

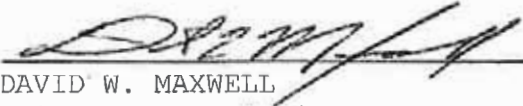
**INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN  
2015-2019**


FOR

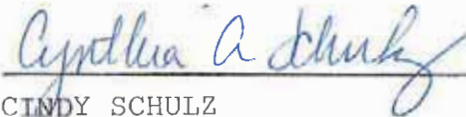
MARINE CORPS BASE, QUANTICO, VIRGINIA

I. AUTHORITY

Per the Sikes Act Improvement Act (SAIA), Public Law 105-85, and per the authority contained in Title 10, U.S.C., Section 2671 and Title 16, U.S.C., Section 670a et seq., Marine Corps Base, Quantico, (MCBQ) Virginia, requested the assistance of the U.S. Fish and Wildlife Service and the Virginia Department of Game and Inland Fisheries to review and update this Integrated Natural Resources Management Plan (INRMP). MCBQ and its partners, through their duly designated representatives whose signatures appear below, approve the following plan in keeping with goals and objectives set forth in the SAIA.

 20150630  
\_\_\_\_\_  
DAVID W. MAXWELL Date  
Colonel, U.S. Marine Corps  
Commander  
Marine Corps Base, Quantico

 09/08/2015  
\_\_\_\_\_  
ROBERT DUNCAN Date  
Executive Director  
Virginia Department of Game  
and Inland Fisheries

 1/8/2016  
\_\_\_\_\_  
CINDY SCHULZ Date  
Field Supervisor, Virginia Ecological Services  
U.S. Fish and Wildlife Service

# Marine Corps Base Quantico Integrated Natural Resources Management Plan: 2015 - 2019



- Wetlands
- Rare Species
- Clean Water
- Quality Of Life
- Erosion Control
- Wildlife Habitat
- Forest Products
- Outdoor Recreation
- Healthy Watersheds
- Resource Stewardship
- Hunting, Fishing, Boating
- Environmental Education
- Conservation Volunteer Program

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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## II. PLAN PREPARATION

The Natural Resources and Environmental Affairs Branch, G-F (Installation and Environment Division), MCBQ, prepared this INRMP by updating the previous version, which was valid for fiscal years 2007-2011. This INRMP, valid for fiscal years 2015-2019, reflects minor changes which do not result in any biophysical consequences materially different from those realized over the previous years of INRMP implementation. Consultation with the following billets and organizations was instrumental in updating this plan.

AC/S G-F (Installation and Environment Division)  
AC/S G-4 (Logistics Division)  
AC/S G-3 (Operations Division)  
Director, Comptroller Division  
Counsel, Quantico Area Counsel's Office  
Commanding General, Training and Education Command  
Community Planning Liaison Officer  
Head, Range Management Branch, G-3  
Director, Safety Division  
Commanding Officer, Security Battalion  
Director, Marine Corps Community Services Division  
Public Affairs Office  
Head, Public Works Branch, G-F  
Head, Fire Protection/Prevention Branch  
Prince William Forest Park, National Park Service  
Virginia Department of Game and Inland Fisheries  
Virginia Field Office, U.S. Fish and Wildlife Service  
Virginia Department of Forestry

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

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A	REAL ESTATE AND LAND MANAGEMENT AGREEMENTS: (1) 1998 MEMORANDUM OF UNDERSTANDING BETWEEN PRINCE WILLIAM FOREST PARK AND MARINE CORPS BASE, QUANTICO; (2) WATERSHED PROTECTION PLAN FOR SOUTH FORK QUANTICO CREEK; (3) WATERSHED PROTECTION PLAN FOR CHOPAWAMSIK CREEK; (4) LIST OF REAL ESTATE GRANT/GRANTEES OCCUPYING MCBQ LANDS SUBJECT TO THIS INRMP; (5) AND RESTRICTIVE EASEMENT FOR MERRIMAC FARM WILDLIFE MANAGEMNT AREA.
B	MCBO P11015.2B, FISH AND WILDLIFE MANAGEMENT PROCEDURAL MANUAL
C	MAPS OF MANAGED OPENINGS IN TRAINING AREAS
D	SPECIES LISTS FOR MARINE CORPS BASE, QUANTICO

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CHAPTER 1

INTRODUCTION

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## CHAPTER 1

### INTRODUCTION

#### 1000. PURPOSE

1. Per the Sikes Act Improvement Act (SAIA), 16 U.S.C. 670 et. seq., Department of Defense (DoD) Instruction 4715.3, and Marine Corps Order P5090.2A, this Integrated Natural Resources Management Plan (INRMP) has been prepared as a planning document that directs management and conservation of natural resources while meeting the mission of Marine Corps Base Quantico (MCBQ). Management actions identified in the INRMP provide for the following:

a. No net loss in the capability of military installation lands to support the military mission of the installation.

b. Fish and wildlife management, land management, forest management, outdoor recreational management and environmental restoration.

c. Fish and wildlife habitat enhancement or modifications.

d. Wetland protection, enhancement, and restoration.

e. Integration of, and consistency among, the various activities conducted under the plan.

f. Establishment of specific natural resource management goals, objectives and time frames for proposed actions.

g. Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the military mission and the needs of the fish and wildlife resources.

h. Public access to the military installation subject to military mission requirements, safety and military security.

i. Enforcement of applicable natural resources laws and regulations.

j. Such other activities as the Secretary of the military department determines appropriate.

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2. This INRMP replaces the MCBQ INRMP completed December 21, 2007, and is valid for the period October 2015 through September 2019.

1001. MISSION. MCBQ is located approximately 35 miles southwest of Washington, D.C. (Figure 1-1). The Base is the home of the Marine Corps Combat Development Command (MCCDC) and numerous tenant organizations. MCBQ provides infrastructure, operational, and community services support to these organizations and to the military members, families, and civilians who live and work on Base. The Base also provides key support for overall Marine Corps objectives and programs.

### 1002. ORGANIZATION AND RESPONSIBILITIES

1. The Assistant Chief of Staff, G-F (Installation and Environment Division), has overall cognizance for the development and management of the natural resources and environmental programs.

2. The Head, Natural Resources and Environmental Affairs (NREA) Branch, has primary responsibility for implementing the Command's natural resources and environmental programs. The organizational chart for the Branch is provided at Figure 1-2. Functional responsibilities and programs managed by the Branch are described on the MCBQ website at:

<http://www.quantico.usmc.mil/Activities/?Section=NREA>

3. Outdoor recreation programs that require highly developed facilities are the responsibility of the Director, Marine Corps Community Services (MCCS) Division.

### 1003. DRIVERS, GOALS AND PROJECTS

1. The Marine Corps INRMP Handbook recommended organizing the INRMP in a progression of drivers, goals and projects as the means to develop natural resources management courses of action. Drivers are the primary functional areas that must be addressed to achieve legal compliance and safeguard the capability of the lands to support training. Goals establish achievable and realistic management courses of action within each driver.

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Projects are the individual actions required to accomplish the goals.

2. Drivers, goals, and projects for this INRMP are listed at Table 1-1. Chapters 3-9 of the INRMP provide background information pertinent to the need for, and consequences of, implementing the projects, along with estimated timelines and budgets. Projects are prioritized as either "A", "B" or "C". Priority "A" (Class I) projects meet compliance level requirements and continue existing programs. Priority "B" (Class II) and "C" (Class III) projects provide for a more comprehensive program and increase the overall program effectiveness but require increased funding and/or manpower.

1004. ACTION. This INRMP, updated for fiscal years 2015-2019, reflects the continuation of natural resources management programs under the existing INRMP. Per DoD guidance, new National Environmental Policy Act (NEPA) documentation is not considered necessary since this INRMP only incorporates minor changes which are not expected to result in any biophysical consequences materially different from those realized from the previous years of INRMP implementation. An Environmental Assessment on the implementation of this INRMP was approved in 2001 to implement priority A projects. The completion of priority B and C projects is optional, depending upon the availability of funding and/or manpower. Separate NEPA documents are prepared for timber harvests conducted under this plan and for any other projects not specifically addressed.

### 1005. FUNDING SOURCES

1. Primary funding sources for INRMP implementation are:

a. Marine Corps Operation and Maintenance (O&M,MC): Fund Administrator BSS1FE, FN (conservation), FX (compliance) and FY (pollution prevention).

b. Funds derived from the sale of forest products (H6).

c. Funds derived from the sale of MCBQ hunting, fishing and trapping permits (17X5095).

d. Environmental Restoration Navy (ERN) funds.



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2. MCCS programs are supported by the Headquarters Marine Corps Non-appropriated Funds (NAF), Appropriated Quality of Life Funds (APF), and from funds generated by the operation of their facilities.
3. A budget summary is provided at Chapter 10.

