objectives, including human values, and maintain ecosystem functionality. This is somewhat of a "something for everybody" means of managing lands, but it is difficult to implement in many cases.

For example, military use is a valid ecosystem management use, but certain aspects of the military mission damage ecosystem functionality. The impact area, for example, burns far more regularly under military use than would naturally occur, and these fires affect natural functions. On the other hand, controlled burning during winter for forestry is less natural since most natural fires occur during warm seasons. Thus, on Fort Rucker some areas burn more than naturally in warm seasons and other areas are burned more than naturally in cold seasons.

Another example is the development of even-aged pine plantations. These are not natural ecosystems, yet they provide a needed human value... timber. Fort Rucker compensates somewhat for these plantations with additional hardwoods than would naturally occur in bottomlands, and there are other aspects of the forest management program, which also mitigate some negative effects of even-aged management.

Other examples of human use conflicting with ecosystem functionality involve game management. Quail management creates lower succession, open habitat that might, or might not, have occurred in abundance in this region during pre-settlement times. Many game and nongame species require substantial numbers of hardwoods, and it is uncertain just what the pine-hardwood mix was prior to settlement.

Fort Rucker has chosen to manage certain areas intensively for commercial timber products, other areas intensively for the military mission, and other areas intensively for wildlife. However, the present longleaf pine reforestation initiative at Fort Rucker attempts to capture some of the "something for everyone" philosophy by improving wildlife habitat, taking advantage of growing season burning, preserving America's renewable resources, and restoring a native ecosystem.

16.2 Ecosystem Management Partnerships

During the 2010-2014 period, Fort Rucker should forge more partnerships with neighbors and organizations interested in managing ecosystems that extend beyond installation boundaries. While this Ecosystem Management approach has potential to improve natural resources management, it also has potential to create biopolitical issues.

It would be fairly easy for Fort Rucker to form partnerships with natural resources-based state and federal agencies. These organizations understand the need for such partnerships, and often they are mutually beneficial. The USFWS and Alabama Department of Conservation and Natural Resources are good examples of organizations with which shared ecosystem management is happening. However, these are

agencies that share goals and objectives with Fort Rucker with regard to natural resources, but they do not share boundaries.

Most neighbors, however, are private landowners. As many published discussions of ecosystem management point out, the matter of private property rights often conflicts with objectives of managing ecosystems. "Takings" legislation at state and federal levels is indicative of the volatility of this issue. Private landowners have a profit motive, and they are not likely to change the management of their lands unless it suits their "bottom lines". There is a need for Fort Rucker to acquire additional lands in outlying areas for aviation students to navigate and fly to and to practice landings and take-offs. These could be private lands that are leased, or public lands that are available thru a Memorandum of Agreement. In any event, there would be no attempt to change the management of the land-other than to conserve, enhance and protect it in order for Fort Rucker to perform its training mission.

Other neighbors are urban. Urban priorities are often very different than ecosystem needs. Urban areas, both large and small, are very concerned about trying to come up with the dollars to comply with federal environmental (and other) mandates. Ecosystem management partnership activities with urban neighbors that cost money from them are likely to be difficult to implement.

The potential for creating biopolitical issues will not stop Fort Rucker from embarking on the ecosystem management route. Recognition and a willingness to deal with such potential conflicts are a part of the process itself. The installation remains committed to managing its large contiguous land holdings on an ecosystem basis and as good stewards of the environment.

17.0 IMPLEMENTATION

This plan is only as good as Fort Rucker's capability to implement it. This INRMP was prepared with a goal of 100% implementation. Described below is the organization, manpower, and funding needed to implement the management programs described in chapters 8-12.

17.1 Organization

The Natural Resources Branch and Range Division at Fort Rucker can implement most of this INRMP and fulfill goals and policies established in Chapter 1. Other organizations identified in Chapter 5 with responsibilities are also capable of implementing their portions of this INRMP with no organizational changes, although they may elect to make changes during 2010-2014 for improved operations efficiency.

17.2 Personnel

17.2.1 Staffing

The following staffing is required to implement this INRMP at Fort Rucker:

Natural Resources Branch:

Title	Number	Grade
Natural Resources Manager	1	GS-12
Land Management Section		
Management Agronomist	1	GS-11
Natural Resources Specialist	1	GS-09
Fish and Wildlife Section		
Fish & Wildlife Administrator	1	GS-12
Fish & Wildlife Biologist	1	GS-11
Biological Technician (Contract)	1	
GIS Analyst (Contract)	1	
Wildlife Biologist (Contract)	1	
Forestry Section		
Forester	1	GS-11
Forestry Technician	1	GS-09
Forestry Technician	1	GS-07
Forestry Technician	2	GS-05
Forestry Technician (Contract)	2	

The personnel lists found above do not include personnel within DPS, DCFA, and other personnel within DPW whom have significant roles in the implementation of this INRMP.

17.2.2 Personnel Training

Natural Resources and/or Training Division will send at least one person to each of the following annual workshops or professional conferences:

American Society of Agronomy annual meeting
National Military Fish and Wildlife Association annual workshop
North American Natural Resources Conference
Society of American Foresters annual meeting
SRP Workshop
The Wildlife Society conference
Southeastern Association of Fish and Wildlife Agencies annual conference
Alabama Chapter of The Wildlife Society annual meeting
International Erosion Control Association annual conference
Alabama Soil and Water Conservation Society annual meeting
Society of American Military Engineers monthly meeting

Other conferences/workshops will be evaluated for their usefulness, and decisions will be made based on appropriateness to ongoing projects and funding availability. Projects which are especially useful include forestry workshops, GIS basic and advanced training, Watchable Wildlife workshops, wetlands training, endangered species training, and Partners in Flight.

The Wildlife Society, Society of American Foresters, American Society of Agronomy, and National Military Fish and Wildlife Association are among the professional societies applicable to meeting the needs of Fort Rucker's natural resources managers. Membership in these societies is encouraged. They have some of the best scientific publications in their professions, and literature review is a necessary commitment to maintain standards. Attending meetings of these societies also provides excellent opportunities to communicate with fellow professionals as well as maintain professional standards.

17.2.3 Outside Assistance

Implementation of this INRMP will require active assistance from Fort Rucker's partners, both signatory and otherwise. Section 5 indicates agencies, organizations, and others in this category. Specific needs from organizations external to Fort Rucker are indicated throughout this document. It is impossible for Fort Rucker to hire the specialized expertise needed for some projects within this INRMP. Fort Rucker will require considerable expertise from universities, agencies, and contractors to accomplish some tasks within this Plan. Fort Rucker will reimburse parties for much of this assistance.

17.3 Project/Program Priorities

Preparation and implementation of this INRMP is required by the Sikes Act and/or Department of Army policy, and therefore, is a high funding priority according to OMB funding rules. The fact that this INRMP is a Federal Facilities Compliance Agreement with action required in a published NEPA document also qualifies it for high priority funding. There are also programs within this INRMP that are required for compliance with other laws and executive orders, especially involving pollution prevention, restoration, wetlands, etc.

However, it is unlikely that all programs within this INRMP will be funded immediately. Therefore, below sections define relative importance of projects and programs specifically included within this INRMP. Each priority category's programs are listed in order they are first mentioned in this document. Estimated time schedules are provided.

Lower priority projects may be implemented ahead of higher ones. This may occur due to funding restrictions. Some "High Priority" projects are critical, but they may not be compliance driven which makes funding more difficult. Below lists are based upon need and effect on Fort Rucker natural resources, not funding likelihood.

17.3.1 High Priority Projects/Programs

- Implement an Ecosystem Management strategy (1.4)
- Implement the ITAM program (1.5)
- Manage forested lands and restore longleaf pine ecosystems as identified (8.2)
- Provide wildlife considerations during forest management (8.2.17.2)
- Implement Best Management Practices (8.2.17.3)
- Manage forests for biodiversity (8.2.20)
- Outlease agricultural lands (8.3)
- Manage hardwoods for wildlife (8.4.2.1)
- Conduct prescribed burning (8.4.2.4)
- Manage game populations (8.5.1)
- Manage threatened, endangered, and special status species (8.5.2)
- Protect and manage wetlands (8.6)
- Protect and manage water quality (8.7)
- Implement LRAM (8.8)
- Implement soil resources management program (8.9)
- Maintain grounds (8.10)
- Implement pest management program (8.11)
- Protect areas of special significance (8.13)
- Conduct forest inventory (9.2.2)
- Monitor game species (9.3.1)
- Monitor fish populations (9.3.2)
- Monitor surface and ground water (9.4)
- Implement GIS and maintain databases (9.6.2)
- Obtain external assistance for program implementation (10.2 and 10.3)
- Implement natural resources law enforcement program (11.0)
- Manage hunters, trappers, and anglers (13.6.3)
- Manage other natural resources outdoor recreation (13.7)
- Protect cultural resources while implementing INRMP (14.3)
- Use NEPA mitigation (15.2.3)

- Natural Resources review of NEPA documents (15.3)
- EA on INRMP (15.4)
- Work to resolve biopolitical and unresolved issues (16.0)
- Provide personnel to implement this INRMP (17.2.1)
- Provide personnel training (17.2.2)
- Obtain funding to implement this INRMP (17.4)
- Provide command support to implement this INRMP (17.6)
- Establish and implement an Army Compatible Use Buffer (ACUB) program

17.3.2 Important Projects/Programs

- Manage for forest insect/disease minimization (8.2.18)
- Provide supplemental food plantings and clearings (8.4.2.3)
- Fertilize ponds (8.4.3.1)
- Manage furbearers and predators (8.5.3)
- Manage other nongame species (8.5.4)
- Maintain pond dams (8.4.3.4)
- Prevent and suppress forest fires (8.12)
- Update floral surveys (9.2.3)
- Evaluate use of satellite imagery (8.2.5) 2000-02
- Monitor neotropical birds (9.3.4)
- Monitor other wildlife species (9.3.5)
- Upgrade microcomputer software and hardware (9.6.1)
- Promote hunting and fishing awareness (12.6)
- Provide safety briefings (13.6.3.6)

17.3.3 Lesser Important Projects/Programs

- Establish and maintain artificial nest boxes (8.4.2.2)
- Control aquatic weeds (8.4.3.2)
- Lime ponds (8.4.3.3)
- Add fish attractors (8.4.3.5)
- Conduct site-specific soil testing (9.5)
- Use media (12.3 and 12.4)
- Support special environmental events (12.5)
- Develop Watchable Wildlife programs (12.7)
- Work with youth groups (12.8)
- Organize special hunts and tournaments (13.6.5)

17.4 Implementation Funding Options

Unlike most functions within the Department of Defense, natural resources management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different application rules. Below are general discussions about different sources of funding to implement this INRMP.

17.4.1 Forestry Funds

Forestry funds are generated from sale of forest products. Forestry Funds are centrally controlled, and Fort Rucker is limited to recovering its approved expenses for forest management. The remainder of the money generated by the Fort Rucker forestry program is split 60:40 between U.S. Treasury and the counties.

These funds are commonly called P7 funds. The account is called the Forest Reserve Account. Funds must be used only for items directly related to management of the forest ecosystem. Such items include timber management, reforestation, timber stand improvement, inventories, fire protection, construction and maintenance of timber area access roads, purchase of forestry equipment, disease and insect control, planning (including compliance with laws), marking, inspections, sales preparations, personnel training, and sales. Army Regulation AR 200-1 and DFAS- IN Regulation 37-1 Chapter 25 outline collection and expenditure systems.

The Forestry program will generate an average of about $640,000 annually during 2010-2014. Of this income, about $600,000 will be required to operate the Forestry program and purchase equipment annually, and the remainder will be apportioned between the counties and the U.S. Treasury.

17.4.2 Sikes Act Funds

Sikes Act funds are collected via sales of licenses to hunt or fish. They are authorized by the Sikes Act and regulated via AR 200-1. These funds may be used only for fish and wildlife management on the installation where they are collected. They cannot be used for recreational aspects of fish and wildlife management. They are exempt from the BCE cap, and they have no year-end (unobligated funds carry over on 1 October). Fee collection and administration (i.e. printing and issuing the State Sikes Act Permit) costs (not to exceed 10% of the annual Sikes Act revenue) are authorized.

Monies accrued from the collection of Sikes Act Permit fees will be expended in support of the Fish and Wildlife program on Fort Rucker and for no other purpose. Collections and disbursements will be accounted for in accordance with guidance provided for the appropriation titled “Wildlife Conservation, Military Reservations”, Army Account 21X5095 (Army Regulation 37-100 and 37-108). Unobligated balances shall be accumulated with current fee collections, and the total amount accumulated at the Installation will be available for obligation as apportioned by the Office of Management and Budget.

Army policy encourages financial self-sufficiency with regard to managing game populations on military lands. Fort Rucker is examining options to increase Sikes Act income to maintain the game base for its quality hunting and fishing program.

17.4.3 Agricultural Funds

Agricultural funds are derived from agricultural leases on installations. They are centrally controlled at both Department of Army and Major Command levels with no requirements for spending where they were generated. AR 200-1 outlines procedures for collection and spending these funds. They are primarily intended to offset costs of maintaining agricultural leases, but they are also available for preparing and implementing INRMPs. These are broadest use funds available exclusively to natural resources managers. They are exempt from BCE limits on the purchase of equipment.

AR-200-1 lists the following uses of agricultural funds:

- Administrative and operational expenses of agricultural leases.
- Initiation, improvement, and perpetuation of agricultural leases.
- Preparation, revisions, and requirements of integrated natural resources management plans.
- Implementation of integrated natural resources management plans.

Services in lieu of payments must provide these same services.

Fort Rucker itself does not normally receive funds from agricultural leases. The agricultural leasing program is handled thru the Mobile Districct Corps of Engeneers and their administrative costs in handling the program consume all monies that are generated as a result of the leases.

17.4.4 Environmental Funds

Environmental funds are a special subcategory of Operations & Maintenance (O&M) funds. Compliance with laws is the key to getting environmental funding. The funding process heavily favors high priority funding projects to return to compliance with federal or state laws, especially if non-compliances are backed by Notices of Violation or other enforcement agency action.

"Must fund" classifications include mitigation identified within *Findings of No Significant Impact* and items required within Federal Facilities Compliance Agreements. This INRMP is a Federal Facilities Requirement Agreement, and some projects and programs within it are also used to mitigate various military activities. The following table details funding for Environmental Projects from FY 10 – FY 14.

* Funds in thousands of dollars.

Environmental Projects*

Project	FY-10	FY-11	FY-12	FY-13	FY-14	Totals
Salaries for Natural Resources not included elsewhere	$60	$65	$70	$70	$75	$340
Implement INRMP (Ecosystem Management)	$485	$485	$485	$485	$485	$2,425
Preparation/Update INRMP				$55		$55
PLS T&E Species Gopher Tortoise Survey	$175	$175				$350
PLS (Siol Survey of Fort Rucker	$405	$405				$810
Totals	$1,125	$1,130	$555	$610	$560	$3980

The table above indicates projects for environmental funding as of Fall 2009. Projects specifically for NEPA, ground water monitoring, pest management, and cultural resources management are not included in this listing**.** During 2010-2014, Natural Resources personnel will be responsible for entering their budget data directly into the **EPR** computer-based budgeting process.

Thus, the total Environmental Fund budget for this INRMP is estimated at $3,980,000 for 2010-2014. These estimates will be adjusted, as needed each year.

17.4.5 Training Funds

The 5-year ITAM Work Plan is used to channel ITAM funding requests from DPTMS Fort Rucker, through IMCOM HQ G3/5/7 to DA G3/5/7. The Workplan Analysis Module (WAM) is a software application that was developed for the TRADOC Program Integration Office-Live (TPIO-Live) to automate the collection of installation-specific ITAM Workplan projects. IMCOM validated projects form the basis for funding calculations. The following table details Fort Rucker's ITAM budget requirements for FY-10 through FY-14.

ITAM Funding*

Project	FY 10	FY 11	FY 12	FY 13	Totals
LRAM	$1,678	$2,621	$1,560	$1,597	$7,456
SRA	$6	$6	$6	$6	$ 24
TRI	$131	$151	$159	$167	$ 608
RTLA	$6	$7	$7	$7	$ 27
GIS	$401	$448	$469	$492	$1,810
Totals	$2,222	$3,233	$2,060	$2,269	$9,925

* Funding in thousands of dollars.

Thus, the total ITAM budget for this INRMP is estimated at $9,925,000 for 2010-2013. These estimates will be adjusted as needed each year.

17.4.6 Other Funds

The only other funding for natural resources programs on Fort Rucker is the use of O&M funds, generally from DPW. These funds are used for erosion control and some fish and wildlife program support. For cost estimation purposes, annual costs of $50,000 are included from O&M funds for implementation of this INRMP. It is understood that O&M funds may also be used for other maintenance projects during the next five years.