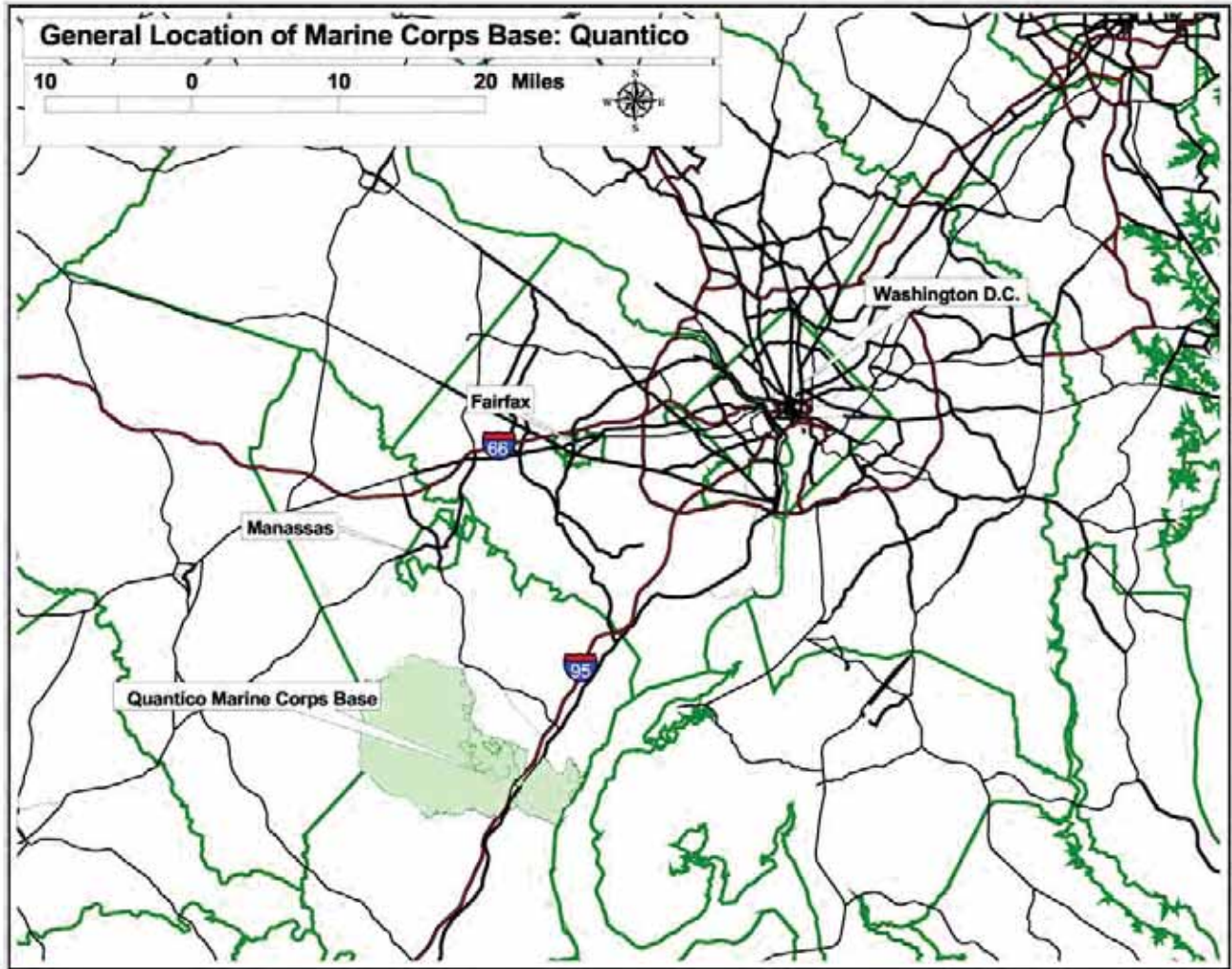


Figure 1-1.--Location of Marine Corps Base, Quantico

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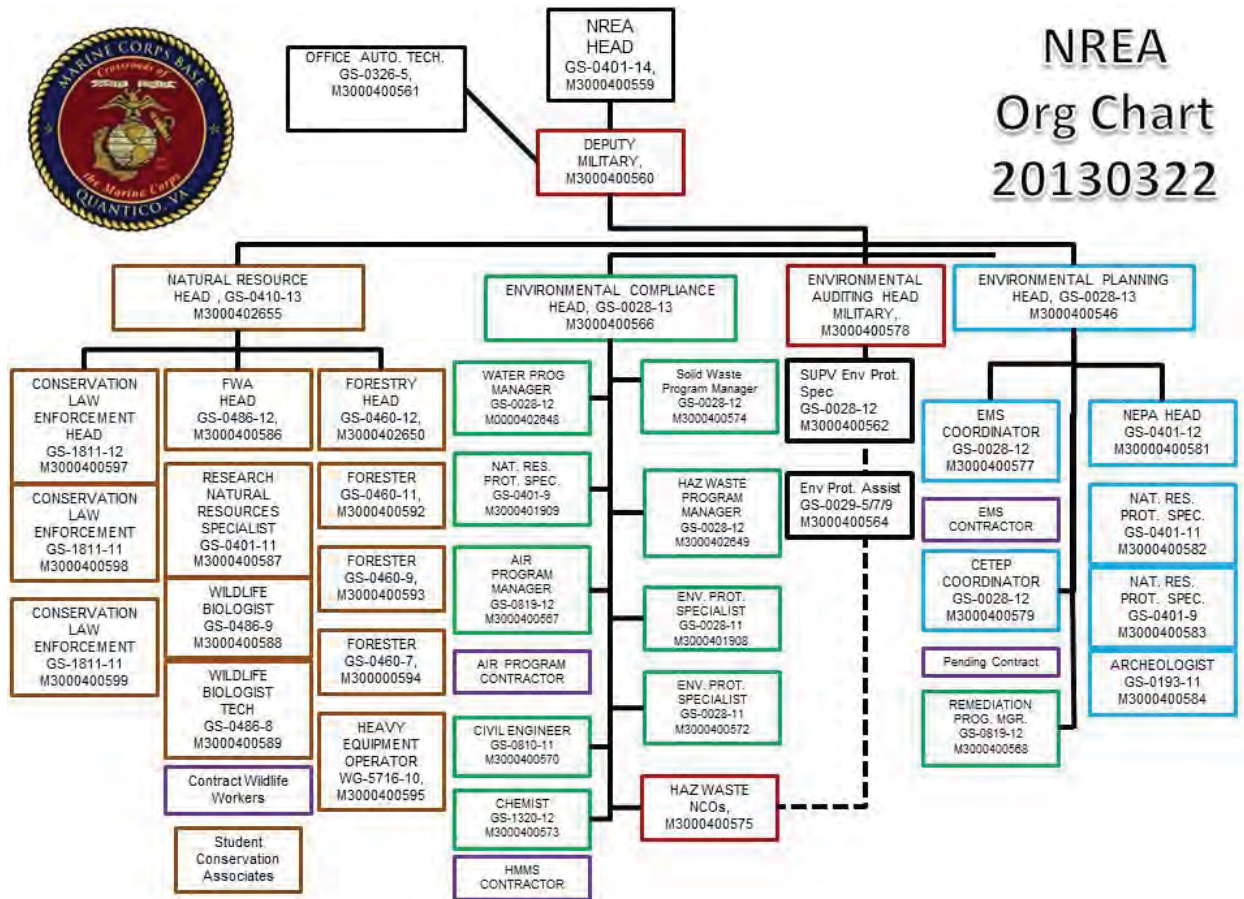


Figure 1-2. NREA Branch organizational chart.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 1-1: Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.	
DRIVER, GOALS AND PROJECTS	PRTY
DRIVER I: TO PRESERVE, DEVELOP AND MANAGE LAND AND WATER RESOURCES CONSISTENT WITH AND IN SUPPORT OF THE MARINE CORPS MISSION AND IN ACCORDANCE WITH PROVEN SCIENTIFIC METHODS AND APPLICABLE FEDERAL, STATE AND LOCAL LAWS/REGULATIONS.	
1. Goal: To comply with the Clean Water Act and the Chesapeake Bay preservation initiatives by identifying, monitoring and mitigating actions that cause land disturbance and/or the release of pollutants.	
1. Collect water quality data from South Fork Quantico Creek when necessary per the U.S. Department of the Interior watershed agreement.	B
2. Collect water quality data from other on-base streams to monitor pollutant loads.	C
3. Collect water quality data from permitted industrial stormwater outfalls to monitor pollutant loads in accordance with VPDES Permit #VA0002151.	A
4. Monitor construction projects to ensure that Virginia erosion and sediment control requirements are being implemented and provide guidance for personnel responsible for mitigation measures.	A
5. Mitigate wetlands losses through site-specific projects to create wetlands or by purchase/use of credits from a wetlands mitigation bank.	A
6. Install 250 meters of vegetated buffers or engineer-designed structure to protect shorelines and riparian zones.	B
7. Patrol and enforce trespassing and unauthorized use of ORV's in MCBQ watersheds.	A
8. Increase shoreline/riparian protection measures to 500 meters.	C
9. Measure sedimentation depth in Lunga and Breckenridge Reservoirs to evaluate dredging needs or potable water impacts.	C
2. Goal: To maintain a source of inquiry, inspection and record reporting for pesticide use and coordinate eradication programs for protection of natural resources.	
1. Maintain an updated Pest Management Plan and coordinate assimilation and distribution of incoming and outgoing pesticide information with the NAVFACENGCOCOM, ATLANTIC.	A
2. Ensure that pesticide applications fall under the Pesticide General Permit that applicators of pesticides are required to have under the relatively new Virginia and EPA regulations	A
3. Provide training and maintain records of on-Base personnel with pesticide training, respond to inquiries on pesticide use and make required inspections to evaluate pesticide use and storage by MCBQ and tenant organizations	A
3. Goal: To evaluate and coordinate multiple land use activities without degrading natural resources or impacting the military mission.	
1. Update the INRMP.	A
2. Monitor long-term trends in land cover in response to fire and other disturbances.	B

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DRIVER, GOALS AND PROJECTS	PRTY
3. Provide professional natural resources support for land-use planning teams on-Base and within the region.	A
4. Produce geologic profile map to identify areas where fault lines, rock formations, high water table and soil characteristics could hinder development.	C
5. Conduct Military Munitions Response Program (MMRP) Site Investigations (SI), to include completion of Lunga Reservoir area.	A
4. Goal: To systematically improve Geographic Information System (GIS) and the Global Positioning System (GPS) techniques in maintaining natural resources databases and producing map products for the purpose of making informed decisions about natural and cultural resources.	
1. Collect data, maintain and update existing GIS data layers for physical changes to the environment.	A
2. Transfer updated data layers to <i>GeoFidelis</i> managers.	A
DRIVER II: TO SUPPORT AND ENHANCE THE PRESERVATION OF ALL ANIMAL AND PLANT LIFE ENDEMIC TO THE BASE ECOSYSTEM WITH SOUND MANAGEMENT PRACTICES THAT MEET THE REQUIREMENTS OF ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS/REGULATIONS.	
1. Goal: To provide for the stewardship of fish and wildlife resources by managing the soil, water, vegetation and other natural features to sustain quality habitats and diversified biological communities.	
1. Participate in NEPA review of land disturbing projects to evaluate impacts on fish and wildlife populations.	A
2. Use agronomy practices to establish and maintain about 150 acres per year of crops/grasslands to support military training, wildlife habitat, soil and water conservation, and recreation.	A
3. Promote recreational fisheries by placement of habitat structure in Lunga Reservoir, Breckenridge Reservoir and Dalton Pond.	A
4. Protect aquatic habitat by point and non-point source pollution abatement	A
5. Maintain walnut and fruit trees in old homesites for aesthetic values, and hard/soft mast production.	A
6. Use prescribed burning to maintain grassland habitat in conjunction with military range management and other land uses. Also see Goal #8.	A
7. Install artificial nest boxes for bluebirds, kestrels, wood ducks, and other wildlife where appropriate.	A
8. Increase land clearing and agronomy practices to treat 250 acres per year.	B
9. Plant impoundment shorelines with moist soil plants during summer draw-downs when feasible.	C
10. Increase agronomy practices to treat 350 acres per year.	C



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DRIVER, GOALS AND PROJECTS	PRTY
11. Conservation Equipment: procure, maintain, lease, and operate chain saws, boats, tractors/tractor attachments, heavy equipment, adaptive equipment, tools, parts and safety gear necessary to carry out INRMP projects done by staff personnel.	A
2. Goal: To promote the preservation and recovery of endangered, threatened and declining native species.	
1. Review NEPA documents re: proposed actions. Coordinate with USFWS/VDGIF on actions that may affect T & E species.	A
2. Locate nests and monitor bald eagle populations.	A
3. Annually visit all small whorled pogonia (SWP) colonies to count the number of stems and flowers.	A
4. Conduct SWP surveys of all forested lands prior to land disturbances.	A
5. Maintain/install fences, gates or signs at SWP colonies and nest protection zones.	A
6. Survey mussel population in Aquia Creek from Rt 641 to Rt 610.	A
7. Count ramets (stems) of Harperella; contract survey every 5 years.	A
8. Conduct survey to inventory bat species and document presence or absence of the long-eared bat.(See footnote 1)	A
9. Conduct 10-year ecology study of SWP micro-habitat to monitor dormancy and change in colony vigor over time.	B
3. Goal: To promote the proper use and protection of fish and wildlife resources through aggressive law enforcement, hunter safety and environmental protection training.	
1. Procure equipment and gear to enforce all Virginia, MCBQ and federal fish, game and environmental laws and issue citations and/or suspensions to violators of those regulations.	A
2. Hunter Safety Training. Operate MCBQ hunter orientation program and support on-Base classes of the Virginia Hunter Safety course.	A
4. Goal: To professionally monitor projects and programs, and directly or indirectly, improve knowledge and gather data beneficial to the conservation and management of fish and wildlife.	
1. Oak Mast Count. Conduct acorn count per Virginia Department of Game and Inland Fisheries (VDGIF) protocol to monitor this important wildlife food source.	A
2. Fisheries Management. Survey Base impounded waters to maintain database of game fish populations.	A
3. Turkey population census. Conduct spring gobbler index count and compile summer brood observations.	A
4. Big Game Harvest Data. Collect deer and wild turkey data at GCS and maintain electronic database to assess long-term population trends.	A
5. Bobwhite Quail Call Count. Conduct quail/rabbit route for annual VDGIF survey. Conduct base-wide call routes to map quail presence/absence.	A
6. Deer Population Counts. Conduct snow track count and post-hunt night-lighting surveys to provide index of deer herd sizes.	A

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DRIVER, GOALS AND PROJECTS	PRTY
7. Beaver Census. Conduct beaver inventory every five years.	B
8. Support nationwide Partners in Flight by operating Monitoring Avian Production and Survival (MAPS) Stations.	A
9. Monitor the relative abundance and distribution of submerged aquatic vegetation in tidal waters and impoundments.	B
10. Monitor effectiveness of Integrated Vegetation Management (IVM) control practices on Rights-of-Way.	B
11. Ecosystem Studies. Sponsor research to monitor the impact of on and off-Base actions, including predation, on regional ecosystems.	A
12. Fishing Creel Survey. Conduct field interviews and creel checks to evaluate the utilization of Base waters and angling success.	B
13. Furbearer Index. Operate 100 scent-station route and/or game camera stations to monitor mammalian predator populations.	B
14. Provide support for VDGIF wildlife disease monitoring programs.	A
15. Develop monitoring programs for wildlife species of greatest conservation concern as ranked in the Virginia Wildlife Action Plan.	B
16. Training. Tuition and registration fees to provide professional training and symposia attendance concerning ecosystem management.	A
5. Goal: To control damage to human health, property, or natural communities by controlling damage due to the overpopulation or encroachment of flora and fauna.	
1. Use IVM practices to control phragmites, tall fescue, autumn olive and other invasive plant species.	A
2. Animal Damage Control (birds). Apply lethal and non-lethal controls approved by USDA APHIS, VDGIF, and permitted by the USFWS to reduce/control resident goose, gull, and vulture populations near administrative, recreational, and air facilities. Support Marine Corps Air facility to reduce Bird Airstrike Hazards (BASH).	A
3. Animal Damage Control (mammals). Apply lethal and non-lethal control measures approved by USDA APHIS and VDGIF to reduce/control property damage, predation, disease, or other problems caused by furbearing mammals.	A
4. Install deer bait stations to transmit acaricide (tick pesticide) to a sample area of the Base. The purpose is to reduce tick populations and reduce health risks and discomfort due to tick bites and tick-borne diseases.	C
6. Goal: To perpetuate a diverse forest environment that fulfills the requirements for military training; sustains the yield of forest products; identifies and controls potential forest insect and disease problems; maintains healthy forest ecosystems; and provides for a diversity of animal and plant species.	
1. Forest Management Planning and Administration.	A
2. Prepare NEPA documentation for forestry projects (timber harvesting, aerial spraying, etc.)	A

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DRIVER, GOALS AND PROJECTS	PRTY
3. Review NEPA projects affecting forest resources.	A
4. Evaluate and treat 3-7 forest compartments per year for forest health and possible timber management.	A
5. Forest road construction and improvements.	A
6. Gravel purchase (road upgrade and maintenance).	A
7. Timber sale contract preparation, advertisement, and administration.	A
8. Complete annual site preparation and reforestation related to commercial timber sales.	A
9. Forest insect and disease management. Monitor, evaluate, and manage forest health threats (IPM).	A
10. Urban forestry/arboriculture.	A
11. Maintain/replace forestry tools and equipment.	A
12. Timber Stand Improvement (TSI) - Pre-commercially thin/release 30-40 acres annually.	A
13. Equipment purchase (small dozer)	B
14. Equipment purchase (trailer for bulldozer)	B
15. GPS, map and label Base Champion Trees with ID tags.	B
16. Develop recreational trails, picnic areas, by Eagle Scout projects or volunteers	B
7. Goal: To provide for the management and control of wildfires from military training exercises through an aggressive fire management program that: establishes a fire danger classification system to assess fire potential; provides for an adequate firebreak system around areas with high fire incidence; provides for safe and effective fire suppression by personnel who are competently trained; and minimizes the likelihood that fires will escape from Base lands to surrounding private property.	
1. Administer and maintain MCBQ fire danger classification system.	A
2. Annually inspect maintenance needs of firebreak system. Assist FMS in routine maintenance with heavy equipment work as needed.	A
3. Review and develop wildfire policy and procedures for MCBQ.	A
4. Serve as co-incident commander and resource protection advisor on wildfire control activities.	A
5. Purchase equipment and software for real-time field mapping of fire incidents.	A
6. Train NREA natural resources personnel on wildfire suppression.	A
7. Maintain and replace fire suppression equipment and safety gear (pumpers, backpack cans, drip torches, Personal Protective Equipment).	A
8. Develop a Base fuel and fire risk model and plan, incorporate into GIS system.	B
9. Reduce fuel loading and fire risk near developed areas on perimeter.	B
8. Goal: To provide for the managed application of fire (prescribed burns) to: meet military training, forestry, wildlife management, and resource protection goals; perpetuate a fire-maintained ecosystem where appropriate; and help reduce intensity and frequency of fires on ranges and training areas with high fire incidence.	
1. Prepare the MCBQ annual prescribed burning plan to meet all Base burning requirements.	A

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DRIVER, GOALS AND PROJECTS	PRTY
2. Coordinate Base prescribed burning program and ensure that proper procedures are followed by those conducting burns on Base.	A
3. Provide input for periodic review/update of MCBO 6240.2 and other fire related orders.	A
4. Assess fuel conditions in training areas and implement appropriate actions to manage fuel loading.	A
5. Comply with the Virginia Certified Prescribed Burn Manager Program and stay current on other appropriate training.	A
6. Provide proper personal protective clothing, equipment, and tools for prescribed burning.	A
DRIVER III: TO PRESERVE AND DEVELOP AN OUTDOOR RECREATIONAL PROGRAM THROUGH CREATIVE MANAGEMENT PRACTICES THAT WILL INCORPORATE AND PROMOTE BASE ORGANIZATIONAL PARTICIPATION AND ESTABLISH COOPERATIVE AGREEMENTS FOR MUTUAL RECREATIONAL BENEFITS.	
1. Goal: To systematically emphasize and develop outdoor recreational programs within the constraints of the military mission and the capability of Base natural/cultural resources to provide for the enjoyment of military personnel and the general public.	
1. MCCA operate Lunga Park and the Marina to support camping, picnicking, and boating.	A
2. Manage programs for gathering of firewood and holiday greenery for personal use.	A
3. Complete Breckenridge Reservoir Recreation Plan per 1998 Memorandum of Understanding with Prince William Forest Park.	A
4. Maintain weir structures, dams and spillways of impounded waters.	A
5. Maintain pedestrian, vehicle and boating access to impounded waters.	A
6. Ensure trifold brochures of maps and policies detailing availability of recreational trails are posted at access kiosks.	A
7. Provide conservation law enforcement patrols to enforce boating and off-road vehicle regulations.	A
8. Develop additional boating access on tidal waters of the Potomac River and Quantico Creek.	B
9. Repair utility infrastructure at Lunga Park.	B
10. Develop joint interpretive programs for guided bird walks, canoe trips at the Chopawamsic Creek Wildlife Viewing Area.	B
11. Repair Marina pier-head.	B
12. Develop shower and bath facility for Lunga campers.	B
13. Find and designate a Recreational Vehicle (RV) storage area that does not impact aesthetic values at Lunga Park.	C
14. Procure signage. Post 300 miles of boundaries to identify recreation and training areas and lands having restricted access. Post regulatory information signs about fishing, boating, trails, natural history, and wildlife hazards.	A
15. Maintain 150 miles of trails for recreational access, search and rescue, resource inventory, and management.	A



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DRIVER, GOALS AND PROJECTS	PRTY
2. Goal: To promote the morale and welfare of personnel assigned to the installation and the public by providing for their recreational needs related to hunting, fishing, wildlife viewing and natural history study.	
1. Revise, print and distribute directives and maps concerning hunting and fishing opportunities.	A
2. Maintain sales of special MCBQ fishing, hunting and woodcutting licenses in keeping with the SAIA and other directives.	A
3. Operate the Game Checking Station (GCS) during open hunting seasons. Requires contract for INRMP implementation support, unless civilian hires are made.	A
4. Schedule meetings for public input and coordination with training Commands.	A
5. Maintenance, upgrades and supplies for Hunter Tracking System computers, software, printers, thermal paper, blank cards, cleaning kits, etc.	A
6. Maintain Arboretum Trails, Wildlife Viewing Area, and Wisdom Tree for appreciation and enjoyment of staff and visitors.	A
7. Develop natural history trifold brochure for Wildlife Viewing Area. Print and provide for visitors.	A
8. Maintain and improve programs to provide wheelchair accessibility for hunting, fishing and boating programs. Maintain existing equipment: hydraulic lift stands, tracked wheelchairs, and shoreline fishing access mechanisms.	A
9. Conduct angler satisfaction survey.	B
10. Install/maintain information kiosks and signs at fishing waters.	A
11. Provide General Schedule billet to support year-long license sales and more consistent visitor services related to natural resources-related recreation.	B
12. Conduct angler recognition program. Provide certificates and patches for quality fish.	B
13. Maintain Secon Pool for special youth fishing program.	A
14. Maintain and license waterfowl hunting blinds for public access.	A
15. Maintain dams and spillways of impounded waters (brush cutting and mowing).	A
16. Operate Conservation Volunteer Program to augment NREA personnel in the accomplishment of INRMP projects. Provide newsletter, recognition and low-cost service awards.	A
17. Update license issuance and recreation management software and hardware at GCS for dispersed recreation.	A
18. Convert 3 contractor positions to GS billets to maintain continuity of natural resources management operations.	B

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DRIVER, GOALS AND PROJECTS	PRTY
3. Goal: To promote public relations and education through proper media management, housekeeping and display of natural resources.	
1. Replace GCS (Building 5-9) with new building that has adequate space for interpretive displays of natural and cultural resources and an environmental training classroom. Not an INRMP funding requirement.	A
2. Replace roof/siding and provide electrical supply and lighting at building 27132 (Pole Barn).	A
3. Provide floor and utility upgrades at building 27009 (Forestry butler building).	B
4. Grounds keeping: ensure adequate staffing/equipment or contracts in place to maintain improved and semi-improved grounds at NREA facilities.	A
5. Maintain litter collection at public fishing, hunting, hiking and wildlife viewing areas.	A
6. Develop/improve social media, web-sites and telephone answering systems concerning programs, events, seasons, and license sales locations.	A
7. Promote establishment of wildlife/butterfly gardens in cooperation with science programs at Dependent Schools and VDGIF's Project Wild.	C
8. Sponsor live raptor programs by Wildlife Center of Virginia to provide on-site wildlife education programs.	C
9. Participate in scout, career-day, garden club, or other civic group programs to provide information about MCBQ natural resources.	A
10. Prepare taxidermy mounts, posters, and other conservation education materials.	B
11. Install rain garden, and tree/shrub hedgerow behind building 27007.	A
DRIVER IV: TO IDENTIFY AND EVALUATE SOURCES OF ENVIRONMENTAL POLLUTION AND INCORPORATE MITIGATION MEASURES FOR RESTORATION OF AFFECTED NATURAL RESOURCES.	
1. Goal: To evaluate and coordinate the installation of preventive methods to reduce and/or eliminate the potential release of pollutants that would be hazardous to the environment by impacting the soil, water or air.	
1. Execute Oil Discharge Contingency Plan/Facility Response Plan, Spill Prevention Control and Countermeasures, and Mission Assurance Plans in response to accidental pollutant discharges.	A
2. Inspect and maintain permanent storm water best management practices (BMPs) to ensure proper water quality and quantity control.	A
3. Develop educational materials and programs to ensure public education and awareness of storm water issues is addressed.	A
4. Implement a multi-faceted water conservation program with emphasis on the use of water in industrial processes; the reduction of the generation of wastewater flows; and the operation and maintenance of equipment and devices installed on the waste distribution systems.	A

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<p>Table 1-1: Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.</p>	
DRIVER, GOALS AND PROJECTS	PRTY
<p>5. Properly service and maintain sewage holding tanks and septic systems at recreational and RTAs where sanitary sewer systems are unavailable.</p>	<p>A</p>

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CHAPTER 2

AREA DESCRIPTION

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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 2

### AREA DESCRIPTION

#### 2000. INTRODUCTION

1. The Base occupies nearly 59,000 acres, with about 31,360 acres in Stafford County, 24,280 in Prince William County, and 3,360 in Fauquier County. The northern boundaries of MCBQ are Cedar Run, Virginia Route 646, and Virginia route 619; the eastern boundary is the Potomac River; the western boundary is Virginia Route 612 and Dorrell's Run; and the southern boundary includes Tank Creek, Aquia Creek, and Virginia Route 610. The approximate center of the reservation is latitude 38<sup>0</sup> 40' North and longitude 77<sup>0</sup> 30' West.

2. The initial acquisition of land in 1917 consisted of approximately 5,000 acres fronting on the Potomac River. In 1942, an additional 51,000 acres were acquired and the Base also used about 4,100 acres of U.S. Department of Interior land under a Special Use Agreement. In 1998, the Base agreed to an administrative exchange of lands to redefine the borders between MCBQ and Prince William Forest Park (PWFP) in a manner designed to allow both agencies more autonomous utility of their lands. As a result, acres used by MCBQ were reduced from 60,079 to 58,995.

#### 2001. CLIMATE

1. The climate of Quantico is classified as "modified continental" and is characterized as having mild winters and humid summers. The Bull Run Mountains west of Quantico influence air masses as they move eastward across Virginia. The Atlantic Ocean, Potomac River, and Chesapeake Bay modify the local climate, with on-shore breezes tending to warm the landmass in winter and cool it in summer. The average growing season or "frost-free" period for the region is from mid-April to late October. Based on 49 years of recorded data, July is the warmest month with an average high temperature of 88° F and January is the coldest month with a mean low temperature of 26° F.