Non-appropriated funds (NAF) are used to defray the outdoor recreation costs associated with this INRMP. However, these are not specifically included within this plan.

17.5 Estimated INRMP Implementation Costs by MDEP

Below is a summary of funding avenues and dollars required for implementation of this INRMP.

INRMP Funding

Type Funds*	FY 10	FY 11	FY 12	FY 13	FY 14	Totals
Sikes Act	$32	$35	$38	$40	$43	$188
Forestry	$450	$450	$450	$450	$450	$2,250
Agriculture	$20	$20	$20	$20	$20	$100
Environmental	$650	$650	$650	$650	$650	$3,250
ITAM	$2,222	$3,233	$2,060	**2,269**	**2,320**	$12,104
Other						$0
Totals	$3,582.39	$3,802.61	$3,909.93	$1,160	$1,163	$13,617.93

***** Funds in thousands of dollars.

Costs do not include related organizations such as PMO and Outdoor Recreation (except Sikes Act sales costs), nor do they include costs incurred by other agencies. NEPA, cultural resources management, water monitoring, non-Forestry road maintenance, and pest management costs are not included.

Fort Rucker, IMCOM-SE, the USFWS, and ALDCNR recognize that year-to-year congressional appropriations for the implementation of the Army's mission or changes in the Fort Rucker mission resulting from Base Realignment and Closure (BRAC) or Force Drawdown may reflect or necessitate different priorities. If these priorities require deferral, re-direction, or cancellation of anticipated projects or plans, Fort Rucker, in consultation with IMCOM-SE, will determine which projects or plans should be implemented first. In every case, Fort Rucker and IMCOM-SE will ensure that constraints on the military mission are minimized and avoided to the greatest extent possible.

17.6 Command Support

Command support is essential to implementation of this Plan. Many priority projects for natural resources management within the next five years require command support. This Plan has the support of the Fort Rucker Commander and other personnel in command positions who are needed to implement this INRMP. The Command is dedicated to implementation of this Plan as required by the Sikes Act and other Federal laws. Just as importantly, the Command is dedicated to maintaining and improving the military mission at Fort Rucker. Implementation of this Plan is a means to that end.

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PERSONS CONTACTED

Bludsworth, Evy - Deputy Director of the Directorate of Family and Morale, Welfare and Recreation
Clancy, John O. – Manager, Outdoor Recreation Program, Directorate of Family and Morale, Welfare and Recreation
Cowart, Susan – Installation Restoration Manager, DPW
Larimore, Robert - Natural Resource Program Manager, U.S. Army Installation Management Command, Southeast Region
Leyh, Bill – Director, DPTMS
Lowlavar, Melissa – Chief, Environmental Management Branch, DPW
Maxwell, Mike – Chief, Master Planning Division, DPW
Mayo, Charles E. – Fish and Wildlife Administrator, DPW
McDougal, Marcus – Director, DPS
Meissner, Paul – Air Traffic Control Specialist, DPTMS
Murphy, Bob - ITAM Coordinator, Range Branch, DPTMS
Newton, Casey H. – Installation Forester, DPW
Parmer, Delarie - Chief, Natural Resources Branch, DPW
Robinson, Barbara - Real Property Officer, DPW
Sparks, Sean – Chief, Training Division, DPTMS
Spillers, Daniel M. - Fish and Wildlife Biologist, Natural Resources Branch, DPW
Townsend, Alfred T. – Chief, Environmental and Natural Resources Division, DPW
Turnbow, Robert H. (PhD) - Pest Management Professional, DPW
Watkins, Doug H. Jr. - Agronomist, Natural Resources Branch, DPW

INTEGRATED NATURAL RESOURCES

MANAGEMENT PLAN

FORT RUCKER, ALABAMA

APPENDICES

APPENDIX 5.3.1: Specific Items of Cooperation Between the U.S. Fish and Wildlife Service, Alabama Department of Wildlife and Freshwater Fisheries, and Fort Rucker

PURPOSE: The purpose of this document is to specifically list items to be provided by the Alabama Department of Wildlife and Freshwater Fisheries (ADWFF), U.S. Fish and Wildlife Service (USFWS), and Fort Rucker for cooperative implementation of the Fort Rucker Integrated Natural Resources Management Plan. Items not specifically listed will generally be the responsibility of Fort Rucker unless the other agencies agree to assist with their implementation.

AUTHORITY: In accordance with the authority contained in Title 10, U.S. Code, Section 2671, and Title 16, U.S. Code, Section 670 the Department of Defense, the Department of Interior, and the State of Alabama, through their duly designated representatives whose signatures appear on the Fort Rucker Integrated Natural Resources Management Plan, specifically approve the Integrated Natural Resources Management Plan and the below specific items of cooperation between the three agencies.

MUTUAL AGREEMENT:

- Persons hunting, trapping, or fishing the lands or waters of Fort Rucker shall be required to obtain special Fort Rucker hunting, trapping, or fishing licenses unless exempt by Fort Rucker regulations. Funds derived from the sale of these licenses will be used exclusively for the implementation of the fish and wildlife management portion of the Fort Rucker Integrated Natural Resources Plan in accordance with Army regulations and the Sikes Act. Fees charged shall be established by the installation in accordance with Army regulations. Persons guilty of violating the requirement for these special licenses may be prosecuted under 10 USC 2671(c).

- Up to 10% of the Sikes Act fee may be used by the Morale, Welfare, and Recreation (MWR) organization to defray the cost of selling permits. A separate community recreation hunting and fishing activity fee, not accounted for as Sikes Act hunting and fishing fees, may be charged to users of optional hunting and fishing services, in accordance with Army Regulation 200-3. Revenues generated from these recreational activity fees will be deposited in the Fort Rucker MWR fund.

- Persons hunting, trapping, or fishing the lands of Fort Rucker must purchase State licenses, tags, and stamps as required by ADWFF, unless exempt by ADWFF regulations. ADWFF agrees that military personnel on active duty and permanently stationed in Alabama may purchase hunting, fishing, and trapping licenses at resident prices.

- A Federal waterfowl stamp is required for hunting waterfowl as prescribed by Federal laws.

- All hunting, fishing, and trapping on Fort Rucker will be in accordance with federal and state fish and game laws.

- Representatives of the ADWFF and the USFWS will be admitted to the installation at reasonable times, subject to requirements of military necessity and security. Such personnel may use U.S. Army transportation on a non-reimbursable basis, to include aircraft, for wildlife related functions

on Fort Rucker provided such transportation is available without detriment to the military mission.

- The ADWFF and USFWS shall furnish technical assistance for development and implementation of professionally sound natural resources programs on Fort Rucker provided funding for such support is available.

- Fort Rucker shall furnish assistance and facilities to ADWFF and/or USFWS for mutually agreed upon natural resources research projects. It shall be the policy of the Commanding General, Fort Rucker to encourage and support research conducted by the participating agencies. To this end, suitable land areas, animals, facilities, and personnel may be made available at the Commanding General's discretion, when requested, providing the proposed studies are compatible with, and in no way limit, accomplishment of the military mission.

- No exotic species of fish or wildlife will be introduced on Fort Rucker lands without prior written approval of the Army, ADWFF, and the USFWS.

- ADWFF shall establish season and bag limits for harvest of game species on Fort Rucker. Fort Rucker may make special requests for such regulations according to procedures established by ADWFF. Requests for regulations not in accordance with those established statewide will be based on data specific to Fort Rucker or designed to meet Fort Rucker's training schedules.

- Hunting, trapping, and fishing on Fort Rucker will be authorized and controlled by the installation commander in accordance with locally published installation regulations promulgated in compliance with applicable Federal and State laws, Army regulations, military requirements, and the Integrated Natural Resources Management Plan.

- Fort Rucker will operate biological check stations to collect harvest data required by ADCNR and Fort Rucker. ADWFF may collect additional data on fish or wildlife resources at Fort Rucker with approval of Fort Rucker for access to training lands.

- Public access for hunting, trapping, and fishing is approved under a system of controls established by Fort Rucker in cooperation with ADWFF. Civilians will be considered on an equal basis with military and Army civilian employees for permits and access to hunting and fishing areas. Should there be a need for quotas on the number of hunters permitted on a daily or seasonal basis for reasons of safety or recreational carrying capacity, such quotas will not be instituted prior to consultation with ADWFF. Persons holding hunting, fishing, or trapping permits will stand at par with each other for use privileges.

- Hunting, trapping, and fishing will be allowed only on those areas where there is no conflict with military training activities and no unreasonable safety hazard to participants, military personnel and dependents, or Army civilian employees. Certain areas will be closed to hunting and fishing, including, but not limited to impact areas containing unexploded ordnance.

- Fort Rucker has concurrent jurisdiction with regard to law enforcement. In areas of concurrent jurisdiction, Alabama laws may be enforced by either federal or state commissioned enforcement personnel. Enforcement will be a joint responsibility of Fort Rucker, ADWFF, and the USFWS.

- Fort Rucker agrees to cooperate with USFWS and ADWFF for management of any threatened or endangered species residing on the installation. Such efforts will be in compliance with Federal and State laws and applicable Army regulations.

- ADWFF and the USFWS will provide technical and professional advice on all matter concerning wildlife and fish management when necessary.

- Fort Rucker has the option to directly transfer funds to the ADWFF and USFWS for implementation of this Integrated Natural Resources Management Plan.

- It is understood that implementation of this INRMP requires certain latitude with regard to professional decisions. However, Fort Rucker agrees that any land use change which significantly impacts natural resources must include modification of this INRMP in addition to any other environmental compliance requirements.

LIMITATIONS:

The military mission of Fort Rucker supersedes natural resources management and associated recreational activities; and, such activities must in all instances be compatible with the military mission. However, where there is conflict between the military mission and provisions of the Endangered Species Act, the Sikes Act, or any other law associated with natural resources conservation, such conflicts will be resolved according to statutory requirements.

REQUIRED REFERENCES:

- Nothing contained in this agreement shall modify any rights granted by treaty to any Native American tribe or to members thereof.

- The possession of a special permit for hunting migratory game birds will not relieve the permittees of the requirements of the Migratory Bird Stamp Act, as amended.

- This INRMP is a Federal Facilities Compliance Agreement.

- As required by the Sikes Act, the following agreements are made:

(1) This Fort Rucker Integrated Natural Resources Management Plan is the planning document required by the Sikes Act, as amended. This Plan contains those items specifically required by law. In the event the Sikes Act is amended after this INRMP is signed, this plan will be amended to conform to the new requirements within the Sikes Act if needed.

(2) This plan will be reviewed by ADWFF, USFWS, and Fort Rucker on a regular basis, but not less often than every 5 years.

(3) No land or forest products from land on Fort Rucker will be sold under Section 2665 (a) or (b), Title 10 USC and no land will be leased on Fort Rucker under Section 2667 of such Title 10 unless the effects of such sales or leases are compatible with the purposes of the Integrated Natural Resources Management Plan.

(4) With regard to the implementation and enforcement of the Fort Rucker Integrated Natural Resources Management Plan, neither Office of Management and Budget Circular A-76 nor any successor circular thereto applies to the procurement of services that are necessary for that implementation and enforcement, and priority shall be given to the entering into of contracts for the procurement of such implementation and enforcement services with Federal and State agencies having responsibility for the conservation or management of fish or wildlife.

(5) The Fort Rucker Integrated Natural Resources Management Plan is not, nor will be treated as, a cooperative agreement to which chapter 63 of title 31, United States Code applies.

(6) This Integrated Natural Resources Management Plan will become effective upon the date subscribed by the last signature and shall continue in full force for a period of five years or until terminated by written notice to the other parties by any of the parties signing this agreement. This agreement may be amended or revised by agreement between the parties hereto. Action to amend or revise may originate with any of the other participating agencies.

APPENDIX 6.7: Scientific Names of Flora on Fort Rucker Mentioned in this INRMP[9]

Common Name	Scientific Name
Alder	*Alnus serrulata*
anise, Florida	*Illicium floridanum*
arum, green	*Peltandra virginica*
Ash	*Fraxinus* spp.
azalea, piedmont	*Rhododendron canescens*
beech, American	*Fagus grandifolia*
Beggartick	*Desmodium* spp.
birch, river	*Betula nigra*
Blackberry	*Rubus* spp.
Bladderwort	*Utricularia* spp.
blazing star	*Liatris* spp.
Bloodroot	*Sanguinaria canadensis*
Blueberry	*Vaccinium* spp.
blueberry-huckleberry complex	*Vaccinium* spp.
broom sedge	*Andropogon virginicus*
buckeye, red	*Aesculus pavia*
cardinal flower	*Lobelia cardinalis*
cherry, wild (blackcherry)	*Prunus serotina*
clubmoss	*Lycopodium* spp.
cypress, bald	*Taxodium distichum*
dayflowers	*Commelina* spp.
devilwood	*Osmanthus americana*
dogwood, flowering	*Cornus florida*
duck-potato	*Sagittaria* spp.
eastern red-cedar	*Juniperus virginiana*
fern, cinnamon	*Osmunda cinnamomea*
fern, southern maidenhair	*Adiantum cappillus-veneris*
fringe tree	*Chionanthus virginicus*
gallberry	Ilex glabra
ginger, wild	*Aristolochiaceae* spp.

[9] **For a complete list of flora confirmed on Fort Rucker, see Mount and Diamond (1992).**

Common Name	Scientific Name
goat's rue	*Tephrosia virginiana*
golden club	*Orontium aquaticum*
goldenrod	*Solidago* spp.
grass, panic	*Panicum* spp.
grasses	*Poaceae* spp.
greenbrier	*Smilax* spp.
gum, black	*Nyssa sylvatica*
gum, tupelo	*Nyssa aquatica*
hawthorn	*Crataegus spp.*
Hercules' club	*Aralia spinosa*
hickory	*Carya* spp.
hickory, sand	*Carya pallida*
holly, American	*Illex opaca*
honeysuckle, Japanese	*Lonicera japonica*
hornbeam	*Ostrya virginiana*
hydrangea, oak-leaf	*Hydrangea quercifolia*
indigo, wild	*Baptisia* spp.
ironwood	*Carpinus caroliniana*
jackson-brier	*Smilax* spp.
jessamine, yellow	*Gelsemium sempervirens*
laurel, mountain	*Kalmia latifolia*
legumes	*Fabaceae* spp.
lily, Atamasco	*Zephyranthes atamasco*
lily, spider	*Hymenocallis occidentalis*
lobelia	*Lobelia* spp.
ludwigia	*Ludwigia* spp.
magnolia, bigleaf	*Magnolia macrophylla*
magnolia, pyramid	*Magnolia pyramidata*
magnolia, southern	*Magnolia grandiflora*
maple	*Acer* spp.
maple, red	*Acer rubrum*
meadow beauty	*Rhexia* spp.
milkweed	*Asclepias* spp.
oak, black	*Quercus velutina*
oak, blackjack	*Quercus marilandica*
oak, bluejack	*Quercus incana*
oak, diamond-leaf	*Quercus laurifolia*

oak, dwarf (or sand) post	*Quercus margaretta*
oak, post	*Quercus stellata*
oak, sand laurel	*Quercus hemisphaerica*
oak, southern red	*Quercus falcata*
oak, turkey	*Quercus laevis*
oak, water	*Quercus nigra*
oak, white	*Quercus alba*
oak, willow	*Quercus phellos*
orchid, rein	*Platanthera clavellata*
palm, needle	*Rhapidophyllum hustrix*
palmetto	*Sabal minor*
partridge berry	*Mitchella repens*
pepperbrush, sweet	*Clethra alnifolia*
persimmon	*Diospyros virginiana*
pine, loblolly	*Pinus taeda*
pine, shortleaf	*Pinus echinata*
pine spruce	*Pinus glabra*
pineweed	*Hypericum gentianoides*
plum, wild	*Prunus americana*
poison-ivy	*Rhus radicans*
poison-oak	*Rhus toxicodendron*
prickly pear	*Opuntia humifusa*
sassafras	*Sassafras albidum*
sensitive brier	*Schrankia microphylla*
sesban, purple	*Sesbania punicea*
silverbell	*Halesia* spp.
sourwood	*Oxydendron arboreum*
sphagnum moss	*Sphagnum* spp.
St. John's wort	*Hypericum* spp.
sundew	*Drosera* spp.
sunflower, narrow-leaved	*Helianthus angustifolius*
sweet bay	*Magnolia virginiana*
sweet shrub	*Calycanthus floridus*
sweetgum	*Liquidambar styraciflua*
sweetleaf	*Symplocos tinctoria*
switchcane	*Arundinaria gigantea*
titi, white	*Cyrilla racemiflora*
treadsoftly	*Cnidoscolus stimulosus*

trillium	*Trillium* spp.
violets	*Viola* spp.
water shield	*Brasenia schreberi*
water-lily, fragrant	*Nymphaea odorata*
wax myrtle	*Myrica cerifera*
willow	*Salix* spp.
yaupon	*Ilex vomitoria*
yellow-eyed-grass	*Xris* spp.
yellow-poplar	*Liriodendron tulipifera*

APPENDIX 6.7.1: Evolutionary History of East Gulf Coastal Plain Vegetation

Below descriptions of evolutionary changes in vegetation within the East Gulf Coastal Plain were taken from Delcourt *et al.* (1993) and Ware *et al.* (1993), unless specifically stated otherwise.