2. Precipitation is relatively evenly distributed throughout the year. Summer precipitation is in the form of showers and thundershowers, and much of the winter precipitation results from mid-latitude cyclones or fronts. In addition to rainfall, some winter precipitation usually occurs as snow. Average annual precipitation is 40.8 inches. Snows depths are highly variable and ground cover is usually of short duration.

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2002. TOPOGRAPHY. The topography of the area is characterized by low rolling hills typical of the Piedmont area. Elevation ranges from near sea level along the Potomac River to 467 ft above sea level near the origin of the North Branch of Chopawamsic Creek. Slopes generally grade from 2% to 25% but steeper terrain is not uncommon. Overall, the land slopes to the southeast at a rate of about 20 feet per mile.

### 2003. GEOLOGY AND SOILS

1. The MCBQ is located within the Piedmont and the Northern Atlantic Coastal Plain physiographic provinces. Approximately 52,000 acres are in the Piedmont and about 7,000 are within the Coastal Plain. A boundary referred to as the Fall Line separates these provinces; the Fall Line roughly corresponds to the route of Interstate 95 in Virginia.

2. Quantico soils are generally clay loams with varying amounts of sand and gravel. They are usually acidic and low in organic matter and natural fertility. The soil parent materials of the Quantico area are diverse in geologic age. They include Holocene alluvium, Pleistocene and Holocene terrace deposits from the Potomac River, Miocene to Pleistocene upland deposits, Paleocene materials of the Aquia Formation, Lower Cretaceous materials of the Potomac Group, Quantico Slate and Chopawamsic Formation materials from the Lower Cambrian to Ordovician period, and Wissahickon Formation from the Precambrian or Lower Cambrian period.

3. Piedmont geology consists of highly deformed and metamorphosed sedimentary, volcanic, and plutonic rocks. These rocks are typically overlain by a mantle of saprolite that forms a clay-rich soil derived from the chemical weathering of the underlying granites, gneisses, schists, shales, and sandstones. In some instances loamy and gravelly fluvial materials have been overlain onto the Piedmont materials, and the resultant soils have characteristics of both the overlying and underlying materials.

4. Coastal Plain soils are underlain by stratified sediments that are sometimes crossbedded. The sediments are a mixture of alluvial, marine, eolian and slack water deposits that have been reworked many times and have developed into mixed strata and pockets of medium to fine sands and variegated clays.

5. The Soil Conservation Service (SCS) completed a soil map for MCBQ in 1967. In 1995, the Natural Resources Conservation Service (formerly SCS) updated the soil survey and provided digitized maps



## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

and an electronic database of soil mapping units that are included in the Base Geographic Information System (GIS). All local GIS data is integrated into the USMC GeoFidelis GIS programming.

6. Soil Groups and Associations. A map of the following soil associations is provided at Figure 2-1.

a. Group I - Areas Dominated by Soils with Reddish and Yellowish, Acid Subsoils

(1) Panorama-Calverton-Arcola. Deep and moderately deep, well-drained, gently sloping, sloping and moderately steep soils; underlain by dark red shales. Soils of this association have moderate limitations for military training purposes. Unsurfaced roads become soft and slippery during wet seasons and erode easily on slopes. The Calverton, Reaville, and Rowland soil series have seasonal high water tables, and heavy equipment may mire down during wet seasons. Excavations in areas of these soils will often be wet and flooded. Low-lying areas along the drainage ways will be frequently flooded.

(2) Elioak-Glenelg-Occoquan. Deep, well drained, gently sloping, sloping, moderately steep and steep soils; underlain by mica schist. Soils of this association have moderate to severe limitations for training purposes. Unsurfaced roads become soft and slippery and erode easily during periods of high rainfall. The Mixed Alluvial Lands and the Meadowville, Hatboro, and Baile soils have seasonal high water tables and some areas are frequently flooded. The steep slopes of the Occoquan soil erode easily and rock outcrops occasionally occur at the base of these slopes.

(3) Buckhall-Hayesville. Deep, well-drained, gently sloping, sloping, moderately steep, and steep soils; underlain by granite and gneiss. Soils of this association have moderate to severe limitations for training purposes and some areas are severely eroded. Unsurfaced roads become soft and slippery and erode easily during periods of high rainfall. The Hoadly and Goldvein soils have a fragipan that can cause a perched water table during periods of heavy rainfall. Mixed Alluvial Lands and the Meadowville, Codorus, Hatborro, Baile and Hoadly soils have seasonal high water tables and the latter two soils may become ponded during periods of very high rainfall.

b. Group II - Areas Dominated by Soils with Medium Textured Surface Soils, and Yellowish, Clayey Subsoils

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

(1) Neabsco-Fairfax. Deep, well and moderately well drained, gently sloping and sloping soils, formed in a fluvial mantle over residual materials; underlain by mica schist, gneiss and granite. These soils have moderate limitations for training purposes. Unsurfaced roads become soft and slippery and erode easily on the more steeply sloped areas during periods of heavy rainfall. The Neabsco soil can have a perched water table on top of the fragipan and the more level areas can pond during periods of high rainfall. The Hoadly, Lignum, Meadowville, and Codorus soils and Mixed Alluvial Lands have high seasonal water tables.

(2) Rumford-Watt. Deep, moderately deep and shallow, well and excessively drained, sloping to very steep soils, underlain by graphitic schist. In general, soils of this association have severe limitations for training purposes. Side slopes range from 18-45 percent and erosion is a serious hazard where vegetation has been removed. The Rumford and Watt soils and the graphitic schist are very unstable. Ridges are narrow, winding and usually gravelly.

### c. Group III - Areas Dominated by Soils with Grayish, Sandy Surface Soils, and Yellowish and Reddish, Clayey Subsoils

(1) Caroline-Lunt-Sandy and Gravelly Sediments. Deep and shallow, well and excessively drained, gently sloping, sloping, steep soils; underlain by stratified sandy, gravelly and clayey materials. Soils of this association have moderate to severe limitations for training purposes. The Neabsco soils are slowly permeable and have a perched water table on top of the fragipan during periods of high rainfall. Unsurfaced roads on Caroline, Turbeville, and Susquehanna soils become soft and slippery and slopes erode easily during heavy rainfall. The latter soil has heavy clay subsoil and a high shrink-swell factor. Undesignated soil areas with sandy-gravelly or sandy-clayey sediments on slopes are unstable and have high erodibility.

(2) State-Murumscos-Suffolk. Deep, well and moderately and moderately well drained, gently sloping soils; underlain by sandy and loamy materials. Most of the building complex at Mainside occurs on this association. These soils have slight to severe limitations for use. The Murumscos, Bertie, and Altavista have a wide variation in properties and are often compacted and slowly permeable.

## 2004. HYDROLOGY

1. Northern Virginia is highly dissected by perennial and ephemeral streams. Among the more important perennial streams and watersheds in the vicinity of Quantico are Cedar Run, South Fork of Quantico

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Creek, Chopawamsic Creek, and Aquia Creek (Figure 2-2). Except for Cedar Run, which flows north/northeast into Occoquan Creek, these creeks flow south and southeast into the Potomac River. The drainage pattern is generally irregularly branched dendritic, and the fluvial cycle is in the late youth to early maturity stage of development, except near the Potomac River where it is in early youth. The entire Base is within the Chesapeake Bay watershed.

2. Historical discharge data are available for two streams that drain portions of the reservation: Aquia Creek near Garrisonville on Virginia Route 641, and South Fork Quantico Creek near Independent Hill on Virginia Route 619. The discharge patterns in both streams are cyclical and characteristic of flow patterns in the region. From October (the beginning of the hydrologic year), discharge increases through February, March, and April and then declines to a low point in July and August. During June through October, temperatures are high and the days are long, and much of the precipitation and moisture stored in the soil are lost to evapotranspiration; therefore, stream discharge is diminished. From January through May, when temperatures are lower and days are short, relatively little moisture is lost to evapotranspiration, and stream discharge is highest.

2005. WETLANDS. MCBQ wetlands identified in the National Wetlands Inventory, U. S. Fish and Wildlife Service, consisted of approximately 3,905 acres of palustrine, riverine, and lacustrine wetlands. Wetlands are shown at Figure 2-2 and are described below.

1. Palustrine Wetlands. Palustrine wetlands are shallow, freshwater wetlands of the Chopawamsic Creek, Aquia Creek, Cedar Run, and Quantico Creek watersheds. These wetlands are of four major types, described as follows:

a. Deciduous Forested Wetlands (DFW) - 2,081 acres. These wetlands occur along stream courses where a bottomland hardwood forest canopy is intact. High water tables characterize these areas but standing water occurs only sporadically and is generally associated with rainfall during the late winter and spring. Many natural cavities available for wildlife nesting and roosting are located in MCBQ DFW habitat. The forest habitat cover type classification of most DFW at MCBQ is non-mast producing hardwoods (NMHD). Tree species commonly found in this habitat type include red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), American sycamore (*Platanus occidentalis*), tulip poplar (*Liriodendron tulipifera*), river birch (*Betula nigra*), black gum (*Nyssa sylvatica*), and willow oak (*Quercus phellos*). White oak (*Q. alba*), a common

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upland species, is found regularly on the margins of deciduous forested wetlands. Common understory shrubs and vines include tag alder (*Alnus serrulata*), Japanese honeysuckle (*Lonicera japonica*), blackberry (*Rubus* spp.), and bush dogwood (*Cornus amomum*).

b. Deciduous Scrub/Shrub Wetlands - 226 acres. Scrub/shrub wetlands occur where seasonal flooding has eliminated most of the forest canopy and has resulted in a dominant cover type of woody shrubs and saplings less than 20 feet in height. At MCBQ this wetland type is derived principally from the cutting, damming, and flooding activities of the beaver (*Castor canadensis*). Overstory density has been reduced to a basal area less than 50 square feet per acre, and shrubs/saplings occur at a high density. Much residual overstory, if present, is dead or dying and provides foraging/nesting sites for woodpeckers and roost/nest sites for great blue herons (*Ardea herodias*). This habitat is only seasonally flooded but has periods of prolonged soil saturation, which inhibits the growth or survival of most tree species. When flooded, this cover types provides excellent wood duck brood habitat.

c. Palustrine Emergent Wetlands - 213 acres. Palustrine emergent wetlands are found primarily in the shallow flooded zone adjacent to beaver ponds. Dominant vegetation includes herbaceous species such as grasses, rushes, sedges, and cattails (*Typha* spp.). These wetlands vary from being flooded nearly year-round to only a few weeks, depending on local hydrology and rainfall. Soils usually remain saturated throughout most of the growing season, which prevents the encroachment of woody species.

d. Open Water Wetlands - 103 acres. Open water palustrine wetlands are the portions of beaver ponds that maintain year-round water of sufficient depth to inhibit the survival of emergent vegetation. Canada geese, mallards and wood ducks are frequently observed at these wetlands during March and April.

2. Riverine Wetlands. These freshwater wetlands are associated with the deeper water habitats of flowing creeks and the Potomac River. Wetlands of the Potomac shoreline, Quantico Creek, and the lower Chopawamsic Creek are affected by tidal fluctuations of about 18 inches between high and low tide. Riverine wetland types are:

a. Intertidal Emergent Wetlands - 21 acres. This wetland type is found in a narrow band along the Quantico Creek, Potomac River, and Chopawamsic Creek shorelines. Characteristic vegetation includes species such as wild rice (*Zizania aquatica*), American three-square (*Scirpus americanus*), soft-stem bulrush (*Scirpus validus*), and arrow-arum (*Peltandra virginica*).

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b. Tidal Emergent Wetlands - 96 acres. The tidal emergent zone of Chopawamsic Creek is characterized by dense stands of spatterdock (*Nuphar luteum*) and American lotus (*Nelumbo lutea*) growing on soft muck. This tidal zone is considered to be an extremely important nursery for fish species of the Potomac River. Hydrilla (*Hydrilla verticillata*) commonly grows submerged among the spatterdock.

c. Open Water Wetlands - 428 acres. Open water wetlands of riverine systems in the region generally contain submerged aquatic vegetation (SAV). Based on observations of the MCBQ wildlife manager from 1983 to the present, there was a transition from an absence of SAV in the early 1980's to an extreme abundance of SAV in the early 1990's. Eurasian water milfoil (*Myriophyllum spicatum*) began to invade the area in 1987, and by 1989 mats of milfoil and hydrilla (*Hydrilla verticillata*) were common enough to impede motorboat operation in much of the creek and along the Potomac shoreline.