Permian through Cretaceous Periods

The last episode of mountain building in the Southern Appalachian Mountains concluded some 260 million years ago, during the Early Permian Period when eastern North America collided with Africa and Europe, creating the supercontinent of Pangea. Resulting Appalachian upthrusts and folds were the long-term montane source of sediments for subsequent development of the Atlantic and Gulf Coastal Plains. Permian floras of southeastern North America were dominated by tree ferns and primitive gymnosperms, typical of humid tropic climates with mean annual temperatures > 77° F.

As Pangea began to break apart, South and North America separated from Africa and Western Europe, producing the Atlantic Ocean, a major phytogeographic barrier to land plant migrations. Development of coastal plain environments was accompanied by evolution and diversification of angiosperms. By 124 million years ago, primitive angiosperms had diverged into monocotyledons and dicotyledons; by 120 million years ago most generalized members of the subclass Magnoliidae had evolved; and by 105 million years ago representatives of Nymphaeales and subclasses Hamamelididae and Rosidae had evolved. By the end of the Cretaceous, 40% of all land-plant taxa were angiosperms, and vegetation was characterized by broad-leafed evergreen angiosperms forming relatively open forest canopies.

Tertiary Period

By the beginning of the Tertiary Period some 66 million years ago, southeastern North America had rotated northeastward and was situated from between 35° to 45° North and 40° to 70° West. Relatively high sea levels placed the marine shoreline at the innermost Atlantic Coastal Plain, bordering the Piedmont, and marine waters encroached into the northernmost Mississippi Embayment of the Gulf Coastal Plain. Periodic fluctuation in sea level produced major inland advances of the shoreline over the coastal plains, followed by offshore retreats that exposed marine sediments deposited on coastal plains. A brief cold episode at the beginning of the Tertiary, possibly triggered by a major meteorite impact, generated a global ecological crisis with attendant substantial plant extinctions in temperate and tropical vegetation and the subsequent expansion of deciduous species of angiosperms. Atlantic Coastal Plain and Mississippi Embayment vegetation was closed-canopy, tropical rain forest, relatively depauperate in plant species.

During the Eocene Epoch, 37-58 million years ago, volcanic eruptions and uplift of mountain ranges in western North America created obstacles that diverted air masses and screened off Pacific Ocean moisture from the mid-latitudinal continental interior and the Southeast Coastal Plain. Instead of precipitation falling evenly throughout the year, the pattern of precipitation changed to a seasonal wet-dry regime, and by 45 million years ago, southeastern vegetation was defined by a series of latitudinal belts. North from the Gulf of Mexico to about 37° N, the seasonally dry tropical rain forest was semideciduous in physiognomy. Increasingly severe intervals of climatic cooling subsequently brought lower mean annual

and a probable greater seasonal range of temperatures, with attendant extinctions in both tropical and subtropical taxa. By approximately 20 million years ago, during the Early Miocene Epoch, broad-leaved evergreen forests, associated with mean annual temperatures of 55-68° F, had developed across the Gulf Coastal Plain.

The Glacial / Interglacial Period.

During the Late Tertiary, between 5 and 2.5 million years ago, volcanism in Central America formed a continuous land bridge between North and South America that closed off equatorial marine currents formerly circulating between the Pacific and Atlantic Oceans. Warm ocean currents (e.g. the Gulf Stream) were consequently diverted along the eastern coast of North America, transferring heat energy from tropical seas into higher latitudes. By the end of the Tertiary, the plate-tectonic configuration of the earth had also shifted sufficiently that the global climate system was affected by relatively small changes in incoming radiation and hence susceptible to great oscillations between glacial and interglacial climatic regimes. These glacier / interglacial cycles are triggered by changes in orbital relationships of Earth and the sun, and each lasts about 100,000 years. Paleoclimatic evidence from the Gulf of Mexico indicates the first glacial/interglacial cycle occurred some 2.4 million years ago, and based on detailed sediment cores taken from the Atlantic Ocean, 20 such glacial/ interglacial cycles have occurred thus far during the Quaternary Period.

During the onset of glaciation (gradual cooling phase) which lasts about 90,000 years, progressive climatic cooling is associated with the expansion of continental glaciers. This gradual cooling phase is followed by a 10,000-year interglacial period during which relatively rapid climatic warming occurs. The greatest rate of environmental change in each cycle typically occurs in the 10,000 to 15,000 years separating peak glacial from peak interglacial conditions. Major changes in the physical environment occur during this period of peak change that trigger major biotic readjustments, including extinction, migration, and speciation. The last such period occurred between full glacial conditions of 20,000 years ago and peak interglacial conditions of 6,000 years ago.

By the end of the last full-glacial episode, some 20,000 years ago, the continental glacier had advanced southward to approximately 40° N. Tundra-like communities dominated by grasses *Gramineae* and sedges *Cyperaceae* extended as far southward as West Virginia at higher elevations, and boreal forests occurred across much of the Southeast between 40° and 34° N. A sharp ecotone between 32° and 34° divided boreal and temperate, mixed deciduous evergreen forests. Forests in northern Florida and Alabama were dominated by southern pines *(Diployylon pinus* spp), and central and western Gulf Coastal Plain forests were dominated by oaks (*Quercus* spp.) and hickories (*Carya* spp.). Species-rich deciduous forests were probably restricted to favorable mesic sites along major river valleys of southern coastal plains that contained both nutrient -rich soils and topographic firebreaks.

Late-glacial climatic changes began some 16,500 years ago, and the Southeast experienced an increased northward flow of warm air from the Gulf of Mexico and the Caribbean Sea due to general weakening of the west-to-east zonal atmospheric flow. With increasing warmth and precipitation, oaks, ash, and other temperate hardwoods invaded northward, displacing spruce and jack pine populations. By 12,500 years ago the southern border of boreal forest had moved north to 36° N. By 10,000 years ago, oaks comprised 60-80% of forests across Florida and typically 40% of Southern Atlantic and Gulf coastal plains forests. Hickories comprised 20-30% of Southern Atlantic Coastal Plain and Gulf Coastal Plain forests west of the Lower Mississippi Alluvial Valley, and beech (*Fagus grandifolia)* comprised 10% of southeastern Atlantic Coastal Plain Forests.

Between 10,000 and 6,000 years ago, prevailing westerlies increased in strength resulting in increased summer warmth and drought severity in the continental interior which favored an increased abundance of oaks, hickories and walnuts. In the Atlantic and Gulf coastal plains, the continued northward flow of warm gulf air brought increased storm activity, summer moisture, and lightning strikes which favored the expansion of southern pines. By 6,000-4,000 years ago, southern pines comprised 60-80% of the southeastern evergreen forest region, and a sharp ecotone had developed between the southeastern evergreen and deciduous forest regions. Modern vegetation patterns have taken shape only within the last several thousand years. Throughout much of the interglacial period, poorly drained coastal zone, presettlement swamps were dominated by tupelo gum *(Nyssa aguatica)* in addition to bald cypress (*Taxodium distichum)* and Atlantic white cedar (*Chamaecyparis thyoides)*. In uplands of the southeastern evergreen forest region, southern pines were maintained as dominants by fire.

The Era of Longleaf Pine Dominance

Longleaf pine (*Pinus palustris)* was the most abundant species in upland forests of the southeastern Atlantic and Gulf Coastal Plains because, under a frequent fire regime, it is the only tree in the Southeast with seedlings adapted to survive fire. Very few longleaf pine seedlings survive to escape into canopy, but in a typical virgin, uneven-aged stand where the oldest trees are 300 years old, one successful sapling escaping every 5 or 10 years may be enough to maintain a fully stocked stand. In some areas of the Southeast, where seasonal moisture stress was combined with annual fire, there were completely treeless areas like the great Alachua Savanna in Florida or the Burgaw Savannah in North Carolina.

Sargent (1884) divided the range of longleaf pine into two regions. The first and more extensive of these included a diverse mosaic of pine savannas, sandhills, and flatwoods, with longleaf pine as the prevailing growth on uplands and where fire occurred every 1 to 3 years. The second was the transitional forest between Coastal Plain regions dominated by nearly pure stands of longleaf and the oak-hickory-shortleaf-pine woodlands of the Piedmont. This forest was a savanna-woodland type of forest (longleaf pine is not known to reproduce in mesic habitats without a nearly continuous flammable herb layer to carry fire) containing a geographically varying mixture of dominant trees including longleaf, shortleaf and loblolly pine, post oak (*Quercus stellata),* white oak (*Q. alba)*, southern red oak (*Q. falcata),* hickories, and various scrub oaks. Presumably this was a bi-layered community with canopy and a savanna-like grass-forb understory in which fires probably occurred every 5 to 10 years.

Before immigration of Native Americans into the Southeast, essentially all fires would have been caused by lightning with bodies of water and topography (*e.g.* steep slopes, islands, peninsulas) acted as agents of fire suppression. Outermost, or most seaward, of the Coastal Plain terraces are the youngest and flattest. Older, higher elevation terraces adjacent to the Piedmont are highly dissected into hills and contain only tiny remnants of upland flats. Although the relationship between fire and landscape has not been studied systematically, examination of longleaf pine savannas on the outer terraces of the Coastal plain, indicates that slopes of more than about 15 degrees appear to be effective firebreaks. Fire seldom runs down steep slopes, and excluding the few areas where steep slopes occur next to flammable wetlands, fires in Coastal Plain forests typically originated on the upland flats, not in bottomlands.

Thus, as topographic heterogeneity increases inland, it logically follows that there is a corresponding decrease in size of fire compartments toward the Piedmont.

Early Human Influence

Humans first entered the North American continent between 15,000 and 12,000 years ago, during the last interglacial interval. Early Native Americans subsequently exerted a progressively increasing influence on vegetation of the southeastern United States, particularly within major river valleys were sedentary human populations were concentrated. Native Americans affected the biota by changing the dominance structure of forest communities through exploitation of wood for use as fuel and building habitations, altering the distributional range of species by introducing exotic species such as maze, by disturbing large areas of valley bottoms for agricultural use and by changing the proportion of forest to non-forest land via the use of fire.

Varying effects of fire in the landscape mosaic have been attributed to fire frequency, with fire intensity and season of burn probably the most important factors. Numerous accounts from the Colonial Period describing Native American burning practices agree that use of wildfire by them was largely limited to fall and winter when fires were set to drive game. In most areas this could be done only once a year on any particular tract, using that year's fuel accumulation. On the outer Coastal Plain, where annual summer lightning fires pre-empted fuel buildup, Native American burning may have increased coverage of land otherwise only occasionally burned by lightning. On dissected inland terraces and the Piedmont, however, where Native Americans may have burned compartments otherwise missed by lightning, effects of fire would have been much greater.

When Euro-American settlement began some 500 years ago, the East Gulf Coastal Plain was not covered primarily by old-growth forests, but instead by vegetation patterns resulting from the continued individualistic responses of species and populations to long-term changes in climate, prevailing disturbance regimes, and prehistoric human activities, such as the development of agriculture and use of fire.

Effects of the Naval Stores Industry.

Tar pitch, rosin, and turpentine, collectively called naval stores, were produced in the Southeast almost exclusively from longleaf pine. These were essential commodities because wagons could not move without tar to grease the axles, and ships could not sail without tar and pitch for waterproofing sails, for caulking leaks, and for coating the hull to prevent destruction by ship-worms.

Longleaf pine was exploited for tar, pitch, and turpentine by the naval stores industry for over 200 years. Collection was a one-person or small group operation, with a few barrels at a time rafted downstream to shipping points. Using 19th Century methods, virgin stands produced for only about four years. Large trees were boxed on three or even four sides, with deep wedges cut into the base to collect the crude resin. Weakened trees in abandoned turpentine orchards often were blown over or killed when the next ground fire set ablaze residue in the boxes. Longleaf pine forests in Virginia were exhausted by 1840, and forests of other states soon followed suit. When the last virgin longleaf pine forests were depleted during the 1920s, the industry collapsed.

Effects of Agriculture

Although extensive, the full extent of Native American and early Colonial agriculture in southeastern forests may never be known. Bartram (1791) described Tallahassee, or Indian old fields, from shifting agriculture in north Florida. In North Carolina and Virginia farming was done on a very small scale in patches adjacent to villages, while much of the diet came from fishing, hunting and gathering. In the Creek country of Alabama, Bartram found a region of Indian farmland, broken only by small tracts of woods between outlying agricultural lands of one village and the next. Much of the land cleared by the Spanish in Florida was overrun by native vegetation after abandonment of settlements to the English. Gulf States remained sparsely populated for 200 years, with principal settlements only along the coast and major rivers.

In the early Colonial Period, most farms had crops in small isolated clearings that were fenced in, while livestock, especially hogs and cattle, were fenced out and roamed the woods. By the Civil War, nearly all lands optimally suitable for agriculture were in production. By 1900, 22.3% of upland forest in the region was listed as improved farmland, a category that included pasture, roads, and buildings as well as cropland. (U.S. Census Office, 1902). While there were no separate figures for land in pasture in 1900, it was necessary to maintain pasture or range on every farm for horses, mules, and oxen used for plowing and transportation. Throughout the region the great majority of livestock was maintained on open range in the woods until passage of fence laws in the late 1800s requiring livestock to be fenced into grazing areas. Until then, pine forest adjacent to farms was fired every winter to green up herbaceous forage for grazing. Discontinuities in the fire landscape created by roads, fields, and other artificial firebreaks were thus partially compensated, perpetuating longleaf pine fire communities in settled areas.

Effects of Logging

Effects of timbering were minor through the early Colonial Period from 1607 to the mid-1730s when logging was done by hand, using horses and mules to drag the logs. Commercial logging was limited to the vicinity of streams, where the harvest could be transported. For over a hundred years milled boards were laboriously sawed by hand and most were used locally. This changed with advent of the water-powered sawmill in the 1730s, followed by steam technology after the Civil War with attendant logging railroads, steam skidders and steam-powered sawmills. By 1880 all commercial timber had been removed from within a few miles of streams and railroads, and by 1930 all remaining virgin forest in the South had been removed.

The spectacular failure of the primeval pine forest to reproduce itself after exploitation is a milestone in the natural history of eastern United States, at least equal in scale and impact of elimination of the chestnut from Appalachian forests by blight. No complete explanation has accounted for this phenomenon, but historical records suggest a combination of three factors:

- the inherently low rate of restocking of longleaf pine forests under a natural fire regime. On some sites, this might take more than 300 years for return to original stand structure after logging.
- the fondness of feral livestock, especially hogs, for the seedlings. Unlike other pines, longleaf pine seedlings have a non-resinous, carbohydrate-rich meristem which while in the grass stage, is vulnerable to grazing for seven years or more. Hogs have been observed to feed heavily on longleaf pine seedlings, consuming up to 400 each in a day. Census reports for livestock from 1870 to 1900 show an average of about 20,000 hogs on open range in every county in the region.

All that would be required to eliminate reproduction would be for a drove of hogs to happen upon a regenerating plot once every 3 or 4 years.

- modern fire suppression, beginning with 1920 state fire laws. On all but drier lands, longleaf reproduction is completely eliminated by mesophytic pine, hardwood, and shrub invasion within a few years after fire exclusion. Nowhere in the South can longleaf pine be seen re-invading the mesophytic mixed pine-hardwood succession that has replaced it.

By 1946 longleaf pine had declined to 1/6th of its original range, and by 1993 natural stands of longleaf pine occurred on only about 1% of former habitat. Longleaf pine was once the most abundant species in the region, but it has largely been replaced as the dominant. Establishment of increasingly large areas protected from fire during the 1930s and 1940s made it commercially feasible to plant slash pine *(Pinus elliotii)* and loblolly pine *(Pinus taeda)* in plantations. More recently timber companies have been forced onto marginal land by development and have found it increasingly desirable to produce pine pulpwood and sawtimber using intensive management. In 1993 there were 15,315,000 acres of pine plantations, primarily loblolly and slash but also some shortleaf and a small amount of longleaf, in the former longleaf region. As mixed pine-hardwood second growth is harvested, it is most often converted to more intensive use categories and nearly all uplands owned by timber companies may soon be managed as plantations.