3. Lacustrine Wetlands - 734 acres. Deep freshwater habitats are found at Lunga, Breckenridge, and Smith Reservoirs, and at Dalton Pond. During summer drawdowns, dwarf spikerush (*Eleocharis* sp.), wild millet (*Echinochloa* sp.), and three-square bulrush can be found growing on exposed shorelines. These waters are generally devoid of submerged aquatic vegetation.

### 2006. LAND COVER TYPE

1. Ecological Setting. The MCBQ is located within the Eastern Deciduous Forest biome of North America. The area lies within an ecological transition zone between northern and southern forest types and contains species characteristic of both regions. Upland habitats compose approximately 94% of MCBQ lands and approximately 6% of the installation is classified as wetlands. A summary of MCBQ acreage by cover types is provided in Table 2-1.

2. Forested Habitats. Nearly 88% of the MCBQ land area is forested. Forest types present have been mapped and classified per the Society of American Foresters forest cover type standards (Eyre 1980) and are listed in Table 2-1. For the purpose of defining forest wildlife habitat, the forest cover types have been further combined into four primary forest habitat types at MCBQ: mast-producing hardwoods (HMHD), nonmast-producing hardwoods (NMHD), mixed pine-hardwoods (PHWD), and conifers (CONI). The acreage of these forest habitat types is listed in Table 2-1. The primary forest habitat types are described as follows:

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a. Timber stands having one or more dominant species of hard mast (nut) producing trees are classified as HMHD. HMHD forests comprise about 56% of MCBQ forestland and 49% of the MCBQ land area. Principal tree species include white oak (*Quercus alba*), southern red oak (*Q. falcata*), northern red oak (*Q. rubra*), hickories (*Carya* spp), and American beech (*Fagus grandifolia*). These species all produce nuts that have high nutritional value and are relished by wildlife. At MCBQ, the availability of hard mast has a significant bearing upon the quality and quantity of the winter food supply and the health of many wildlife populations. From 1990 through 1994, the gypsy moth defoliated and killed a high percentage of oak trees in some mast-producing forest stands. Understory species vary considerably, but dogwood (*Cornus florida*), American holly (*Ilex opaca*), mountain laurel (*Kalmia latifolia*) and blueberry (*Vaccinium* spp.) are common.

b. Mixed pine-hardwood forests (PHWD) cover over 9,000 acres and are comprised mainly by mature pine stands that have at least 20% of the merchantable basal area comprised by hardwood species.

c. Non-mast producing hardwood forests (NMHD) comprise about 2,500 acres of MCBQ forestland, 5% of the total forested area. Most NMHD forestland is comprised of species such as yellow poplar (*Lireodendron tulipifera*), sweet gum (*Liquidambar styraciflua*), sycamore (*Platanus occidentalis*), and river birch (*Betula nigra*) that can survive in seasonally saturated soils. Much of the NMHD is located along riparian areas and is classified under the U.S. Fish and Wildlife Service wetland classification system as palustrine forested wetlands.

d. Conifer forests cover over 11,000 acres, with Virginia pine (*Pinus virginiana*) being the predominant species; there are also some natural stands of shortleaf pine (*P. echinata*). Other species such as eastern white pine (*P. strobus*), table-mountain pine (*P. pungens*), and pitch pine (*P. rigida*) occur as a few scattered trees. In some cases the occurrence of these species is probably the result of plantings at old building sites. Existing mature pine stands developed on farmland that was abandoned at or before the acquisition of MCBQ in 1940. Some of these stands have developing understories of oak, hickory, beech, dogwood, red maple (*Acer rubrum*), and sweetgum. Present forest management practices favor the replacement of Virginia pine with more fire tolerant species such as loblolly and shortleaf pine due to the frequency of fires related to training activities.

e. The forests at MCBQ provide a variety of benefits to the Base and to the general public. The forest management program creates many stages of forest growth that provide a diversity of woodland



## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

cover types for military training exercises. Wooded areas provide buffer zones around housing and administrative areas, buffer/safety zones around live firing ranges, and testing areas for engineering equipment. Further, the forests provide merchantable timber, wildlife habitat, watershed protection, recreation, and aesthetic values.

### 3. Open Lands

a. Semi-improved Grounds. Nearly 3,000 acres of semi-improved grounds occur on the Base. These include fire-maintained grasslands, range target areas, powerline rights-of-way, landing zones, drop zones, and wildlife openings.

(1) Over 900 acres of woodland openings and cleared areas occur throughout the Base training areas. Openings range from 0.1 to 40 acres in size and are managed primarily for military exercises. Landing Zones, Drop Zones, and wildlife openings fall into this category. Vegetation must be controlled to prevent the encroachment of woody stems but there is some management flexibility to rotate mowing with the planting of wildlife forage. Herbaceous plantings of ladino clover and small grains are used on a rotational basis to revegetate portions of the openings and provide high quality wildlife grazing areas while also maintaining military training facilities.

(2) Over 1,600 acres of native grasslands occur near explosive impact areas. These grasslands are the result of frequent fires that occur as a result of military training exercises and prescribed burning. The fires control invasion of woody plant species and help to maintain a healthy native grassland community. The largest of such tracts is located in training area 9A, the primary impact area. Plant surveys conducted in 1998 and 1999 found over 40 county record plant species occurring in impact area grasslands.

(3) Utility companies maintain nearly 400 acres of powerline rights-of-way on roughly a 5-year mowing interval. In 2013, Dominion Power started an Integrated Vegetation Management program to use herbicides to control woody vegetation on the rights-of-way. This will reduce mowing costs and should result in habitat suitable for ground-nesting birds and pollinator species of insects.

b. Improved Grounds. Buildings and associated lawn and landscape plantings occupy over 2,600 acres. These acres also include areas that are mowed on a regular and frequent basis such as the ranges at Weapons Training Battalion, the golf course, roadsides, schoolyards, Lunga recreation areas, and athletic fields.

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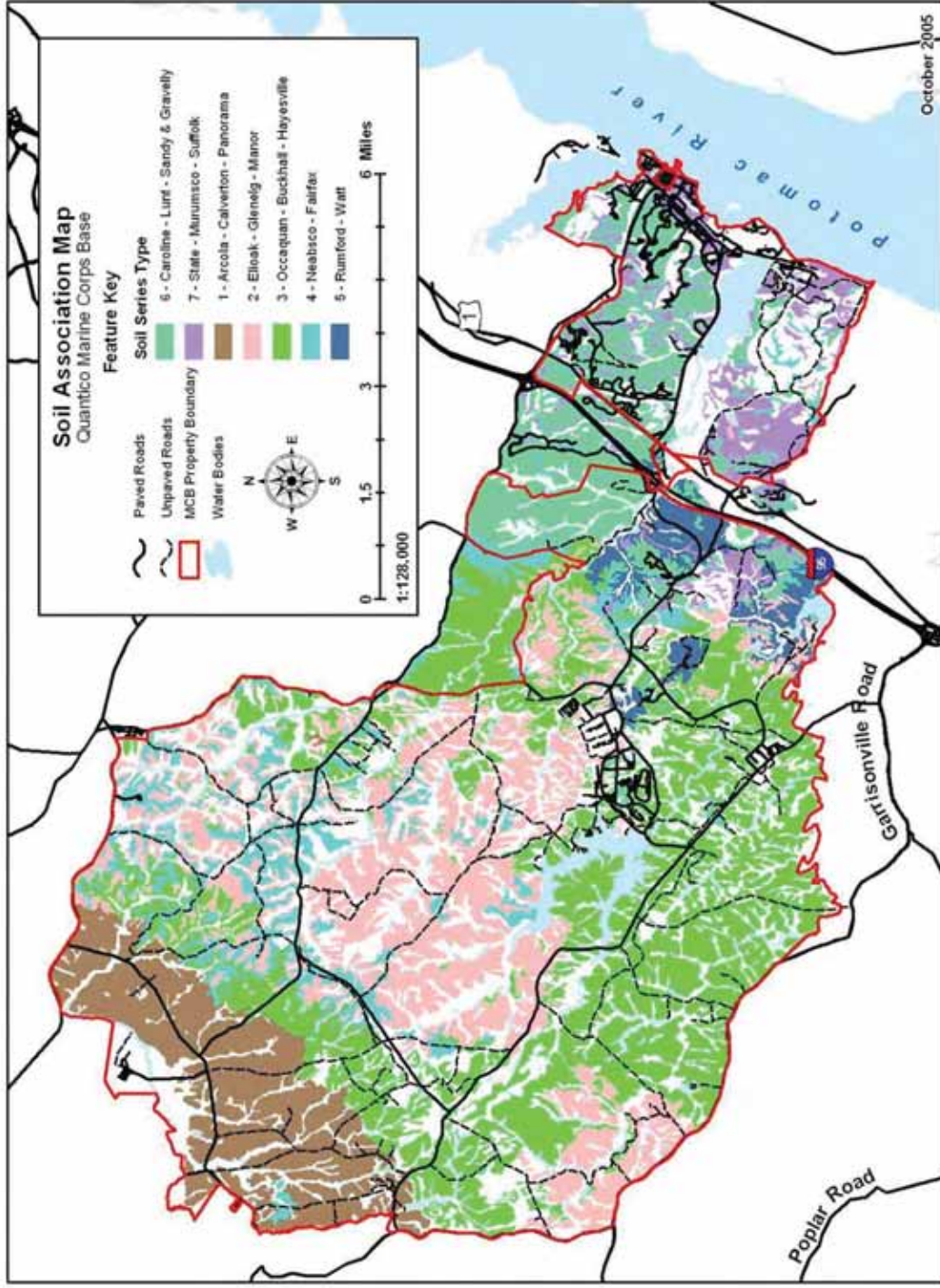


Figure 2-1.---Soil association map of Marine Corps Base, Quantico.

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Table 2-1. Summary of Acreage by Cover Type at MCBQ.

Cover Type	Acres	<sup>1</sup> SAF/GIS Cover Type
<b><u>Forest Cover</u></b>		
<b><u>Mast-producing hardwoods (HMHD)</u></b>		
Chestnut oak	370	44
White, black, northern red oak	9,072	52
White oak	349	53
Yel. poplar, wh. oak, N. red oak	18,933	59
Pin oak, sweet gum	378	65
Sweet Gum, Willow oak	90	92
American chestnut	1	115
Subtotal = Mast-producing hardwoods	29,193	
<b><u>Mixed pine-hardwoods (PHWD)</u></b>		
Virginia pine/oak	8,658	78
Loblolly pine/hardwood	189	82
Subtotal = Mixed pine-hardwoods	8,847	
<b><u>Non-mast producing hardwoods (NMHD)</u></b>		
Aspen	13	16
Yellow poplar	924	57
Yellow poplar/hemlock	35	58
River birch/sycamore	59	61
Sweetgum/yellow poplar	1,065	87
Sycamore, sweetgum, American elm	78	94
Red maple	408	108
Green Ash	23	93
Paulownia	2	116
Subtotal = Non-mast hardwoods	2,607	
<b><u>Conifers</u></b>		
Table mountain pine	6	117
Eastern hemlock	25	23
Shortleaf pine	77	75
Virginia pine	8,512	79
Loblolly pine	2,823	81
Subtotal = Conifers	11,443	
<b>Subtotal: Acres of Forested Land</b>	<b>52,090</b>	

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Table 2-1 (continued). Summary of Acreage by Cover Type at MCBQ.

Cover Type	Acres	<sup>1</sup> GIS/SAF Cover Type
<b><u>Non-forested Uplands</u></b>		
<u>Herbaceous Cover: Semi-improved Grounds</u>		
Native grass/shrub/seedling	452	201
Legume pasture	260	202
Small grain/legume	236	204
Fire maintained grasslands	1,629	206
Powerline rights-of-way	366	207
Subtotal	2,943	
<u>Herbaceous Cover &amp; Buildings: Improved Grounds</u>		
Fescue/managed turf grass	2,527	205
Bare areas	6	300
Buildings	76	500
Subtotal	2,609	
<b>Subtotal Non-forested Uplands</b>	<b>5,552</b>	
<b><u><sup>2</sup>Non-forested Wetlands</u></b>		
Lacustrine	656	700
Estuarine	18	710
Palustrine	159	720
Riverine	520	730
<b>Subtotal Non-forested Wetlands</b>	<b>1,353</b>	
<b>TOTAL ACREAGE</b>	<b>58,995</b>	

<sup>1</sup>In the MCBQ Geographic Information System database, these codes are used to identify land surface cover types. Codes for forest vegetation are based on the Society of American Foresters cover types (Eyre 1980). Most developed landscapes are identified as managed turf areas even though they may include trees and buildings; landscapes nearly devoid of any vegetation are coded as bare areas or buildings.