APPENDIX 6.8: Fauna on Fort Rucker, Alabama[10]

Mammals	
armadillo, nine-banded	*Dasypus novemcinctus*
bat, evening	*Nycticeius humeralis*
bat, red	*Lasiurus borealis*
bat, Seminole	*Lasiurus seminolus*
beaver	*Castor canadensis*
bobcat	*Felis rufus*
chipmunk, eastern	*Tamias striatus*
cottontail, eastern	*Sylvilagus floridanus*
coyote	*Canis latrans*
deer, white-tailed	*Odocoileus virginianus*
dog	*Canis familiaris*
fox, gray	*Urocyon cinereoargenteus*
fox, red	*Vulpes vulpes*
house cat	*Felis catus*
mink	*Mustela vison*
mole, eastern	*Scalopus aquaticus*
mouse, cotton	*Peromyscus gossypinus*
mouse, golden	*Ochrotomys nuttali*
mouse, house	*Mus musculus*
mouse, oldfield	*Peromyscus polionotus*
opossum, Virginia	*Didelphis marsupialis*
otter, river	*Lutra canadensis*
pocket gopher, southeastern	*Geomys pinetis*
rabbit, swamp	*Sylvilagus aquaticus*
raccoon	*Procyon lotor*
rat, hispid cotton	*Sigmodon hispidus*
shrew, least	*Cryptotis parum*
shrew, short-tailed	*Blarina carolinensis*
shrew, southeastern	*Sorex longirostris*
skunk, striped	*Mephitis mephitis*
squirrel, fox	*Sciurus niger*

[10] **Adapted from Mount and Diamond, 1992.**

squirrel, gray	*Sciurus carolinensis*
squirrel, southern flying	*Glaucomys volans*
vole, pine	*Pytymys pinetorum*
weasel, long-tailed	*Mustela frenata*
Birds	
anhinga	*Anhinga anhinga*
blackbird, red-winged	*Agelaius phoeniceus*
bluebird, eastern	*Sialia sialis*
bobwhite, northern	*Colinus virginianus*
bufflehead	*Bucephela albeola*
bunting, indigo	*Passerina cyanea*
cardinal, northern	*Cardinalis cardinalis*
catbird, gray	*Dumetella carolinensis*
chat, yellow-breasted	*Icteria virens*
chickadee, Carolina	*Parus carolinensis*
chuck-will's widow	*Caprimulgus carolinensis*
coot, American	*Fulica americana*
cormorant, double-crested	*Phalacrocorax auritus*
cowbird, brown-headed	*Molothrus ater*
crow, American	*Corvus brachyrhynchos*
crow, fish	*Corvus ossifragus*
creeper, brown	*Certhia americana*
cuckoo, yellow-billed	*Coccyzus americanus*
dove, common ground	*Columbina passerina*
dove, mourning	*Zenaida macroura*
duck, American black	*Anas rubripes*
duck, mallard	*Anas platyrhynchos*
duck, ring-necked	*Aythya collaris*
duck, ruddy	*Oxyura jamaicensis*
duck, wood	*Aix sponsa*
eagle, bald	*Haliaeetus leucocephalus*
egret, cattle	*Bubulcus ibis*
egret, great	*Casmerodius albus*
flicker, northern	*Colaptes auratus*
flycatcher, great crested	*Myiarchus crinitues*
goldfinch, American	*Carduelis tristis*
goose, Canada	*Branta canadensis*
gnatcatcher, blue-gray	*Podilymbus podiceps*

grackle, common	*Quiscalus guiscula*
grebe, pied-billed	*Podilymbus podiceps*
grosbeak, blue	*Guiraca caerulea*
ground-dove, common	*Columbina passerina*
gull, herring	*Larus argentatus*
gull, ring-billed	*Larus delawarensis*
harrier, northern	*Circus cyaneus*
hawk, broad-winged	*Buteo platypterus*
hawk, Cooper's	*Accipiter cooperii*
hawk, red-shouldered	*Buteo lineatus*
hawk, red-tailed	*Buteo jamaicensis*
hawk, sharp-shinned	*Accipiter striatus*
heron, great blue	*Ardea herodias*
heron, green-backed	*Butorides striatus*
heron, little blue	*Egretta caerulea*
heron, yellow-crowned night	*Nyctocorax violaceus*
hummingbird, ruby-throated	*Archilochus colubris*
jay, blue	*Cyanocitta cristata*
junco, dark-eyed	*Junco hyemalis*
kestrel, American	*Falco sparverius*
killdeer	*Charadrius vociferus*
kingbird, eastern	*Tyrannus tyrannus*
kingfisher, belted	*Ceryle alcyon*
kinglet, ruby-crowned	*Regulus calendula*
mallard	*Anas platyrhynchos*
martin, purple	*Progne subis*
meadowlark, eastern	*Sturnella magna*
mockingbird, northern	*Mimus polyglottos*
nighthawk, common	*Chordeiles minor*
nuthatch, brown-headed	*Sitta pusilla*
nuthatch, white-breasted	*Sitta carolinensis*
oriole, orchard	*Icterus spurius*
osprey	*Pandion haliaetus*
owl, barn	*Tyto alba*
owl, barred	*Strix varia*
owl, eastern screech	*Otus asio*
owl, great horned	*Bubo virginianus*
parula, northern	*Parula americana*

phoebe, eastern	*Sayornis phoebe*
robin, American	*Turdus migratorius*
sapsucker, yellow-bellied	*Sphyrapicus varius*
shrike, loggerhead	*Lanius ludovicianus*
sparrow, field	*Spizella pusilla*
sparrow, house	*Sparrow domesticus*
sparrow, swamp	*Melospiza georgiana*
sparrow, vesper	*Pooecetes gramineus*
sparrow, white-throated	*Zonotrichia albicollis*
starling, European	*Sturnus vulgaris*
swallow, bank	*Ripara riparia*
swallow, barn	*Hirundo rustica*
swallow, northern rough-winged	*Stelgidopterix serripennis*
swift, chimney	*Chaetura pelagica*
tanager, summer	*Piranga rubra*
teal, green-winged	*Anas crecca*
tern, Forster's	*Sterna forsteri*
thrasher, brown	*Toxostoma rufum*
thrush, hermit	*Catharus guttatus*
thrush, wood	*Hylocichla mustelina*
titmouse, tufted	*Parus bicolor*
towhee, rufous-sided	*Pipilo erythrophthalmus*
turkey, wild	*Meleagris gallopavo*
vireo, red-eyed	*Vireo olivaceous*
vireo, white-eyed	*Vireo griseus*
vulture, black	*Coragyps atratus*
vulture, turkey	*Cathartes aura*
warbler, black-and-white	*Mniotilta varia*
warbler, hooded	*Wilsonia citrina*
warbler, Kentucky	*Oporornis formosus*
warbler, magnolia	*Dendroica magnolia*
warbler, palm	*Dendroica palmarum*
warbler, pine	*Dendroica pinus*
warbler, prothonotary	*Prothonotatia citrea*
warbler, yellow	*Dendroica petechia*
warbler, yellow-rumped	*Dendroica coronata*
waxwing, cedar	*Bombycilla cedorum*
woodcock American	*Scolopax minor*

woodpecker, downy	*Picoides pubescens*
woodpecker, hairy	*Picoides villosus*
woodpecker, pileated	*Dryocopus pileatus*
woodpecker, red-bellied	*Melonerpes carolinus*
woodpecker, red-headed	*Melanerpes erythrocephalus*
wood-pewee	*Contopus virens*
wren, Carolina	*Thryothorus ludovicianus*
yellowthroat, common	*Geothlypis trichas*
Reptiles	
alligator, American	*Alligator mississippiensis*
anole, green	*Anolis carolinensis*
coachwhip, eastern	*Masticophis flagellum flagellum*
cooter, river	*Pseudemys concinna* spp.
copperhead, southern	*Agkistrodon contortrix contortrix*
cottonmouth	*Agkistrodon piscivorous*
kingsnake, scarlet	*Lampropeltis triangulum elapsoides*
lizard, eastern fence	*Sceloporus undulatus*
lizard, eastern glass	*Ophisaurus ventralis*
lizard, southern fence	*Sceloporus undulatus undulatus*
racer, southern black	*Coluber constrictor priapus*
racerunner, six-lined	*Cnemidophorus sexlineatus*
rattlesnake, eastern diamondback	*Crotalus adamanteus*
rattlesnake, timber (canebrake)	*Crotalus horridus*
skink, broadheaded	*Eumeces laticeps*
skink, five-lined	*Eumeces fasciatus*
skink, ground	*Scincella lateralis*
slider, pond	*Chrysemys scripta*
snake, brown water	*Nerodia taxispilota*
snake, corn	*Elaphe guttata*
snake, eastern coral	*Micrurus fulvius fulvius*
snake, eastern garter	*Thamnophis sirtalis*
snake, eastern hognose	*Heterodon platyrhinos*
snake, Florida pine	*Pituophis melanoleucus mugitus*
snake, gray rat	*Elaphe obsoleta spiloides*
snake, midland water	*Nerodia sipedon pleuralis*
snake, rainbow	*Farancia erytrogramma erytrogramma*
snake, ringneck	*Diadophis punctatus*
snake, rough green	*Opheodrys aestivus*

snake, rough earth	*Virgina striatula*
snake, southern ringneck	*Diadophis punctatus punctatus*
snake, southeastern crowned	*Tantilla coronata*
snake, scarlet	*Cemophora coccinea*
tortoise, gopher	*Gopherus polyphemus*
turtle, common musk	*Sternotherus odoratus*
turtle, common snapping	*Chelydra serpentina*
turtle, eastern box	*Terrapene carolina carolina*
turtle, eastern mud	*Kinosternon subrubrum subrubrum*
Amphibians	
bullfrog	*Rana catesbeiana*
frog, bronze	*Rana clamitans*
frog, ornate chorus	*Pseudacris ornata*
frog, southern cricket	*Acris gryllus gryllus*
frog, southern leopard	*Rana utricularia*
frog, upland chorus	*Pseudacris triseriata feriarum*
peeper, northern spring	*Pseudacris (Hyla) crucifer crucifer*
peeper, spring	*Pseudacris crucifer*
salamander, red	*Pseudotriton ruber* spp.
salamander, spotted	*Ambystoma maculatum*
salamander, spotted dusky	*Desmognathus fuscus conanti*
salamander, southeastern slimy	*Plethodon grobmani*
salamander, southern two-lined	*Eurycea cirrigera*
salamander, blue ridge two-lined	*Eurycea wilderae*
salamander, three-lined	*Eurycea longicauda guttolineata*
toad, American	*Bufo americanus*
toad, eastern narrowmouth	*Gastrophryne carolinensis*
toad, oak	*Bufo quercicus*
toad, southern	*Bufo terrestris*
treefrog, barking	*Hyla gratiosa*
treefrog, bird-voiced	*Hyla avivoca*
treefrog, green	*Hyla cinerea*
treefrog, gray (common or Cope's)	*Hyla versicolor or Hyla chrysoscelis*
treefrog, pine woods	*Hyla femoralis*
treefrog, squirrel	*Hyla squirella*
waterdog, Alabama	*Necturus alabamensis*
Fish	
bass, largemouth	*Micropterus salmoides*

bass, spotted	*Micropterus punctulatus*
bass, white	*Morone chrysops*
bluegill	*Lepomis macrochirus*
bownfin	*Amia calva*
bullhead, yellow	*Ameiurus natalis*
catfish, channel	*Ictalurus punctatus*
chub, clear	*Hybopsis winchelli*
chub, speckled	*Extrarius aestivalis*
chubsucker, lake	*Erimyzon succeta*
crappie, black	*Pomoxis nigromaculatus*
darter, blackbanded	*Percina nigrofasciata*
darter, bluntnose	*Etheostoma chlorosomum*
darter, choctawhatchee	*Etheostoma davisoni*
darter, gulf	*Etheostoma swaini*
eel, American	*Anquilla rostrata*
madtom, speckled	*Noturus leptacanthus*
minnow, silverjaw	*Ericymba buccata*
mosquitofish	*Gambusia affinis*
perch, pirate	*Aphredoderus sayanus*
pickerel, grass or redfin	*Esox americanus*
pickerel, chain	*Esox niger*
redhorse, blacktail	*Moxostoma poecilurum*
shad, gizzard	*Dorosoma cepedianum*
shiner, blacktail	*Cyprinella venusta*
shiner, blacktip	*Lythrurus atrapiculus*
shiner, golden	*Notemigonus chrysoleucas*
shiner, longnose	*Notropis longirostris*
shiner, weed	*Notropis texanus*
sucker, spotted	*Mirytrema melanops*
sunfish, green	*Lepomis cyanellus*
sunfish, longear	*Lepomis megalotis*
sunfish, redear	*Lepomis microlophus*
sunfish, spotted	*Lepomis punctatus*
topminnow, blackspotted	*Fundulus olivaceus*
warmouth	*Lepomis gulosus*

APPENDIX 8.2.2: Fort Rucker Longleaf Restoration Plan

The **Fort Rucker Longleaf Restoration Plan** is currently being developed. This plan will be conducted in two phases: a planning phase and an execution phase. Longleaf restoration is currently ongoing and will continue during the development of this plan. The planning phase will be completed no later than FY13 (1 OCT 2012 - best-case scenario). The execution phase will most likely be 35 years for the initial establishment of planted stands (assuming there is sufficient funding). Natural regeneration will take place in all areas where it is possible. The end goal is to promote uneven-aged management and natural regeneration. Assuming adequate funding is available, sites currently occupied by pine species other than longleaf will be underplanted once they have been thinned to a basal area of 40 square-feet and less.

Planning Phase:

We are in the initiation phase of developing a longleaf restoration plan. Our primary planning tool (an historical vegetation and fire regime map) is currently being developed. Objective planning will take place with the completion of this map (beginning no later than August 2011). Overall, the intent of this plan will be to restore longleaf pine to appropriately suited sites across Fort Rucker contiguous acreage. Currently, Fort Rucker has approximately 1900 acres of longleaf pine stands, made up of the following types:

Longleaf pine plantations:	1449 acres
Natural longleaf pine /upland hardwood:	259 acres
Natural longleaf and other pine:	148 acres
Total acreage	**1,856 acres**

Fort Rucker contracted a forest inventory for 18,557 acres, which was completed in 2006/2007. This inventory provided actual acreage of existing longleaf on approximately half of the managed forested acreage. We are currently in the process of conducting a growth and yield project to grow that inventory to its' current level. We are also in the process of initiating a forest inventory for the remaining acreage of managed timber (18,223 acres) on Fort Rucker. The completion of growth and yield from the first inventory and the completion of the inventory of the remaining acreage will provide quantitative information for scheduling intermediate treatments, such as thinnings and TSI work required in stands of longleaf and other timber types. It will also provide information on the status of sites best suited for longleaf that are currently occupied by other species. Quantitative information for these areas will help to determine the logical steps for converting these sites to longleaf.

Our primary planning tool for longleaf restoration is currently being developed. This tool is a map that is currently being developed by Cecil Frost which will depict historical vegetation and the historical fire regime of that vegetation. This map will break out different timber types, specifically longleaf pine, as they most likely existed prior to European settlement. The development of this map is taking into account a variety of factors, including soil type, aspect, and slope in order to most accurately determine the locations and vegetation communities of those historical longleaf stands. Some training areas, due to high use, will not be restored immediately. Areas with less of a training signature will be restored first and used as demonstration areas.

The intent is to reforest no less than 500 acres per year for the next 26 years. According to the first draft of the historical map described above, 17852 additional acres have been determined to be best-suited sites for the re-establishment of longleaf pine. Not all of these 17,852 acres will be restored to longleaf sites.

This is due to the fact that some of these areas are now occupied by various land uses, primarily by Army and other military training. Fort Rucker Natural Resources Management staff, along with input from the Fort Rucker Training Division and other directorates, will prioritize areas to be reforested based on current and future land uses.

Best suited sites for the re-establishment of longleaf pine:

Longleaf pine woodland and savanna:	13045 acres
Longleaf pine slopes:	4025 acres
Longleaf pyrophytic oak and hickory:	2638 acres
Total acreage:	**19,708 acres** (includes 1856 acres of already established longleaf pine)

Execution Phase:

This phase will be ongoing until all suitable areas are reforested with longleaf pine. Beginning in FY12, 275 acres will be planted with containerized longleaf pine seedlings. Every year thereafter, the goal is to plant no less than 500 acres with containerized longleaf seedlings. More information is needed to develop a more detailed timeline and the associated costs with restoration throughout the planning horizon. We feel that FY12 and our new funding protocol will provide us with more concrete information and guaranteed funding, which is required to accurately plan for these considerations.

Coordinations with regional priorities:

Currently, it is a priority of Installation Management Command- Southeastern region to promote the reforestation of longleaf and to restore longleaf across its' historical range from Virginia to Texas. Department of the Army landholdings makeup the largest percentage of suitable longleaf contiguous acreage across the range. Fort Rucker continues to work with The Longleaf Alliance, the Gulf Coastal Plain Ecosystem Partnership, The Nature Conservancy, Auburn University, Clemson University, and other military installations across the southeast to ensure that Fort Rucker initiatives meld with regional priorities in the promotion of longleaf restoration.

APPENDIX 8.5.2.5: Management Guidelines for the Gopher Tortoise on Army Installations

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
SOUTHEAST REGION
1593 HARDEE AVENUE SW
FORT MCPHERSON, GEORGIA 30330-1057

REPLY TO
ATTENTION OF

IMSE-PWD-E

11 MAR 08

MEMORANDUM FOR

Garrison Commander, U.S. Army Garrison Benning, 6751 Constitution Loop, Suite 550, Fort Benning, GA 31905-5000
Garrison Commander,, U.S. Army Garrison Gordon, Building 33720, Fort Gordon, GA 30905-5040
Garrison Commander, U.S. Army Garrison Stewart, 42 Wayne Place, Fort Stewart, GA 31314-5048
Garrison Commander, U.S. Army Garrison Rucker, 453 Novosel Street, Building 114, Fort Rucker, AL 36362-5105

SUBJECT: Management Guidelines for the Gopher Tortoise (GT) on Army Installations

1. Reference Army Regulation (AR) 200-1, Environmental Protection and Enhancement, dated 29 May 2007, paragraph 4-3.

2. Subject guidelines (enclosed) are distributed for implementation on all Installation Management Command-Southeast (IMCOM-SE) installations where Gopher Tortoises are present. The guidelines are meant to ensure there is standard management across IMCOM-SE installations, and to demonstrate pro-active concern for this Species at Risk (SAR) on Army installations throughout its range. The ultimate goal is to prevent restrictions on Army training were this SAR to end up listed as "endangered" under the Endangered Species Act.

3. These guidelines will be incorporated into the installation Endangered Species Management Components (ESMCs) of the Integrated Natural Resources Management Plan to meet (and supplement if required) installation specific Gopher Tortoise conservation needs and unique military mission requirements.

4. Periodically, installations will report GT and GT habitat conditions, GT cooperative conservation plans, and efforts with Federal and state agencies, private organizations, and individual landowners in support of GT recovery efforts that benefit our installations. Regional studies and research proposals on individual installations (best management practices, research results, lessons learned, etc.) will be conducted by or coordinated through the IMCOM-SE, as appropriate. Installation condition assessments are coordinated with the U.S. Fish and Wildlife Service (USFWS) Region 4 Office, and the Regional RCW/Longleaf Pine Recovery Coordinator (Section III, paragraph C and G of enclosure) as an IMCOM-SE function.

IMSE-PWD-E
SUBJECT: Management Guidelines for the Gopher Tortoise (GT) on Army Installations

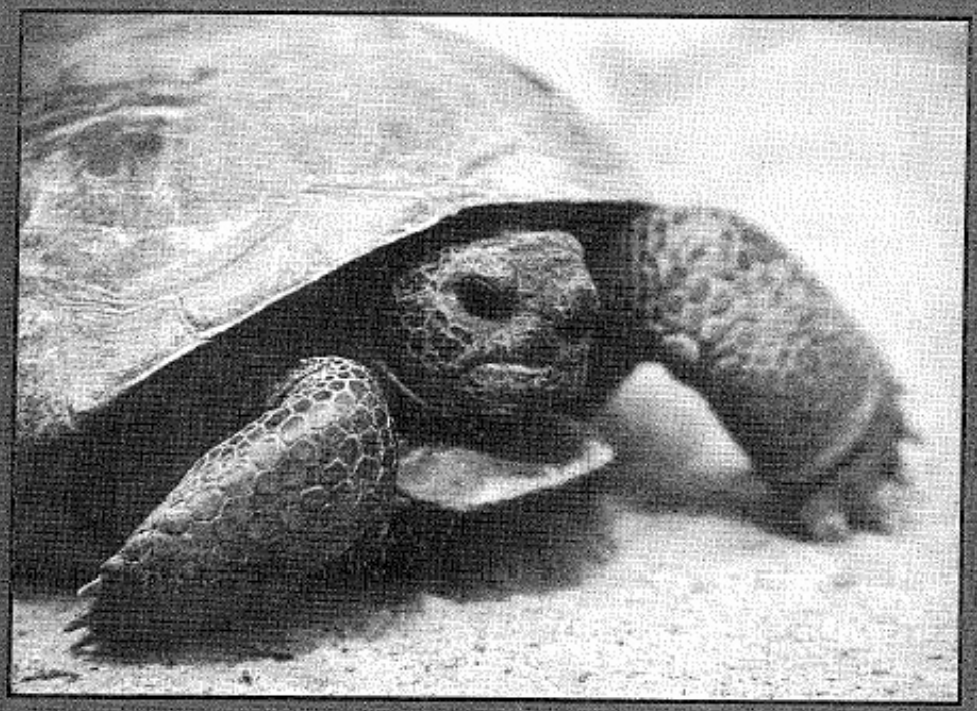
5. The POCs for this action are Mr. Casey Newton, (404) 464-4090, casey.h.newton@us.army.mil, and/or Mr. Frank Lands, (404) 464-1645, frank.w.lands@us.army.mil.

Encl

DAVID D. TINDOLL, JR.
Director

CF:
Commander, U.S. Army Environmental Command (IMAE-CO), 5196 Hoadley Road, Aberdeen Proving Ground, MD 21010-5401
HQDA (DAIM-ED), ODEP, 600 Army Pentagon, Washington DC 20310-0600

MANAGEMENT GUIDELINES FOR THE GOPHER TORTOISE ON ARMY INSTALLATIONS



February 14, 2008

I. General

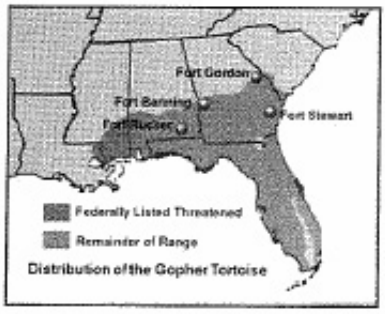
A. Purpose

These guidelines establish baseline management standards for Army installations to support the conservation of the Gopher Tortoise (*Gopherus polyphemus*) and its habitat. Each installation's Integrated Natural Resources Management Plan (INRMP) may supplement these guidelines with measures tailored to meet installation-specific Gopher Tortoise conservation requirements and unique military mission needs.

B. Background

A 15 September 2006 Army policy memorandum, *Army Species at Risk Policy and Implementing Guidance*, specifically identifies the Gopher Tortoise as a priority Army Species at Risk. This policy encourages proactive management efforts for Species at Risk and their habitat, before federal protection under the Endangered Species Act is necessitated, and further encourages installations to capitalize on partnerships and agreements when managing for such species. Chapter 4 of AR 200-1 encourages installations to participate in regional/habitat-wide species conservation efforts with other federal and state agencies and provides authority for managing Army-designated Species at Risk and their habitats.

The Gopher Tortoise is Federally listed as threatened in parts of Louisiana, Mississippi, and southwest Alabama. In January 2006 the U.S. Fish and Wildlife Service was petitioned to list the Gopher Tortoise throughout the species' range in Florida, Alabama, Georgia, and South Carolina. If the eastern population becomes imperiled to the extent that Federal listing is warranted, listing will represent a regulatory and management challenge to military testing, training, silviculture, infrastructure development, and other land management activities at Forts Rucker, Benning, Stewart, and Gordon.



The Army will be a signator to the Candidate Conservation Agreement (CCA) for the Gopher Tortoise, which is in draft form as of February 2008. The guidelines provide management guidance to conserve the Gopher Tortoise and its habitat on those Army installations in the eastern portion of the species' range,. The guidelines will incorporate and promote the local and landscape level conservation efforts described in the CCA, in accordance with the Army's mission. These guidelines will be incorporated as an appendix to the final CCA.

C. Applicability

The guidelines are developed specifically for those Army installations within the eastern, or non-listed range of the Gopher Tortoise: Fort Rucker (Alabama), Fort Benning (Alabama and Georgia), Fort Gordon (Georgia), and Fort Stewart (Georgia).

D. Revision

These guidelines will be reviewed every 5 years and revised as necessary to incorporate the latest and best scientific data available. The Army will establish a Gopher Tortoise Management Team (GTMT) that will meet annually, or as needed to review ongoing management actions, implementation of these guidelines and the revision of these guidelines. The GTMT will consist

of installation personnel and their higher headquarters organizations as identified in these guidelines.

E. Goal

The Army's goal is to implement these guidelines which will allow the Army to accomplish military readiness missions while concurrently ensuring the conservation of the Gopher Tortoise and to assist in the prevention of the need to list the Gopher Tortoise as an endangered or threatened species in its eastern range. The inclusion of Gopher Tortoise guidelines as a component to the INRMP should significantly contribute to the landscape-scale conservation of some of the largest existing Gopher Tortoise populations and habitats.

II. Army Policies Applicable to Gopher Tortoise Management

A. Conservation

Implementation of Gopher Tortoise management strategies in accordance with these guidelines supports the Army's commitment and responsibility under the CCA to adopt a long-term approach to Gopher Tortoise conservation and habitat management consistent with the military mission.

B. Ecosystem Management

Conservation of the Gopher Tortoise and other species is part of a broader goal to conserve biological diversity on Army lands consistent with the Army's mission. Biological diversity and the long-term survival of individual species, such as the Gopher Tortoise, ultimately depend upon the health of the sustaining ecosystem. Therefore, installation-specific Gopher Tortoise management strategies should promote ecosystem integrity. Maintenance of ecosystem integrity and health also benefit the Army by preserving and restoring training lands for long-term use.

C. Education and Outreach

Soldiers and other personnel involved in "on the ground" activities frequently lack awareness of the presence and biology of Gopher Tortoises, their high conservation priority as a Species at Risk, and/or their vulnerability to certain training and land management practices. Although no training activities are restricted by these guidelines, soldiers and other personnel (including contractors) involved in field activities will receive training or literature on how to minimize impacts whenever practical while still accomplishing mission goals. Outreach and education materials will include Gopher Tortoise and Gopher Tortoise burrow identification, the relevance of Gopher Tortoise conservation to the Army mission, and information on how certain activities (e.g., heavy wheeled and tracked vehicle operation and mechanical digging) may directly harm Gopher Tortoises, damage burrows and nests, affect the ability of Gopher Tortoises to forage or nest, and have potential for significant habitat damage. Education and outreach materials may be developed in collaboration with the Gopher Tortoise Council (GTC) and Partners in Amphibian and Reptile Conservation (PARC).

D. Cooperation with the Gopher Tortoise Team

The Army will work closely and cooperatively with the Gopher Tortoise Team (GTT). The GTT is a group created to administer and periodically review the Candidate Conservation Agreement, and will consist of one or more designated representatives from the Army and each party to the CCA. Installations should routinely communicate with the Army's GTT representative(s) to ensure that proposed actions are consistent with CCA guidance.

E. Staffing and Funding

Garrison commanders are responsible for ensuring that adequate professional personnel and funds are provided for the conservation measures described in these guidelines. Gopher Tortoise conservation projects are important components of the Army Environmental Conservation program element of Base Support. Installations will program for funds to implement Gopher Tortoise conservation projects and develop methods to ensure all activities that have the potential to affect Gopher Tortoises are coordinated with all required elements of the installation staff.

F. Conservation on Adjacent Lands

Gopher Tortoise habitat components may be located entirely on installation lands. There may be instances, however, where a portion of a local Gopher Tortoise population is located on installation land, while another portion is located on adjacent non-Army land. Installations need to work with adjacent landowners through education and outreach, cooperative management efforts and/or information/data sharing, and/or help preclude the need to list the species. If needed to support mission sustainability on an installation, the Army Compatible Use Buffers (ACUB) program could incorporate the conservation of Gopher Tortoises through site selection and land management stipulations.

G. Regional Conservation

The interests of the Army and the Gopher Tortoise are best served by encouraging conservation measures in areas off the installation. A significant portion of Gopher Tortoise populations and habitat occur on private lands; therefore, engaging private landowners in the conservation of Gopher Tortoises is essential for the conservation of the species and in avoiding its potential listing under the ESA. In accordance with the landscape level conservation efforts identified in the CCA (Section 10.1.1), installations will identify and collaborate with landowners (private and public) on conservation/management efforts needed to sustain or minimize impacts to Gopher Tortoise habitat. Installations are also encouraged to develop and/or participate in cooperative Gopher Tortoise conservation plans, solutions, and efforts with other federal, state, and private organizations and landowners in the region. Examples of such programs include, but are not limited to, ACUB, regional prescribed fire councils, and regional translocation cooperation.

III. Guidelines for Installation Gopher Tortoise Management Strategies

Installations are to manage Gopher Tortoise populations according to the following guidelines.

A. Gopher Tortoise Management Strategy Development Process

Preparation of installation Gopher Tortoise management strategies requires a systematic, step-by-step approach. Gopher Tortoise populations, Gopher Tortoise habitat (current and potential), and training and other mission requirements (present and future) are to be identified. Analysis of these factors and their interrelated impacts are needed as a first step in the development of a management strategy. Installations are to use the following or a similar methodology in conducting this analysis:

1. Identify installation and tenant unit mission requirements. Overlay these requirements on the Gopher Tortoise distribution scheme. This is in direct support of a CCA Section 10.1.1 commitment - identify areas of potential agency mission – Gopher Tortoise habitat conflict. This is the first proactive step in identifying potential conflicts and developing

possible Gopher Tortoise avoidance, minimization or mitigation measures.

2. Develop a Global Information System (GIS) for the Gopher Tortoise population and its habitat on the installation. Based on current use, soils, and vegetation, designate non-fragmented[1] areas of occupied as well as potentially suitable habitat as Gopher Tortoise Habitat Management Units (HMUs). This supports CCA Section 10.1.1 commitments to identify suitable or potentially suitable habitat for and areas occupied by the gopher tortoise, 1st & 2nd bullets.

3. Determine current Gopher Tortoise population levels and demographics by conducting line transect distance burrow surveys using GIS land cover data and DISTANCE 5.0 software available on the web at http://www.ruwpa.st-and.ac.uk/distance/ as described in the Gopher Tortoise Survey Handbook developed by the Jones Ecological Research Center. After an initial baseline survey is conducted, surveys using consistent and systematic re-sampling should be repeated every 2-5 years to monitor long term population trends.

4. Identify any isolated Gopher Tortoise burrows that are outside areas that realistically can be managed as HMUs. These may include residential lawns, roadsides or transmission line rights of way in areas where prescribed burning or mowing of adjacent habitat is not feasible, etc.

5. Identify HMUs that could support Gopher Tortoise translocation by serving as recipient sites. These must meet the criteria of III.F.2 and III.F. 3 below.

6. Identify HMUs with Gopher Tortoise densities and foreseeable conflict with present and projected mission activities that will adversely and permanently degrade/ fragment/ destroy occupied gopher tortoise habitat. In concert with Section 10.1.2 of the CCA, installations will consider translocating Gopher Tortoises from these HMUs to those identified in III.A.5 above.

7. Analyze the information developed above using the guidance contained in these guidelines.

8. In support of CCA Section 10.1.1, 6th bullet, and where permitted by law, assist in the identification of important Gopher Tortoise populations, habitats, cooperators, and partnership opportunities outside the installation boundaries.

B. Gopher Tortoise Population Goals

Installations will strive to establish no-net loss in the number of gopher tortoises identified as the baseline population of the installation. Efforts will be made to increase population numbers and available habitat, but at least maintaining baseline conditions will help to stabilize the species and prevent further decline. If current population levels cannot be maintained due to mission activities, installations will ensure that adequate habitat is available to replenish or enhance gopher tortoise numbers. Populations can be augmented on installations through translocation

[1] Non-gated paved roads or unpaved roads with significant traffic or high cut road banks that would interfere with Gopher Tortoise movement constitute fragmentation, and will divide otherwise contiguous HMUs.

of individuals from offsite locations. Any such translocation efforts must meet the criteria of III.F.2 and III.F. 3 below.