<sup>2</sup>Wetland types are defined in paragraph 2005.



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CHAPTER 3

LAND MANAGEMENT

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CHAPTER 3

LAND MANAGEMENT

3000. INTRODUCTION

1. Marine Corps Base Quantico (MCBQ) is known as the "Crossroads of the Marine Corps," the center of Marine Corps combat development and education. Since 1917, virtually every Marine Corps officer and many career enlisted Marines have been stationed or trained at Quantico. The mission of the Base is to provide infrastructure, operational, and community services to support the objectives of the



Marine Corps, the requirements of our tenant commands, and the needs of our military members, families, and civilians. Some of the commands, agencies, and organizations located aboard MCBQ are: Marine Corps Combat Development Command (MCCDC), Marine Corps Systems Command (MARCORSYSCOM), Marine Corps Intelligence Activity (MCIA), Marine Corps Manpower & Reserve Affairs (M&RA), Marine Corps Recruiting Command (MCRC), Training and Education Command (TECOM), Marine Corps Air Facility (MCAF), Marine Helicopter Squadron 1 (HMX-1), Marine Corps University, Marine Corps Test and Evaluation Activity (MCOTEA), Joint Non-Lethal Weapons Directorate (JNLWD), 4th Light Armored Reconnaissance Battalion (4LAR), Marine Corps Information Operations Center (MCIOC), Marine Corps Network Operations and Security Command (MCNOSC), Marine Corps Non-appropriated Fund Audit Service, Marine Corps Embassy Security Group (MCESG), Naval Health Clinic Quantico (NHCQ), Naval Criminal Investigative Services (NCIS), Military Department Investigative Agencies (MDIA), , Marine Corps Heritage Foundation, Marine Corps Association, Program Executive Officer Land Systems, the Federal Bureau of Investigation (FBI) Academy, the Drug Enforcement Administration, and the Wounded Warrior Regiment.

2. MCBQ is an active military reservation used extensively for officer training, including field maneuvers and live-fire exercises. The Base includes 54 live-fire operational ranges available to support a variety of weaponry using munitions ranging from small arms to large caliber artillery rounds and 500 pound bombs.

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3. An Integrated Land Use Plan (ILUP), completed in 2012, provides the future land use planning map at Figure 3-1. The land use plan was based on the following 10 planning principles:

- Training and education is Priority #1.
- Manage encroachment - internally and externally.
- Manage growth.
- Promote sustainable development.
- Maximize highest and best use of assets.
- Provide for safe and secure base.
- Maximize land use compatibility.
- Focus development in the right places.
- Be good resource stewards.
- Provide for healthy communities.

Encroachment from activities both on and off the installation poses a concern for the continued use of the land for military training. Urban development is occurring rapidly in Stafford and Prince William Counties adjacent to MCBQ. Prince William Forest Park, administered by the National Park Service, borders the Installation on the northeastern boundary and provides a buffer to development in that area.

4. This Integrated Natural Resources Management Plant (INRMP) is intended to support the MCBQ land use principles. It also supports DoD policy for the conservation of biodiversity while supporting the training mission. Biodiversity is simply the total number of species and their abundance in a given area. This policy is often addressed as ecosystem management and was first stated as a goal by DoD in 1994. DoD later officially adopted the following biodiversity-related goals in 1996:

- Maintain or restore native ecosystem types across their natural range of variation.
- Maintain or reestablish viable populations of native species in an installation's areas of natural habitat.
- Maintain ecological processes such as disturbance regimes (fire), hydrology (flooding), and nutrient cycles.
- Manage over sufficiently long time periods for changing system dynamics.
- Accommodate human use.

Experience on a variety of military installations has shown that the following guiding principles have been effective for biodiversity conservation on military lands (Benton et al. 2008):

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- *Focus on the military mission.* Place the conservation work in the context of military readiness.
- *Implement a solid Integrated Natural Resources Management Plan.* An INRMP developed in cooperation with stakeholders is the essential foundation for all natural resources management.
- *Seek out and rely on the best available science.* Management practices based on sound science are more defensible and more likely to achieve consensus among diverse stakeholders. Monitoring and evaluating the effects of management actions is essential.
- *Adopt an ecosystem-based approach.* Focus on the health of the entire ecosystem while taking into account economic and social as well as ecological concerns.
- *Think regionally and work across boundaries.* Consider the broader landscape to better understand the role that the installation's lands play in regional conservation issues.
- *Form partnerships and establish trust.* Working beyond the fenceline requires regular two-way communication with stakeholders and the public.

5. Sustainable, resource-based land use programs at MCBQ include forest management, fish and wildlife management, outdoor recreation, potable water production, and waste disposal.

a. The forest management program was initiated in 1962. Primary activities of the program include forest inventory, timber sales, forest insect and disease control, reforestation, forest health maintenance, and fire management. Forest management actions are designed to maintain species diversity and ensure that forest ecosystems remain functional for watershed protection, wildlife habitat, and production of wood fiber. Management of the forest resource is addressed in Chapter 5.

b. The fish and wildlife management program monitors fish and wildlife populations and habitats in support of regional ecosystem management objectives. Up to 48,000 acres may be available for hunting activities when not being used for military training or other scheduled activities. Fish and wildlife management programs are described at Chapter 6.

c. The Marine Corps Community Services (MCCS) Division operates recreational facilities for camping, boating, and team sports. Additionally, Base roads and trails are popular for bicycle riding and jogging. These and other recreational opportunities are addressed in Chapter 8.

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d. Potable water production supplies drinking water to a large percentage of the Base. Lunga and Breckenridge Reservoirs provide a year-round source of untreated water to supply the primary Base potable water system. Water from the Aquia Creek watershed on Base goes to Smith Lake, a Stafford County water supply reservoir, and also supplies a portion of the West Side of MCBQ by way of contract with Stafford County. Water from the northwestern drainage areas flows into Cedar Run and Lake Jackson, a Manassas City water supply reservoir. The quality of the water on Base affects potable water supplies in communities on and off Base.

e. There are three landfills on Base that have been closed. Monitoring and remediation of these disposal sites is done under post-closure permits and/or the Base Installation Restoration Program (IRP). These sites do have land-use restrictions.

### 3001. POLICIES AND GUIDELINES

1. MCBQ, like all Federal agencies, is required to comply with applicable environmental protection and land management requirements. These requirements are promulgated in various Federal and State laws, regulations, Executive Orders, and DoD policies and guidelines. Some of the more important policies and guidelines are discussed in the following subsections.

2. The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 et seq.). NEPA mandates that Federal agencies shall "utilize a systematic, interdisciplinary approach to ensure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making that may have an impact on man's environment." General NEPA procedures from the President's Council on Environmental Quality are found at 40 C.F.R. § 1500 et seq., and specific guidelines for the implementation of NEPA relevant to Marine Corps activities are given in Marine Corps Order P5090.2A, "Environmental Compliance and Protection Manual." Additional guidance specific to Base NEPA procedures can be found in MCBO 5090.1B "Environmental Impact Review Board." The NEPA procedures require federal decision makers to consider the environmental consequences of a proposed action before making the decision to take the action. For certain actions, NEPA requires decision makers to open the decision making process to public review and involvement.

3. Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.). This Act mandates in relevant part that Federal agencies protect plant and animal species that the U.S. Department of the Interior has

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listed as threatened or endangered (T&E). The listed species and associated protection measures on MCBQ are described in Chapter 7.

#### 4. The Clean Air Act (CAA) of 1970, as amended (42 U.S.C. § 7401 et seq.)

a. The CAA specifies air quality management requirements to protect the health and general welfare of the public. To improve air quality nationwide, the CAA Amendments of 1990 mandated stringent pollution control and prevention measures. The CAA mandates the prevention and control of air pollution from both stationary and mobile sources. This mandate is carried out through a multitude of permitting processes, monitoring and reporting requirements, work practice standards, emission limits, and restrictions on material usage.

b. The ambient air quality of MCBQ is generally good due to the lack of manufacturing plants on or near the Installation and separation from major metropolitan areas. Prince William County, however, has been identified by the U.S. Environmental Protection Agency (EPA) as part of the Metropolitan Washington, DC non-attainment area for ozone. The EPA has also identified Prince William County as a non-attainment area for PM<sub>2.5</sub>, or particulate matter that is less than 2.5 microns in diameter. These designations mean that optimal air quality conditions for those pollutants are not met, and additional protections and procedures are required in order to achieve them. Elevated levels of these pollutants pose some threat to human health.

5. The Clean Water Act (CWA) of 1977, as amended (33 U.S.C. § 1251 et seq.). The CWA is a compilation of over sixty-five years of Federal water pollution control legislation. The CWA itself was enacted in 1972 as an amendment to the Federal Water Pollution Control Act of 1948. The intent of the CWA is to restore and protect the integrity of the Nation's waters by controlling discharges of pollutants, including oil and hazardous substance spills, into those waters. The CWA is the major Federal legislation concerning improvements to the Nation's water resources. The CWA has been amended several times over the years, including adding measures to address stormwater runoff, to strengthen enforcement capabilities, and to strengthen municipal and industrial wastewater treatment standards. Additionally, the CWA contains specific provisions for the regulation of dredge soil disposal within navigable waters and for the placement of materials into wetlands. Discharge permits are required under Sections 402 and 404 before discharges of wastewater and/or dredged material/fill may occur to the Nation's waters,



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respectively. Federal agencies are also subject to state water pollution control programs through the CWA under most circumstances.

6. The National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. § 470 et seq.), Archeological and Historic Preservation Act (AHPA) of 1974, as amended (16 U.S.C. § 469 et seq.), Archeological Resources Protection Act (ARPA) of 1979, as amended (16 U.S.C. § 470aa et seq.), and Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, as amended (25 U.S.C. § 3100 et seq.). These acts require Federal agencies to survey, identify, and protect culturally significant properties, and take affirmative responsibility for cultural resources on their facilities. The application of these statutes to the Base is addressed in the following sections.

### 3002. PREHISTORIC

1. Archaeological surveys of both the coastal plain and upland piedmont portion of MCBQ have revealed an abundance of prehistoric sites distributed throughout these areas. Archaeological surveys and assessments indicate that, although modifications and impacts resulting from the military mission and Base operations are fairly widespread across the Base, sites exist with sufficient integrity and research potential to be eligible for listing on the National Register of Historic Places (NRHP). These highly significant sites include resources located in areas of the Base that have undergone relatively little disturbance, in comparison to similar regional sites located outside of the Installation where much of the potential archaeological significance is being lost to urban expansion. Notable among the prehistoric sites that are eligible for the NRHP are a prehistoric seasonal camp site that once overlooked Chopawamsic Creek and several other exploitive foray camps containing ceramics remnants. Current data indicates that the probability of finding remains of the Paleo-Indian period is very low, but the potential for discovery of Archaic and Woodland period sites is high due to the flood plain terraces adjacent to marshes, streams, and stream confluences. These sites are typically either sparse scatters or shallow with only mixed plowzone deposits, particularly in areas away from streams. Late Woodland sites are rare in the piedmont due to the poor quality of the soils; however, the estuarine and coastal areas of the Base have a high potential for occupation.

2. Information being gathered at the Base will improve its understanding of the development in this area from a regional perspective. Prehistoric information derived from studies will not only be useful to the Marine Corps in managing on-Base cultural resources, but will also be important to scholars interested in

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documenting site types and settlement changes through time. Additional information is available in the MCBQ Integrated Cultural Resources Management Plan (ICRMP).