C. Habitat Management

Maintaining habitat conditions preferred by Gopher Tortoises and that meet military mission needs requires a commitment by resource managers to plan and initiate certain vegetation management practices.

1. Silviculture
   Current silvicultural standards for Red-cockaded Woodpecker (RCW) management on installations is consistent with requirements for Gopher Tortoise habitat. Where RCW management is not an issue, forest management and timber harvest will be evaluated for compatibility with Gopher Tortoise habitat needs. Installations will use pine and hardwood timber harvest and various forms of mechanical and chemical vegetation control, as necessary, to achieve specific habitat and vegetation objectives or to enhance degraded habitat. In general, silvicultural practices in HMUs will employ ecosystem management including maintaining canopy closure at 60% or less, reducing midstory encroachment, and maintaining native grasses and forbs through prescribed burning, minimizing soil disturbance, and implementing appropriate timber management to promote adequate light at ground level. Roller-chopping and other intensive heavy equipment use in areas with high burrow concentrations will be avoided, unless there is no other alternative to reducing saw palmetto (*Serenoa repens*) or other shrub cover.

2. Prescribed Burning
   Current prescribed burning standards for RCW management on installations is consistent with Gopher Tortoise habitat management. Frequent burning reduces shrub and hardwood encroachment, and stimulates growth of Gopher Tortoise forage plants such as grasses, forbs, and legumes. The physical result of fire on tree and shrub species is to reduce canopy cover. Heat stress caused by prescribed burning will trim the lower limbs of pine and hardwood trees and induce mortality among young, stressed, and diseased trees. This allows greater sunlight penetration to reach ground level which promotes establishment of understory species used by the tortoise as forage and is also important for proper egg incubation in gopher tortoises. Burning during the early growing season (April – June) causes even more pronounced vegetative responses when compared to burning conducted during the period of plant dormancy. These early growing season burns stimulate flowering in many warm season grasses, increase species composition among understory plants, and result in higher understory biomass production. For Gopher Tortoise HMUs that do not fall under RCW management, prescribed burning will be conducted at a frequency of one to five years, but preferably at least every three years. Burning should normally be conducted in the growing season, but winter burns may be appropriate to reduce high fuel loads.

3. Invasive Exotics
   Invasive exotic plants can displace Gopher Tortoises, reduce native plant species composition, and interfere with the application of management practices such as prescribed burning. Infestations of such invasive plants in Gopher Tortoise HMUs will be identified and controlled through proper herbicide treatments or other acceptable means, as needed.

4. Predation
   Predator populations, such as raccoons and crows, can be artificially high in some habitats because of anthropogenic factors. If Gopher Tortoise hatchling survival is greatly affected by induced predation pressure, installations will implement measures to control applicable predator populations. To assist with hatchling survival under such circumstance, installations will consider a head-start program where juveniles are protected until large enough to minimize the predation risk and then released back in the area where they were captured.

5 Corridors
   Corridor(s) are to be maintained or, if necessary, established to allow movement of Gopher Tortoises among HMUs so they can fulfill essential life requirements (i.e., breeding) and sustain genetic and population viability. Care should be taken to prevent these corridors from becoming roads. Where corridors cannot be maintained in support of mission requirements and result in isolated populations or sub-populations of Gopher Tortoises that are not viable, installations will consider translocation of the tortoises to acceptable recipient sites on or off the installation.

D. Population Monitoring

Installations should conduct monitoring programs to scientifically determine demographic trends and to measure success.

1. Burrow Surveys
   As stated in III.A.3 above, surveys for and monitoring of tortoise burrows in Gopher Tortoise HMUs will be conducted by qualified biologists at intervals of 2-5 years. Surveys in previously unoccupied areas are needed only if the installation biologist determines that improved habitat conditions have increased the likelihood of Gopher Tortoise occurrence.

2. Project Surveys
   To identify Gopher Tortoises that may need to be avoided or possibly relocated prior to certain actions, the installation will conduct burrow surveys prior to timber harvesting operations, construction, or other significant land-disturbing activities, excluding prescribed fire. These surveys will be conducted within a year prior to project initiation by natural resources personnel or contractors trained and experienced in Gopher Tortoise biology. Burrows found prior to project activities should be marked with conspicuous caution flagging tied to adjacent shrubs or other vegetation. Avoidance, minimization, and/or mitigation measures will be implemented in areas where such activities will impact gopher tortoises, as necessary or as needed.

E. Burrow Marking

Installations may permanently mark or tag Gopher Tortoise burrows for monitoring and/or burrow protection. If permanently marking burrows, installations should use inconspicuous numbered metal tags on short wire stakes. Installations should also consider conspicuous tall stakes placed beside particularly vulnerable burrows to help vehicle operators avoid them. Where many burrows are near where tracked or wheeled vehicles are prone to disturbing them, appropriate signage may be deemed necessary, with language such as "Be Aware—Please Avoid Gopher Tortoise Burrows."

F. Translocation

Translocating Gopher Tortoises from populations threatened by habitat destruction to restore severely depleted populations on secure lands is an important management tool. Installation plans will provide for translocation to augment low density populations, where appropriate.

1. Installations will identify potential recipient translocation sites for Gopher Tortoises being displaced by development or other activities elsewhere on the installation and/or nearby private lands.

2. Recipient sites must have no (or limited) foreseeable conflict with present and projected mission activities.

3. In areas determined acceptable to receive Gopher Tortoises, habitat inspection and improvement work must be completed before translocation is attempted to ensure that translocation is successful. Potential recipient sites must have suitable habitat in good condition that is presently deemed to be either lacking or under-stocked with tortoises and will not be readily repopulated without human intervention. The reason(s) for deficient tortoise populations should be recognized or suspected (and no longer exist) before tortoises are stocked onto these lands. Reasons for low densities might include a past history of human harvest, disease die-offs, or unsuitable habitat (*e.g.*, dense pine plantation, fire-suppressed habitat) that has been restored to favorable conditions for tortoises.

4. Any translocations will be undertaken in close coordination with the GTT.

G. Data Records, Reporting, and Coordination

1. Installations will record and retain permanently all survey, inspection and monitoring data for Gopher Tortoise populations and habitats for trend analysis.

2. Installation biologists and foresters will maintain close coordination and, at a minimum, will conduct an internal Gopher Tortoise installation progress review once a year.

3. Installation Management Command-Southeast (IMCOM-SE) will serve as integrator and facilitator for Gopher Tortoise management on Forts Rucker, Benning, Gordon, and Stewart.

4. IMCOM-SE will coordinate annual reporting to the GTT. IMCOM-SE will provide Gopher Tortoise oversight. IMCOM-SE will ensure that data collected will be evaluated for trend analysis.

5. Installations annually will report results of any Gopher Tortoise inventory and monitoring activity to IMCOM-SE. IMCOM-SE will provide data to the GTT in accordance with the CAA requirements. These data will include measures of population status and actions taken to improve habitat.

6. Gopher Tortoise maps will be developed using survey data to accurately depict the location of Gopher Tortoise colonies, burrows, and HMUs. Maps will be updated at least every 5 years. Maps used internally will be tailored to the users, e.g. trainers,

foresters, etc. and will be widely distributed for use by those conducting land use activities on the installation, including military training, forest management, construction projects, and range maintenance.

TRAINING ACTIVITY WHERE TORTOISE BURROWS OCCUR

MANEUVER AND BIVOUAC	Potential Adverse Impacts
Hasty defense, light infantry, hands and hand tool digging only, no deeper than 2 feet	NO
Hasty defense, mechanized infantry/armor	YES
Deliberate defense, light infantry	NO
Deliberate Defense, mechanized infantry/armor	YES
Establish command post, light infantry	NO
Establish command post, mechanized infantry/armor	YES
Assembly area operations, light infantry/ mechanized infantry/armor	YES
Establish CS/CSS sites	YES
Establish signal sites	YES
Foot transit thru the colony	NO
Wheeled vehicle transit through the colony	YES
Armored vehicle transit through the colony	YES
Cutting natural camouflage	NO
Establish camouflage netting	NO
Vehicle maintenance	YES
WEAPONS FIRING	
7.62mm and below blank firing	NO
.50 cal blank firing	NO
Artillery firing point/position	NO
MLRS firing position	NO
All others	NO
NOISE	
Generators	NO
Artillery/hand grenade simulators	NO
Hoffman type devices	NO
PYROTECHNICS/SMOKE	
CS/riot agents	NO
Smoke, haze operations only, generators or pots, fog oil and/or graphite flakes (3)	NO
Smoke grenades	NO
Incendiary devices to include trip flares	NO
Star colonies/parachute flares	NO
YES HC smoke of any type	NO
DIGGING ALLOWED	
Tank ditches	YES
Deliberate individual fighting positions	YES
Crew-served weapons fighting positions	YES
Vehicle fighting positions	YES
Other survivability/force protection positions	YES
Vehicle survivability positions	YES

Fort Rucker FY 10 Submission for Gopher Tortoise Candidate Conservation Agreement Annual Report

1. Gopher Tortoise Population and Habitat Availability

a. Estimated Population

The following is from the 2003 Planning Level Survey for Threatened and Endangered Species:

"Although tortoise burrows were actively sought in all accessible areas of Fort Rucker with seemingly suitable habitats, the scope of the survey did not allow for 100 percent coverage of all potential habitats. In other words, many tortoise burrows were not observed. Nevertheless, a total of 636 active tortoise burrows was documented on the Main Post (Appendix B).

Of the 51 active tortoise burrows that were "scoped" with a remote video camera probe, 22 (43%) were found to contain tortoises, and 19 (37%) could not be fully explored to the terminal end. The only other vertebrate encountered in an active burrow was one eastern diamondback rattlesnake. Eight inactive burrows were also scoped with negative results except for one southern toad.

The gopher tortoise population on Fort Rucker is in all likelihood the second largest on publicly owned land in Alabama. Only the Conecuh National Forest is known to support more tortoises. Considering the fact that some of the best habitats probably occur in the frequently burned and off-limits Impact Area (which comprises a quarter of the area of the Main Post), the total number of tortoises on Fort Rucker could easily exceed 1,000 individuals. In addition, three burrows were found on Hunt Field, two on Runkle, and a minimum of three on Cairns. More are probably present on Cairns, but access was restricted and some areas could not be investigated.

Gophers have declined because of habitat loss, collection for food, highway mortality, forestry practices involving intensive site-preparation and favoring dense pine plantations, and possibly from gassing of their burrows by "rattlesnake hunters." Fire ants are known to prey on hatchlings, and increases in numbers of raccoons may also have harmed gopher populations.

Gopher tortoises occur primarily in well-drained, deep sandy soils with a relatively open forest canopy. Such conditions allow for deep burrows and sunlight intensity necessary for thermoregulation, nesting, and growth of forage plants such as grasses and forbs. Such habitat is present in abundance on Fort Rucker, especially in the eastern portion (Figure 6). In Alabama, frequently burned, longleaf pine-turkey oak sandhills support the best populations. Tortoises will colonize pine plantations during the first few years after planting, but will abandon these habitats as canopy closes. Thinned and burned planted pine habitats (e.g., slash or loblolly) may meet necessary minimum requirements. Gopher tortoises avoid or abandon dense hardwood and unburned pine/hardwood habitats. Early successional, ruderal communities (e.g., old agricultural fields, food plots) may support tortoises, but areas subjected to annual cultivation or mowing will not likely support viable populations.

Where gophers have been moderately well protected from human molestation and exploitation, they tend to occur in loose "colonies," consisting of a small number of adults, along with individuals in younger

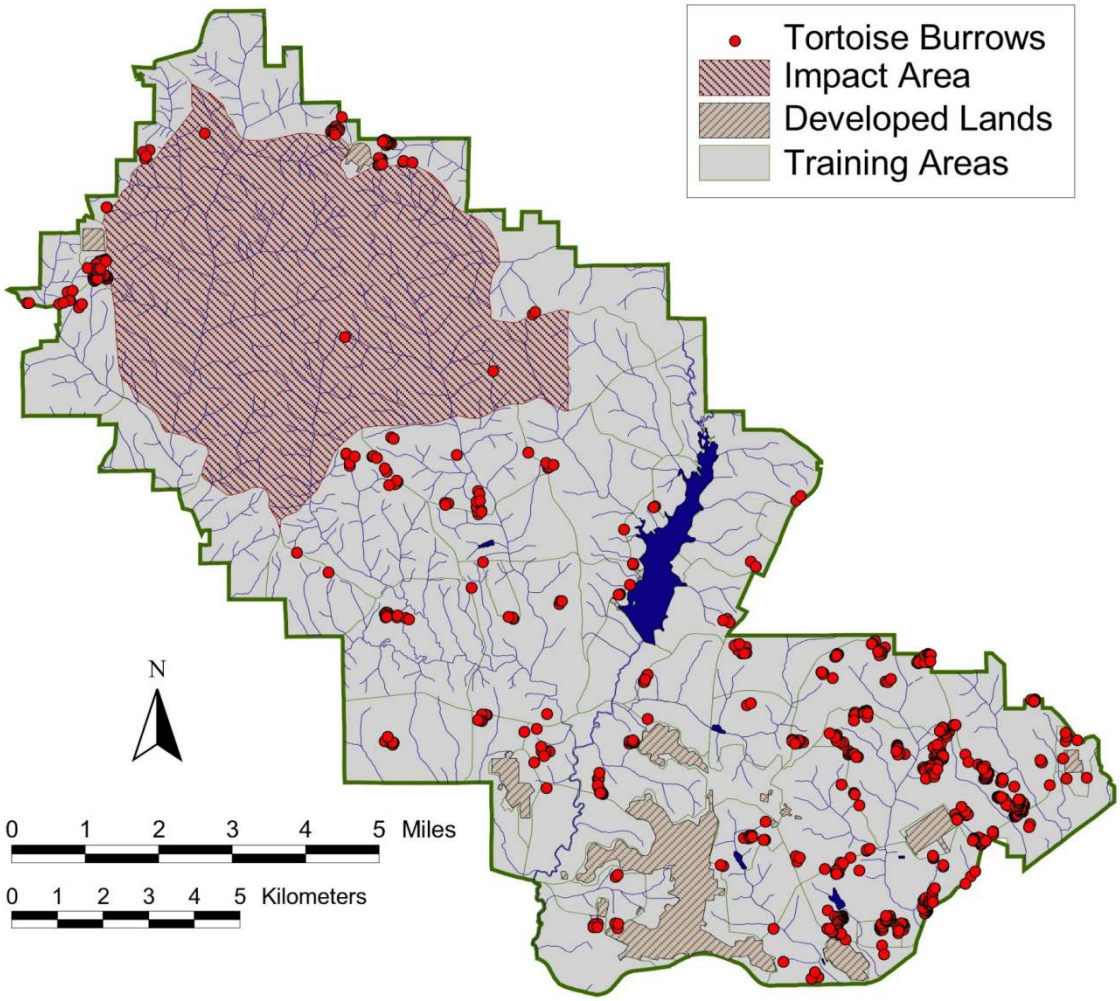
size-classes. A few such assemblages were found on Fort Rucker, but many tortoises occurred as isolated individuals or were widely scattered.

Considering the amount of suitable habitat for burrowing and the availability of various grasses and forbs that constitute the bulk of the gophers' diet, the current population size is low and probably less than ten percent of carrying capacity. In conversations with locals, one concludes that in past years the gophers on Fort Rucker have suffered from heavy human depredation, and their burrows have been subjected to gassing by "rattlesnake hunters."

The gopher tortoise is considered a "keystone species" in the areas where it occurs. Range wide, gopher tortoise burrows (Figure 7) provide shelter for more than 40 other species of vertebrates and a host of invertebrates as well, some of which cannot exist in the absence of the tortoise. Because of its status and of its value to other animal life, measures to enhance the gopher populations on Fort Rucker would be desirable.

This is the most current survey work for tortoise population density. Funding has been sought for the past two fiscal years for an up to date survey but this has not been funded.

The following map shows burrow distribution found during the 2003 PLS:



b. Population Trends

Based on observations by Natural Resources personnel, the overall population is thought to be stable on the Installation.

c. Disease and predation impacts

Although tortoises mortality due to disease and predation are certainly occurring, evidence of this

mortality is rarely seen.

d. Take of Tortoises as a Result of Mission Activities

No take of tortoises as a result of mission activities has been noted, however it may occasionally occur.

e. Translocation of Gopher Tortoises

Twenty gopher tortoises were released east of Hanchey Field in Training Area 35 in 1993 as part of a mitigation effort by the Georgia Highway Department.

f. Head Start Effort

None

g. Means in Which Burrow/GTs are protected from mission activities

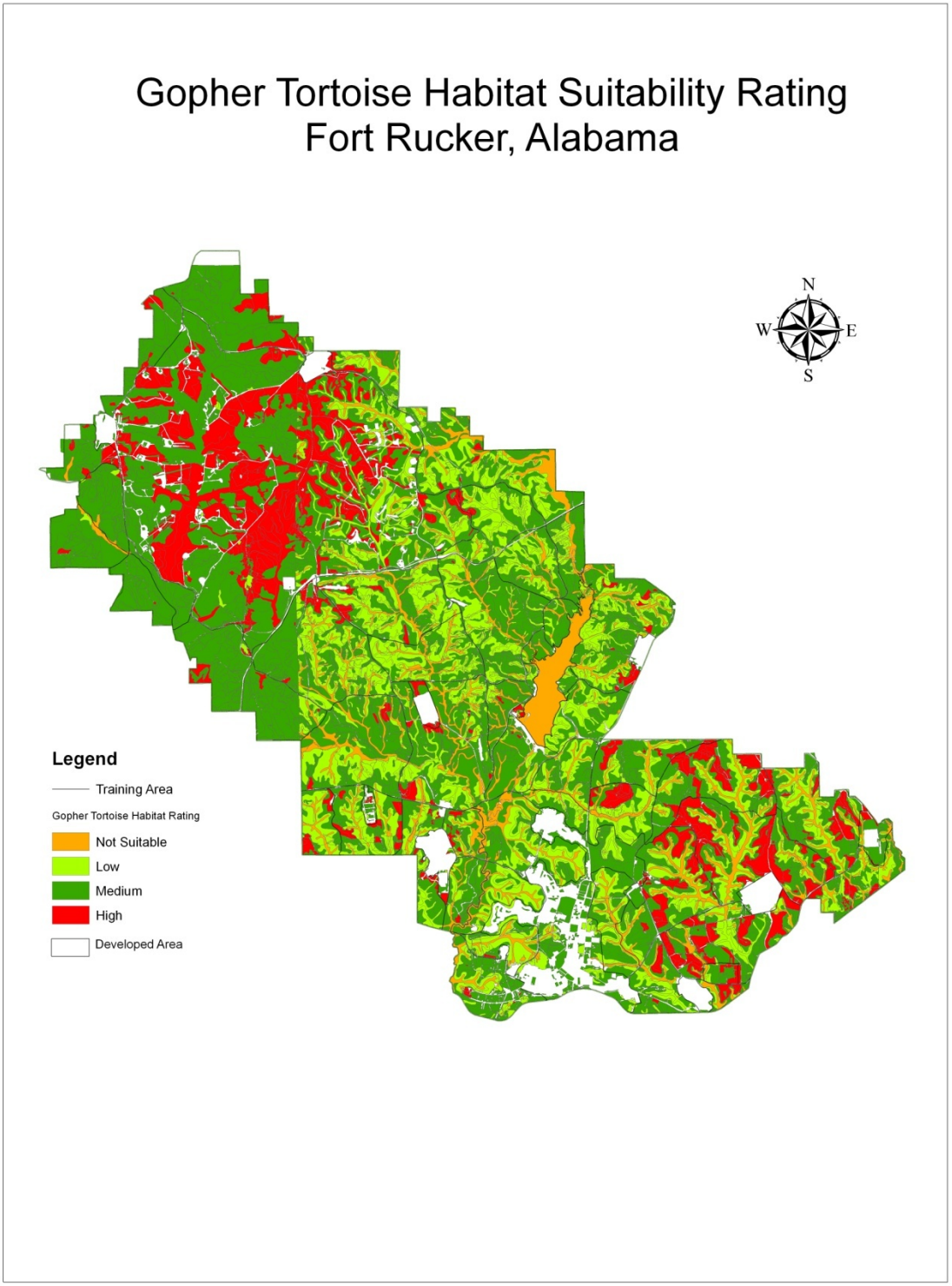
Gopher tortoises are protect by Alabama law on Fort Rucker. Additionally units training here receive briefing materials from Range Control informing them of the protected status of the gopher tortoise.

2. Habits

a. Acreage of current suitable habitat on the installation

A vegetative communities survey was conducted on the Installation in 2009. As part of this survey the contractor used soil and vegetation rankings developed by natural resources personnel to classify gopher tortoise habitat on the Installation. The following figures and map are provided.

1 Unsuitable Habitat	4463 acres
2 Marginal Habitat	12490 acres
3 Suitable Habitat	28275 acres
4 Preferred Habitat	8301 acres
Grand Total	53529 acres


Gopher Tortoise Habitat Suitability Rating
Fort Rucker, Alabama
N
W
E
S
Legend
Training Area
Gopher Tortoise Habitat Rating
Not Suitable
Low
Medium
High
Developed Area

b. Impact

i) currently being disturbed by installation activities to the degree it will no longer be suitable habitat for GT: none that we are aware of

ii) that will be disturbed in the near future to the degree it will no longer be suitable habitat for GT: none that we are aware of

iii) not **managed** (*maintaining an open park-like canopy with a diverse herbaceous groundcover and minimal shrub encroachment*) for GT: unknown, estimated 13,000 acres that would be suitable habitat but is not managed to the extent of maintaining a park-like canopy and minimal shrub encroachment

C. Conservation- 8,301 acres of preferred habitat, 28,275 acres of suitable habitat
NOTE: Funding for gopher tortoise habitat management has been requested for the last two fiscal years but has not been approved.

i) **restored/improved** (*land management activities that produce conditions favorable for tortoise foraging (diverse herbaceous groundcover) and reproduction (open, sunlit sites for nesting*)).

ii) maintained through:

A) prescribed burns: 12000/year on 4 year cycle

B) mechanical means: 700 acres

C) other methods: wildlife opening 300 acres, forest stand thinning 1500-2000 acres annually

iii) invasive species treated/eradicated (include invasive plant/animal type) : approx 20 acres of cogongrass and kudzu

iv) predator control and/or protection from predation (include species and protection method, if applicable): none

v) protected through Army Compatible Use Buffers : none so far, ACUB in progress

3. Research and Education/Outreach

a. Supporting Research: Cooperated with U.S. Fish and Wildlife Survey on gopher tortoise survey of south Alabama in 1983

b. Education/outreach: Earth Day activities

4. Installation Policies and/or Directives: INRMP addresses SAR and specifically recommendations for gopher tortoise protection and management IAW Army Gopher Tortoise Guidelines. Also USAAVNC 215-1 Range Control Regulation.

APPENDIX 9.6.2: Fort Rucker GIS Databases

Feature Dataset	***Feature Class***
Auditory	Noise Contour Line
	Noise Incident Point
	Noise Zone Area
Boundary	Jurisdiction County Area
	Jurisdiction Municipal Area
	Jurisdiction State Area
Buildings	Structure Existing Area
	Structure Existing Point
Cadastre	DOD Property Management Point
	Installation Area
	Installation Historical Area
	Section Area
Carto	Subsurface Water Flow Direction
	Surface Water Flow Direction
Common	Coordinate Grid Area
	Coordinate Grid Line
	UTM Grid Line
	UTM Grid Point
Communications	Communication Antenna Point
	Speaker Point
Environmental Hazard Building	Lead Paint Hazard Point
Environmental Hazmat Waste	Hazmat Storage Location Point
	Hazwaste Storage Location Point
Environmental Haz Pollution	Air Emissions Source Point
	Surface Water Discharge Point
Environmental Haz Regulated Tank	Solvent Tank Point
Environmental Haz Solid Waste	Landfill Cell Area
Fauna	Species Forage Area
Flora	Flora Fire Area
	Flora Prescribed Burn Area
	Forest Compartment Area
	Land Vegetation Area
	LCTA Point
	Timber Harvest Area
Geodetic	Control Point
	Digital Elevation Model Points
	NGS Control Point
	USGS Quad Area
Hydrography	Flood Zone Area
	Surface Water Body Area
	Surface Water Course Area
	Surface Water Course Centerline

	Watershed Area
	Wetlands Area
Improvement Flood Control	Dam Site
Improvement General	Fence Line
	Gate Point
Improvement Recreation	Athletic Field Area
	Golf Course Area
	Hunting Area
	recreation Trail Centerline
	Swimming Pool Area
Improvement Well	Water Well Point
Land Status	Borrow Pit Area
	Cemetery Area
	Land Repair Area
	Placement Point
Landform	Elevation Contour Line
	Spot Elevation Point
	Survey Traverse Point
Military Air Operations	Military Flight Corridor
	Military Special Use Airspace
	Military Route Line
	Military Route Point
Military Range	Firing Fan Area
	Firing Lane Area
	Firing Point
	Military Live Fire Area
	Military Range Area
	Military Range Site Area
	Military Target Line
	Military Target Point
Military Safety	Ammunition Storage Area
	Dudded Impact Area
	Quantity Distance Arc Area
	Surface Danger Zone
	Safety Marker Point
	Non Dudded Impact Area
	UXO Clearance Area
	UXO Contamination Point
Military Security	Military Restricted Access Area
Military Training	Military Landing Zone Area
	Military Landing Zone Point
	Military Observation Point
	Military Training Sub Area
	Tank Trail Line
	Training Areas
	Training Point

Soil	Soil Map Unit Area
Transportation Air	Air Accident Zone Area
	Airfield Area
	Airfield Imaginary Surface Area
	Airfield Surface Area
	Airfield Surface Edge Line
	Airfield Surface Point
	Airspace Obstruction Navaid Point
	Navigational Aid Point
Transportation Road	Railroad Centerline
Transportation Vehicle	Road Bridge Centerline
	Road Centerline
	Road Edge Line
Utilities Electrical	Electrical Cable Line
	Electrical Generator Point
	Electrical Substation Point
	Electrical Switch Point
	Exterior Lighting Point
Utilities Fuel	Fuel Farm Area
	Fuel Tank Point
Utilities General	Utility Pole Tower Point
Utilities HCS	Heat Cool Pump Point
Utilities Industrial	Industrial Waste Tank Point
Utilities Storm	Storm Water Stilling Basin Point
	Storm Sewer Discharge Point
Utilities Wastewater	Wastewater Line
	Wastewater Discharge Point
Utilities Water	Water Fire Connection Point
	Water Line
	Water Pump Point
	Water Pump Station Site
	Water Tank Point
	Water Treatment Plant Area

Natural Resources GIS Data Layers

Fish and Wildlife

Annual Camera Survey Camera Locations
Ft Rucker Land Boundary Dispute
Game Check Station Locations
Fawn Mortality Project Layers*

- *Fawn Mortality Study Area*
- *Bait Sites*

Fire Lane Road Work
Food Plot Location and Types
Lake Tholocco*

- *Christmas Tree Locations*
- *Contour Intervals*
- *Fish Attractors*
- *Rubble Piles*
- *Trenches*
- *Windrows*

Turkey Walk-In Sign Locations
Vegetative Communities
NPDS
Perimeter Security Shapefiles*
Pictures

- Fawn Pictures
- Fish Survey Pictures
- Turkey Pictures

Forestry

Prescribed Burn Shapefiles

- Burn Units
- Smoke Area Buffer Rings
- Smoke Plume Angles
- Firelanes
- Points of Concern
- Smoke Sensitive Areas
- Burn Documents

Ft Rucker Stands

APPENDIX 14.2.3: Previous Cultural Resources Surveys on Fort Rucker, Alabama[11]

STUDY	AREA	REFERENCE
1983	4,500 acres	1
1985	Molinelli helicopter stagefield and aerial gunnery range	2
Fall 85-Winter 86	Eight sites	3
1987	Ten timber harvest areas	4
1988	Golf course expansion	5
Nov 1988	Ten timber harvest areas	6
May, Sep 1989	Six timber harvest areas	7
August 1990	Exposed bed of Lake Tholocco	8
Spring 1991	Proposed expansion of Alabama National Guard UTES facility	9
Summer 1991	Four proposed timber harvest areas	10
October 1991	Four areas of pine beetle-infested trees	11
February 1992	Proposed golf course expansion	12
April 1992	Proposed expansion of Knox Field facilities	13
April 1992	Four proposed timber harvest areas	14
March 1993	FY 93 timber harvest areas, cantonment, proposed tank maneuver area	15
Summer 1995	Cantonment, Cairns AAF, Training Areas 8, 10, 17, 22, 3 8, 40, A, B, C, E, F	16
1996	Historic Preservation Plan, Cultural Overview, 100% Inventory	

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[11] **Taken from Rust Environment and Infrastructure (1999)**

1. Braley, C.O. and R.L. Mitchelson. 1984. *A Cultural Resources Survey of Fort Rucker. Alabama*. Report prepared for the United States Army Aviation Center, Fort Rucker, Alabama by Archaeological Services Branch, National Park Service, Atlanta, GA.
2. U.S. Army Corps of Engineers, Mobile District. 1985. *A Cultural Resource Reconnaissance of the Longstreet Helicopter Stagefield and Ordnance Impact Area at U.S. Army Fort Rucker, Coffee and Dale Counties, Alabama*. U.S. Army Aviation Center, Fort Rucker, AL.
3. Braley, C.O. and Misner, E.J. 1986. *The Archaeological Testing and Evaluation of Eight Sites at Fort Rucker, Alabama*. Archaeological Services Division, National Park Service, Atlanta, GA.
4. U.S. Army Corps of Engineers, Mobile District. 1987. *A Cultural Resources Survey of Timber Sale Areas, Fort Rucker, Enterprise, Alabama*. U.S. Army Aviation Center, Fort Rucker, AL.
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7. U.S. Army Corps of Engineers, Mobile District. 1989. *Historic Resource lnvestigations, Fort Rucker, Alabama*. U.S. Army Aviation Center, Fort Rucker, AL.
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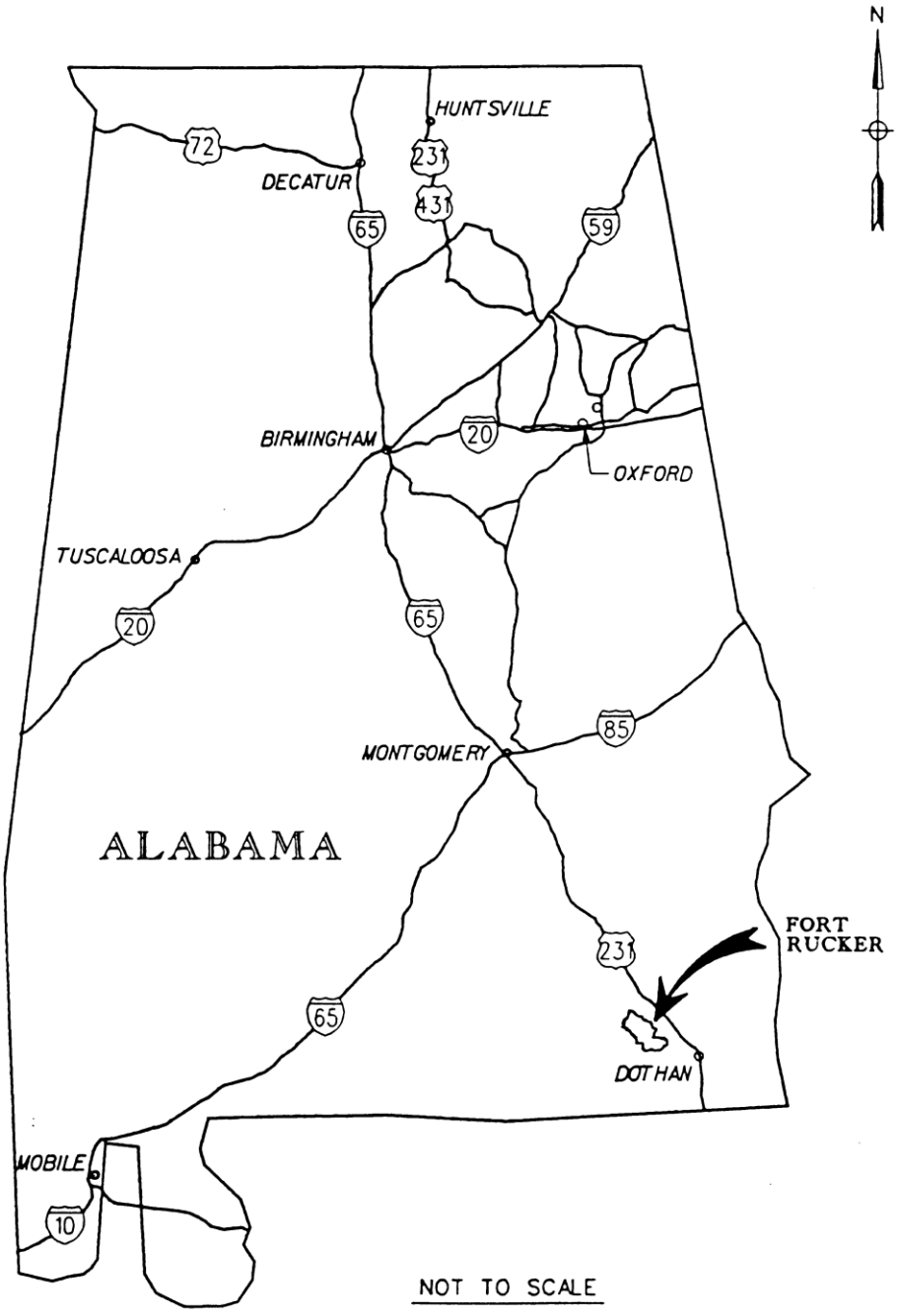
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT RUCKER, ALABAMA