### 3003. HISTORIC

1. The Quantico area is one of our country's most historic regions. The Manahoac Branch of the Algonquin Indians were the earliest known inhabitants of the area. The Algonquin were driven away by the Iroquois in 1540. The area was visited by the Spaniards 40 years before Jamestown was settled, and was explored by Captain John Smith in 1608. The earliest white settlers to the Quantico-Dumfries area were Scots. They developed some of the many plantation settlements where tobacco was grown and exported to Europe and other colonies. These early settlements and plantations were confined to the flatlands bordering the Potomac. The hills to the west remained essentially uninhabited until the early 1700's. The Quantico-Dumfries area tobacco trade, which suffered during the Revolutionary War, never fully recovered. This was due to the siltation of Quantico Creek, which closed access to the Dumfries customs houses and a shift in European trade to the West Indies. During the Civil War, Quantico regained importance as a location for several Confederate batteries and encampments that attempted to block passage of Union ships on the Potomac. After the Civil War, Quantico continued to decline in population and strategic importance. At the turn of the century, "The Quantico Company" promoted Quantico as a fishing village, tourist center and as "The New Industrial Center."

2. Maps from periods of early settlement of this area indicate tobacco plantations were located along the Potomac River. Archaeological surveys have identified a number of significant historic sites, to include Civil War period military camps, approximately 400 early homesteads and 25 cemeteries, and the second Prince William County courthouse. During this period of time, many sections of the Base were cleared for agriculture and there is evidence of extensive soil erosion from this activity.

3. A Programmatic Agreement signed in 2011 with the Virginia State Historic Preservation Office identified 120 buildings located on the Mainside area of the Base that are considered contributing to the Quantico Marine Corps Base Historic District ("Quantico Historic District"), shown at Figure 3-2. The Quantico Historic District includes early housing in both Georgian Revival and Dutch Colonial Revival Style and the African American Barracks area.



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4. Additional information about the latter non-military settlement in the Quantico area is available in the MCBQ ICRMP, including the manner with which the historic and cultural resources located aboard the Base are managed.

### 3004. MILITARY ACQUISITIONS

1. The initial military acquisition of land in the Quantico area began in 1917 when the federal government leased approximately 5,300 acres adjacent to the Town of Quantico. In 1918, Congress authorized the purchase of this land. The Marine Corps Air Station began operations at Brown Field in 1918, and a permanent facility was constructed in 1919. Brown Field remained operational until 1931, at which time, the present airfield was built along the shore of the Potomac River. The outbreak of World War II caused a tremendous increase in manpower and the need for additional land and facilities for training. In 1942, an additional 51,000 acres of land were acquired west of U.S. Highway 1. The Marine Corps also obtained use of 4,262 acres of adjacent land under a Special Use Permit (SUP) from the Department of the Interior. Further internal development occurred during the Korean Conflict when Camps Goettge, Upshur, and Barrett were constructed. In 1972, through an Executive Order, 1,100 acres of woodland were turned over to Prince William and Stafford Counties, and in 1978 an additional 726 acres were transferred to the Veterans Administration for a national cemetery.

2. Virtually all of the land area has been used for military training at some point, and spent military ammunition and old earthworks can be found generally throughout the Base. Currently, approximately 6,400 acres are dedicated to impact zones, ammunition storage, and other restricted usage.

### 3005. GIS/GPS SUPPORT SYSTEMS

1. Geographic Information System (GIS). The GIS is a computer-based informational system that facilitates land management planning. This regionally managed system within the Marine Corps is known as *GeoFidelis*. This system provides a planning tool with easy access to database and graphic information, such as current land uses and restrictions, and natural resource inventories. Examples of current GIS database coverages that are utilized for land management include: archaeology sites, endangered species management areas, forest stands, historic district boundaries, hunting areas, contaminated areas, restricted areas, streams, topography, watersheds, and wetlands. Existing coverages are continuously being updated and new

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layers are added as survey work is completed. MCBQ Natural Resources and Environmental Affairs Branch (NREA) personnel need local resources in terms of hardware, software and editing rights to update the various natural resources data layers.

2. Global Positioning System (GPS). NREAB maintains GPS rover units for field studies and information gathering. Information gathered in the field can be saved and downloaded into ArcGIS software to and edit and create new data layers.

### 3006. IMPROVED GROUNDS MANAGEMENT

1. Improved grounds are those on which intensive development and maintenance measures are performed. There are a total of 2,609 acres of improved grounds on MCBQ, including areas with facilities for administration, education, research, support, housing, community services, and recreation. Landscaped areas, parade grounds, drill fields, and athletic grounds are also included in this category. New or modified improved grounds within the Quantico Historic District must be in accordance with the Secretary of the Interior's Standards for Rehabilitation of Historic Property ("Secretary's Standards"). The Base Exterior Architecture Plan (BEAP) also provides a set of internal standards for designing of all new construction, building renovation and landscaping, compatible with the Secretary's Standards.

2. Developed Facilities. There are over 1,250 buildings at MCBQ with a total building space of more than 7 million square feet. The developed area also includes 777 miscellaneous structures, 173 miles of roads and over 47,000 square yards of concrete runways, aprons and airfield surfaces.

3. Landscape Plantings. The natural woodland vegetation of the Base is comprised predominately of oaks, beech, hickory and Virginia pine. Commonly, Virginia pine will develop in a cleared area when it is left undisturbed. This species is not considered desirable for landscaping, as it tends to break in ice storms and uproot in strong wind storms. Common native hardwoods of oak, maple, dogwood, and red bud are encouraged for native and developed landscapes. MCBQ is in the Arnold Arboretum Hardiness Zone 6/7 and there are many ornamental plants that are hardy within the minimum temperature range of 10 to -5 degrees Fahrenheit of this zone. Chapter 3 of the BEAP, as updated, identifies native and non-native plants suitable for landscaping, and also identifies invasive plants that are prohibited for use. Plants listed as a threat to ecosystems or agriculture by the U.S. Department of Agriculture or the Virginia Department of

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Agriculture are listed as prohibited from planting. All Base plantings must also comply with Executive Order 13112, "Invasive Species," which prohibits any actions that promote the introduction or spread of non-native species. The Naval Facilities Engineering Command (NAVFAC) MO-100.1 frequency for mowing improved grounds is at intervals sufficient to prevent vegetative growth from exceeding four inches. Mowing height for lawns, cemeteries, physical training areas (TAs) and parade grounds is two to three inches.

### 3007. SEMI-IMPROVED GROUNDS MANAGEMENT

1. Semi-improved grounds are those that require periodic, recurring maintenance to keep a low vegetative cover primarily of native grasses but can include some grasses and legume plantings. These grounds consist of road shoulders, utility rights-of-way, firing ranges, ammunition storage, landing/drop zones, wildlife food plots, family cemeteries, earth embankments, and outlying recreation or support facilities.

2. Training Areas. The majority of MCBQ real estate is devoted to outdoor live-fire and operational training. TAs are located primarily in the western portion of the Base. The TAs are critical to supporting the Base mission of training Marine Corps officers and enlisted personnel. The TAs are also used by other federal, state, local and civilian agencies for a variety of training purposes.

3. Firing Ranges. The live firing ranges located in the western portion of the Base, known as the Guadalcanal area, can accommodate a large array of weaponry and munitions. Ordnance and how it is used at these ranges changes frequently. Operations Division (Range Management Branch) maintains a scheduling system that produces daily range and training area schedules that detail the land areas and times affected by all operations within the training complex. The area between the firing positions and the targets are usually maintained in grasslands by mowing and/or controlled burns. Areas downrange from the targets are often forested, but maintenance and timber harvesting in downrange forests is generally not feasible due to contamination with metal fragments. Weapons Training Battalion and the FBI Academy have ranges that are located in TA-11B. These ranges are in open, grass-maintained areas that are frequently mowed to provide a clear line of sight to targets. Demolition Ranges have limited access, as do dud areas where unexploded ordnance is known to be present.

4. Landing/Drop Zones. There are 64 Landing Zones (LZ) ranging in size from 1 to 40 acres that are used during training missions. Some

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of the LZ areas are cultivated approximately every third year to provide higher quality forage for wildlife. Planted areas have been manipulated to enhance recreational hunting opportunities. The remaining LZ areas are mowed or prescribed burned one to several times a year to keep the areas from reverting back to woodlands.

5. Road Shoulders. There are over 173 miles of roads within the Base. Shoulders along these roadways vary from highly maintained grass coverings to low maintenance areas with varying successional stages of natural vegetation. Road shoulders aboard the Base provide areas for bicycling and jogging and are used extensively for above- and below-ground utility corridors.

### 3008. UNIMPROVED GROUNDS

1. Unimproved grounds are predominately-forested areas that may be used extensively for military training and recreational hunting. Unimproved grounds may also include water resources such as wetlands, streams, waterways, and open water areas. The major timber types in unimproved grounds at MCBQ are representative of the Central and Southern Forest Regions. The yellow poplar-white oak-northern red oak type, classified by the Society of American Foresters as a type in the Central Forest, is the most widespread type on the Base. The Virginia pine type, representing the Southern Forest, is the second most widespread type according to completed inventory data. The inter-mix of traits for the two regions provides a great variety of species and types. Important forest species include Virginia, shortleaf, and loblolly pine, white and red oak, and yellow poplar. Other merchantable species of lesser value or restricted abundance include sweet gum, red maple, American beech, aspen, hickory, red cedar, black walnut, and black cherry. A few scattered stands of eastern hemlock occur along the steep bluffs of the Chopawamsic Creek and Beaverdam Run drainages. Understory vegetation and ground cover includes a large variety of species including dogwood, Japanese honeysuckle, blueberry, redbud, sassafras, ironwood, poison ivy, and mountain laurel.

2. The maintenance of unimproved grounds is primarily a function of Forestry and Fish, Wildlife and Agronomy personnel, in coordination with Operations Division, and is described in detail in Chapters 5 and 6 of this INRMP. The Base forestry program utilizes Virginia Best Management Practices in developing contracts for harvesting forest products, constructing logging roads, and preparing firebreaks. They also control damaging insects and diseases, and conduct prescribed burns to reduce the potential for destructive forest fires. The Fish, Wildlife and Agronomy program and the

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Facilities Maintenance Section are involved in maintenance of trails and stream crossings that are found on unimproved grounds, including clearing vegetation along trails, maintaining culverts, recovering dumped refuse, and restoring vegetation in disturbed land areas.

### 3009. ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

1. Increased demands on land usage at MCBQ have made environmental considerations, natural resource conservation, and the need to maintain realistic training conditions, crucial land management issues. Environmental compliance requirements and other mandates (e.g., NEPA, ESA, CWA, CAA, Resource Conservation and Recovery Act (RCRA), etc.) and public awareness of environmental issues have heightened the need for the Base to address environmental concerns in a proactive manner. EMS has been adopted by the U.S. Marine Corps based on International Organization for Standardization (ISO) 14001 to provide a standard framework for environmental management. All personnel at MCBQ are to conduct their daily operations in a manner consistent with MCBQ's EMS as described in MCBQ 5090.2D and the MCBQ Environmental Compliance and Protection Standard Operating Procedure (ECPSOP).

### 3010. SPECIAL NATURAL AREAS

1. On 12 August 1993, MCBQ designated the lower Chopawamsic Creek wetland a Protected Natural Area (PNA). Per DODI 4715.3, Natural Resources Conservation Program, PNA's are now referred to as Special Natural Areas (SNA). This SNA portion of the Chopawamsic Creek is a small tidal estuary that enters the western side of the Potomac River approximately 75 miles above its mouth and 34 miles south of Washington D.C. This area is the largest and most significant wetland site on the Base starting at the creek inlet near the Marine Corps Air Facility and ending 3.3 miles upstream near Interstate 95. The SNA designation promotes the preservation of the woodland and marsh areas along the creek banks in their natural state for the enjoyment of military families and the public. The area has a nature trail and a wildlife-viewing platform. A bald eagle nesting site and great blue heron rookery are located within this SNA.

2. Populations of threatened and endangered species at MCBQ are being protected through the establishment of buffer zones around locations where they have been discovered. Protection zones for federally-listed species at MCBQ are shown in Chapter 7.

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### 3011. COORDINATION WITH PRINCE WILLIAM FOREST PARK

1. Until December 2002, MCBQ had used approximately 4,500 acres in TAs 6, 11, 12 and 16 that were owned by the Department of Interior under a SUP. In 1998, a Memorandum of Understanding (MOU) between Prince William Forest Park and MCBQ defined mutual goals and initiated actions to round out the borders of each agency's property through a land exchange. The MOU is provided at Appendix A.

2. Public Law 107-314 provided the legislation necessary to implement the land exchange. The MOU also mandated establishment of a 300-foot "green corridor" on MCBQ lands adjacent to Route 619 (the northeastern border of the Base), development of joint Watershed Management Plans, and development of a Joint Recreation Plan for use of Breckenridge Reservoir. Joint Watershed Management Plans for the South Fork of Quantico Creek and Chopawamsic Creek watersheds are provided at Appendix A. The Joint Recreation Plan has not been completed and is addressed in Chapter 8.