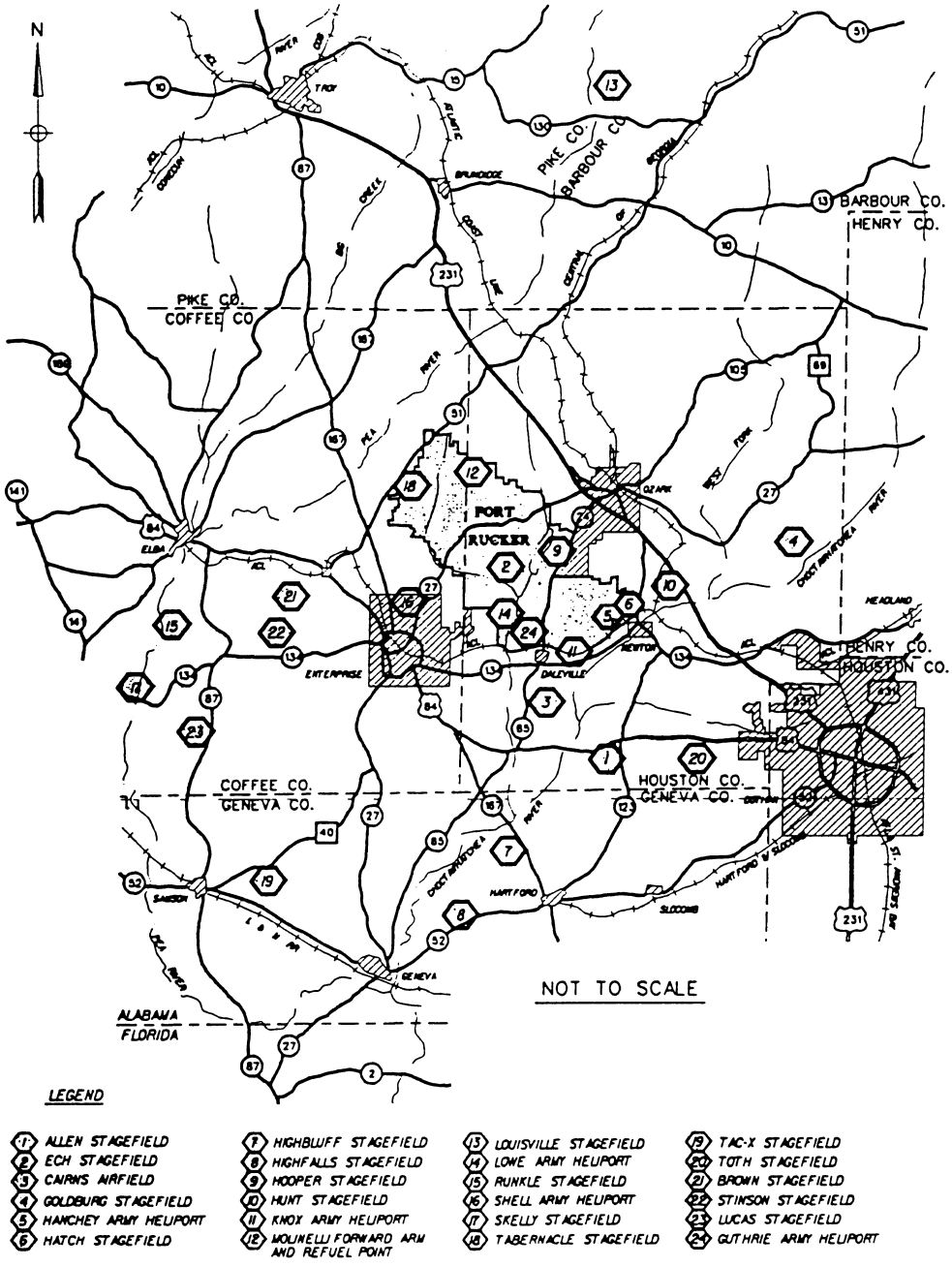
MAPS

MAP 2.1: General Location of Fort Rucker, Alabama[12]



[12] **Taken from Rust Environmental and Infrastructure (1996).**

MAP 2.2: Fort Rucker Satellite Installations[13]

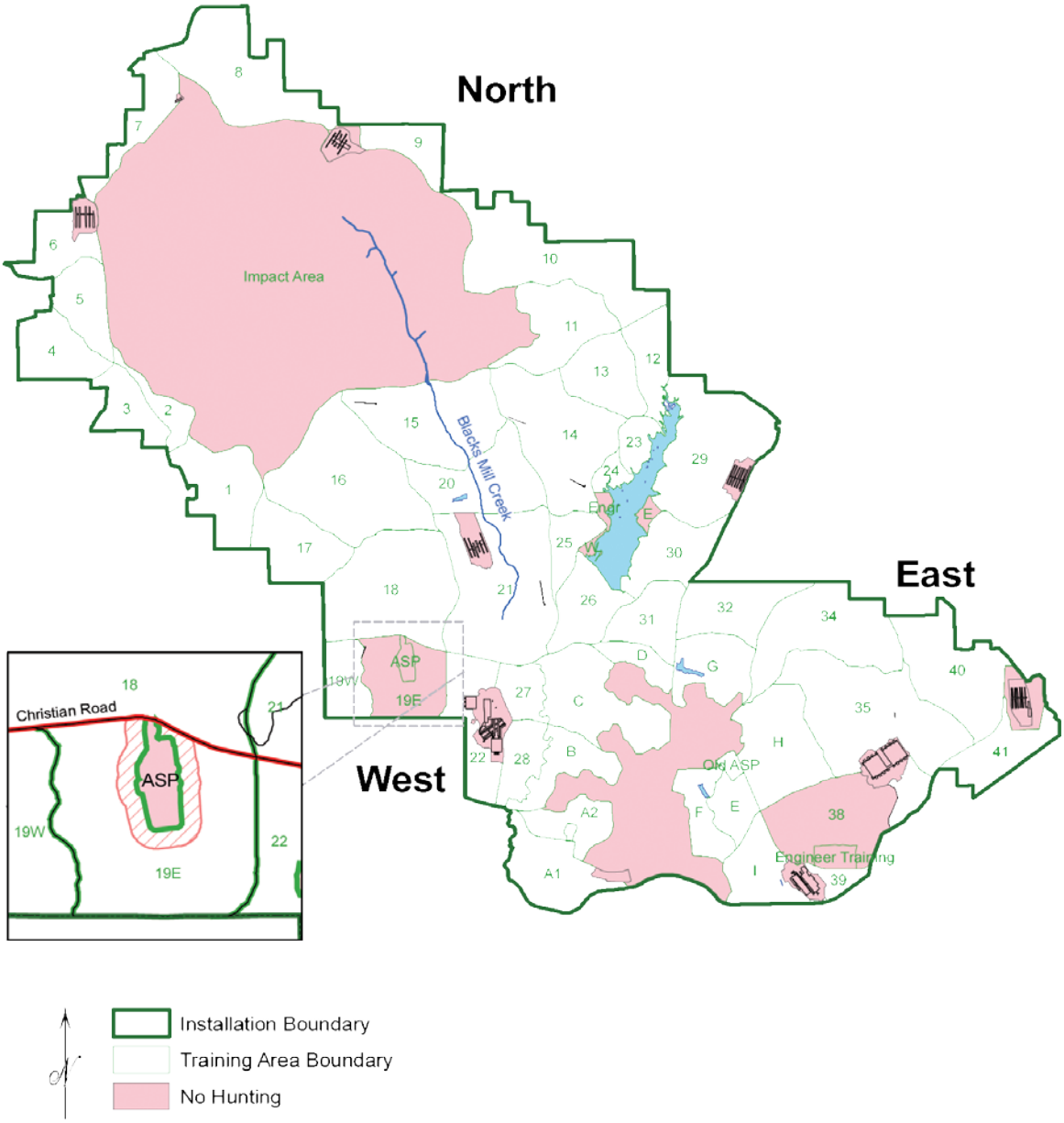


[13] **Taken from Rust Environmental and Infrastructure (1996).**

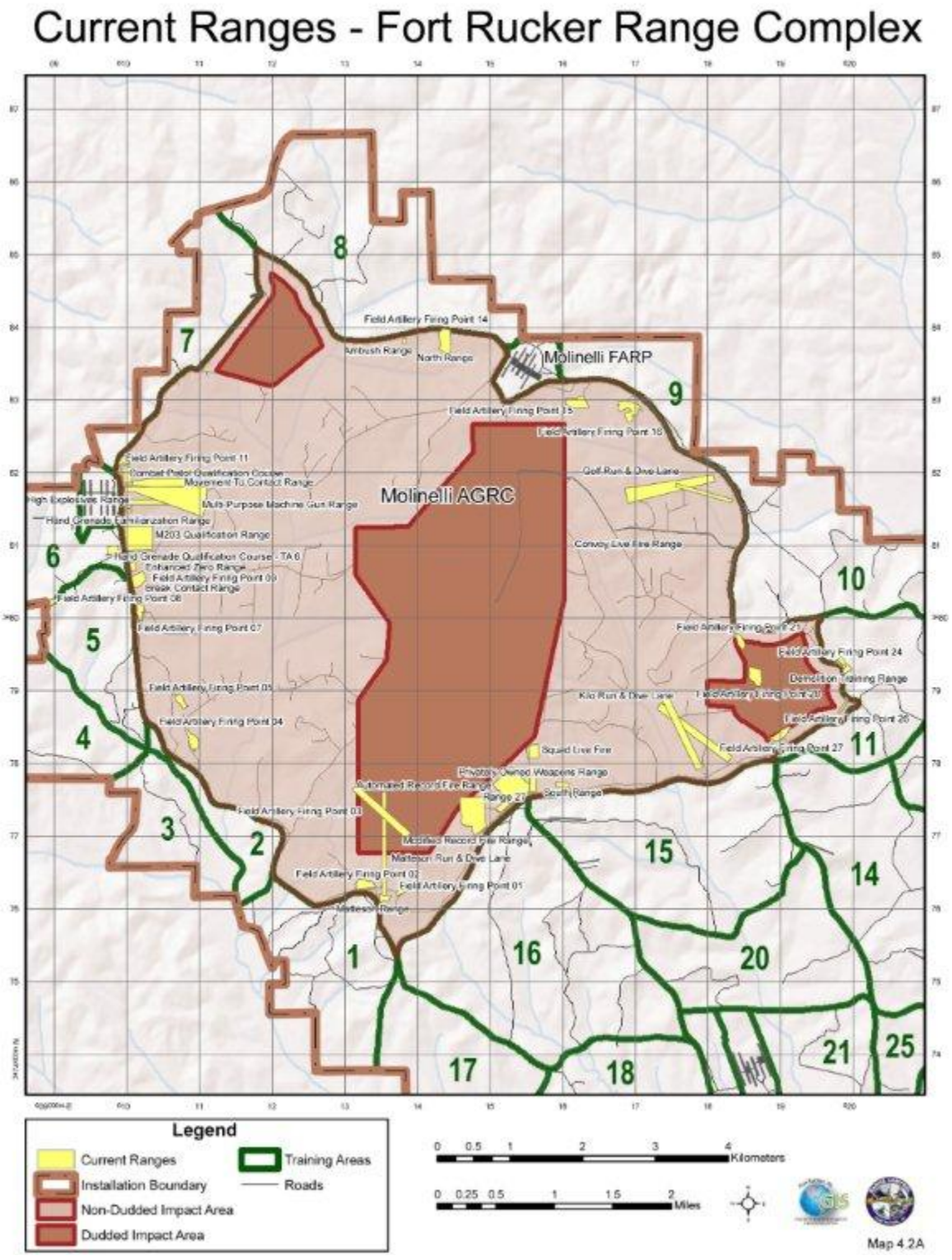
MAP 4.1: Fort Rucker, Alabama Hunting and Training Areas

FORT RUCKER RESERVATION MAP

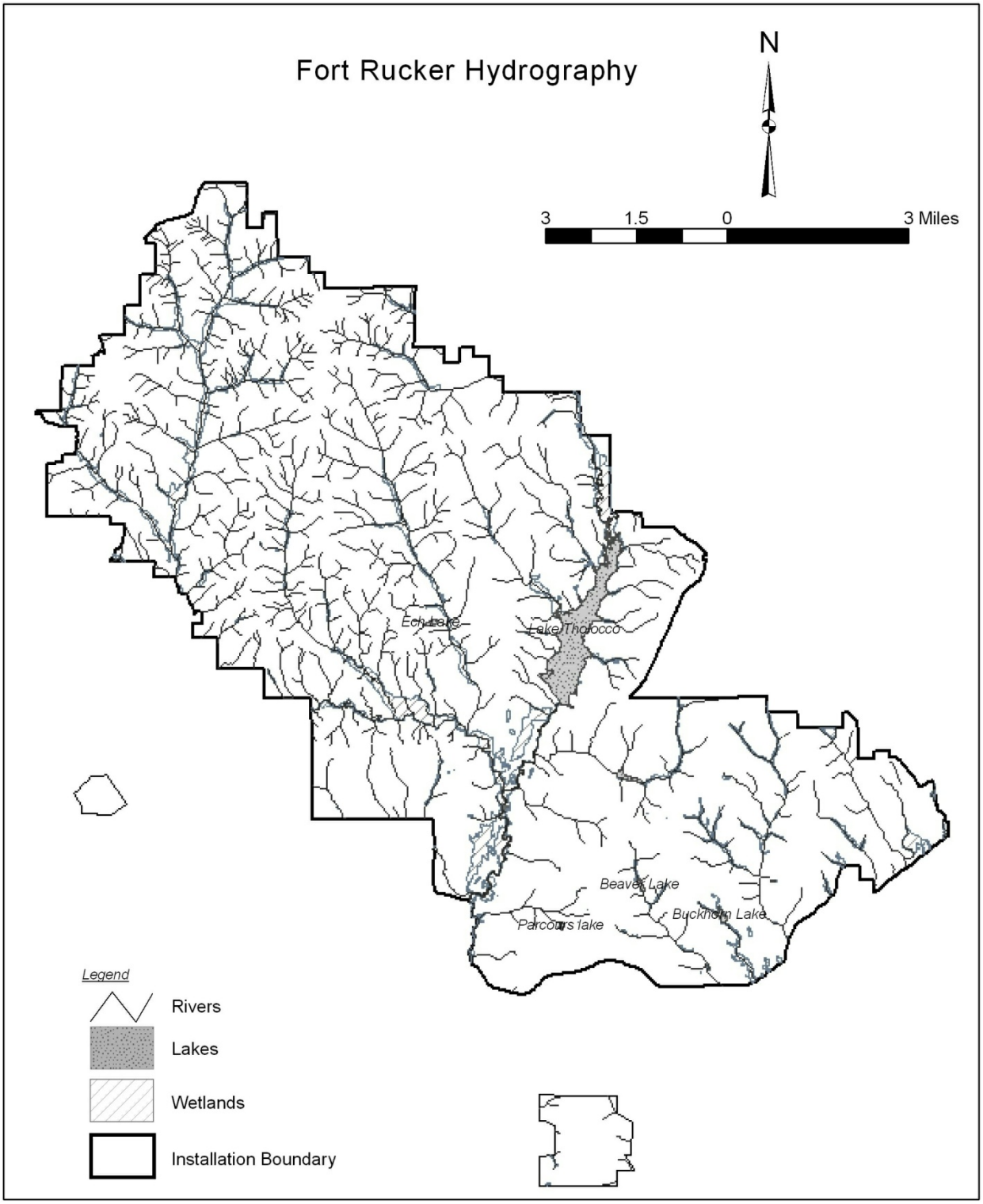
HUNTING AREAS



MAP 4.1.3: Fort Rucker Firing Ranges



MAP 6.7.7: Fort Rucker Wetlands



MAP 7.3.2: Master Cutting Units