3012. CONSERVATION EASEMENT. On 16 January 2008, MCBQ acquired a restrictive easement (see Appendix A) on over 300 acres of land adjoining TA-17 to buffer against encroachment. The easement was made possible by a Virginia Land Conservation Foundation Grant and through the initiative and partnership with the Prince William Conservation Alliance, the Virginia Department of Game and Inland Fisheries (VDGIF), the U.S. Marine Corps (USMC), and the heirs of Lieutenant Colonel Dean McDowell, USMC. This property, the Merrimac Farm Wildlife Management Area, is owned by the VDGIF and is dedicated to wildlife management and the sustainability of the MCBQ military training mission.

3013. LANDS OCCUPIED BY TENANTS OR LESSEES. In 2005, supplemental guidance from DoD and the Commandant of the Marine Corps (CMC) (CMC ltr 5090/LF of 15 Jun 2005) specified that this INRMP is applicable to all lands for which MCBQ has real property accountability. That includes all lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right-of-way, or any other form or permission. The Navy Real Estate Office provided a list of agreements, easements, licenses, leases, and permits currently applicable to lands at MCBQ. The list is provided at Appendix A. All actions proposed on these lands are subject to NEPA review and approval by the MCBQ Environmental Impact Review Board.



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### 3014. INTEGRATED PEST MANAGEMENT

1. Integrated Pest Management (IPM) is a sustainable approach to managing pests and controlling disease vectors by combining applicable pest management tools in a way that minimizes economic, health and environmental risks. IPM is the method of choice for DoD pest management and disease vector control. IPM uses regular or scheduled monitoring and employs physical, mechanical, cultural, biological, and educational tactics in addition to regulatory chemical application.
2. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1972, as amended (7 U.S.C. § 136 *et seq.*) applies to the manufacture, sale and use of restricted use pesticides. DoD Instruction 4150.7 is the primary applicable instruction for all of DoD, and Chief of Naval Operations Instruction (OPNAVINST) 6250.4 is applicable to the Navy and Marine Corps. Specific Marine Corps instructions are located in MCO P5090.2A. Pest management operations at MCBQ Quantico are carried out in accordance with these instructions.
3. Most pest management at MCBQ is handled under contracts administered by Facilities Support Contract Section of the Public Works Branch. MCBQ has certified applicators located at the Marine Corps Community Services (MCCS) Medal of Honor Golf Course and in the Natural Resources Section, NREA Branch, for invasive species eradication/management.
4. The Pest Management Coordinator (PMC) in NREA Branch is tasked with ensuring that all pest management activities and pesticide storage facilities aboard the Base comply with federal, state, and Department of the Navy regulations, and that pesticide usage is reported as required. All pest management activities at the installation must be coordinated through the PMC. The PMC will ensure that all contracts involving pesticide and herbicide application are forwarded to NAVFAC-Atlantic for review prior to advertisement. The PMC will also ensure that pest management contractors obtain proper Clean Water Act permit coverage for pesticide application, when necessary.
5. The PMC is also responsible for maintaining the Pest Management Plan for the Base. This plan outlines procedures in place and requirements for handling all pesticide/herbicide applications and pest management issues at MCBQ.



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### 3015. MILITARY MUNITIONS RESPONSE PROGRAM

1. The DoD launched the Military Munitions Response Program (MMRP) in order to respond to safety and environmental hazards related to the presence of munitions and explosive constituents of concern (MEC) on military properties, excluding those at active ranges. In accordance with the DON Munitions Response Program, Headquarters Marine Corps has been tasked with identifying closed range areas on each Marine Corps Base. Additionally, active ranges (i.e., those still available for training of members of the armed forces in the use and handling of military munitions, other ordnance and weapons systems) are to be assessed for surrounding land uses that are incompatible with range activities. Incompatible uses are to be recommended for closure.

2. The DON MMRP is a centrally funded program managed for MCBQ by the Naval Facilities Engineering Command (NAVFAC) Washington. Funding for the MMRP is provided by Headquarters Marine Corps as Environmental Restoration, Navy (ERN) funds.

3. The primary impact on MCBQ may be implementation of land use controls on closed ranges. Land use controls are necessary in instances where detection technologies cannot support complete munitions removal and disposal. Where closed ranges are unable to be fully cleared, land use controls are required to minimize the risks associated with actual or expected hazards that may remain after any partial removal actions. Where land use controls exist, additional surveying for munitions may be required when performing any tasks involving excavation, such as construction or utility improvements, on the closed range. Lunga Reservoir and its associated camping areas were closed beginning in April 2012 for MMRP removal operations which may require multiple years to complete.

3016. WORK PLAN. Recommended projects, estimated budget and time line for the execution of land and pest management planning are listed in Table 3-1.

### 3017. REFERENCE

Benton, N., J.D. Ripley, and F. Powledge, eds. Conserving biodiversity on military lands: A guide for natural resources managers. 2008 edition. <http://www.dodbiodiversity.org>. Arlington, Virginia: NatureServe. 2008. 220 pp.

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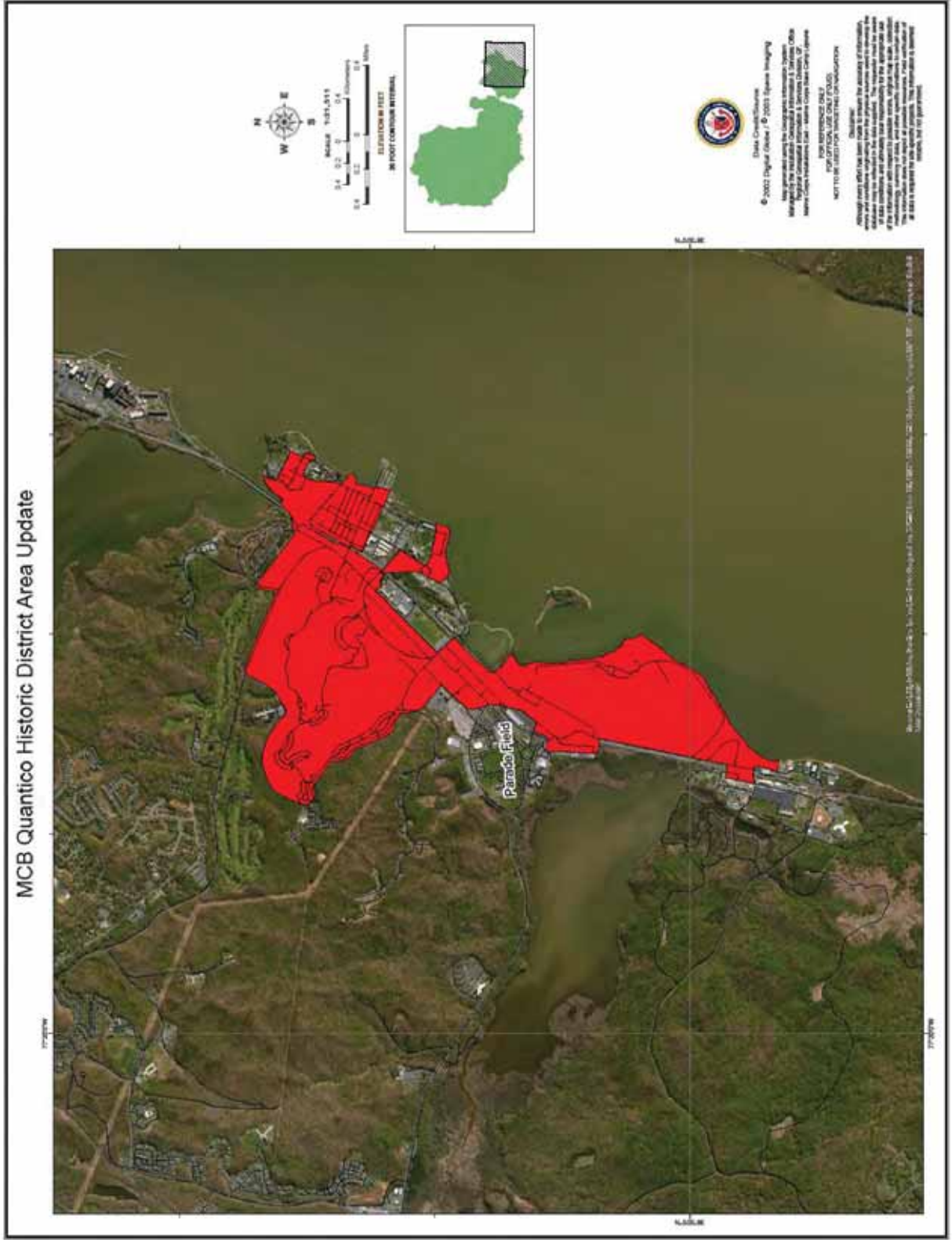


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MCB Quantico Historic District Area Update



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Table 3-1. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
DRIVER I. PRESERVE, DEVELOP & MANAGE LAND & WATER RESOURCES						
1. See Table 4-1 for Goal 1, Driver I.						
2. Goal: To maintain a source of inquiry, inspection, record keeping and reporting for pesticide use and coordinate eradication programs for protection of natural resources.						
1. Maintain an updated Pest Management Plan and coordinate assimilation and distribution of incoming and outgoing pesticide information with the NAVFAC, ATLANTIC.	A	*	*	25	*	*
2. Ensure that pesticide applications fall under the Pesticide General Permit that applicators of pesticides are required to have under the relatively new Virginia and EPA regulations.	A	*	*	*	*	*
3. Provide training and maintain records of on-Base personnel with pesticide training, respond to inquiries on pesticide use and make required inspections to evaluate pesticide use and storage by MCBQ and tenant organizations	A	10	10	10	10	10
3. Goal: To evaluate and coordinate multiple land use activities without degrading natural resources or impacting the military mission.						
1. Update the INRMP	A	*	*	*	*	50
2. Monitor long-term trends in land cover in response to fire and other disturbances.	B	10	10	10	10	10
3. Provide professional natural resources support for land-use planning teams on-Base and within the region.	A	*	*	*	*	*



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Table 3-1. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
DRIVER I. PRESERVE, DEVELOP & MANAGE LAND & WATER RESOURCES						
4. Produce geologic profile map to identify areas where fault lines, rock formations, high water table and soil characteristics could hinder development.	C	0	0	0	135	0
5. Conduct Military Munitions Response Program (MMRP) Site Investigations (SI), to include completion of Lunga Reservoir area.	A	**	**	**	**	**
4. Goal: To systematically improve GIS and the GPS techniques in maintaining natural resources databases and producing map products for the purpose of making informed decisions about natural and cultural resources.						
1. Collect data, maintain and update existing GIS data layers for physical changes to the environment.	A	35	35	40	40	45
2. Transfer updated data layers to <i>GeoFidelis</i> managers.	A	5	5	5	5	5
<b>Subtotal for "A" projects</b>		<b>50</b>	<b>50</b>	<b>80</b>	<b>55</b>	<b>110</b>
<b>Subtotal for "B" projects</b>		<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>
<b>Subtotal for "C" projects</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>135</b>	<b>0</b>
<b>Grand Total</b>		<b>60</b>	<b>60</b>	<b>90</b>	<b>200</b>	<b>120</b>

\*Costs are primarily labor related

\*\*Costs are programmed by NAVFAC

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CHAPTER 4

SOIL AND WATER CONSERVATION

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## CHAPTER 4

### SOIL AND WATER CONSERVATION

#### 4000. WATER QUALITY AND QUANTITY

1. Water quality and quantity at Marine Corps Base Quantico (MCBQ) falls under several different federal and state regulations, as described in the sections below. Regulating the quality of water discharged is critical to the continued health of the Potomac River and the Chesapeake Bay, as well as to the sustained mission effectiveness at MCBQ.

#### 4001. LAND USE POLLUTION ABATEMENT

1. Soil disturbing activities that have the potential for causing soil erosion and adversely affecting water quality are regulated by both state and federal laws. The Virginia Erosion and Sediment Control Law (VESCL) (Title 10.1, Chapter 5, Article 4 of the Code of Virginia) establishes compliance standards for the mitigation of soil disturbance for most land clearing/soil disturbing activities. MCBQ uses the National Environmental Protection Act (NEPA) (42 U.S.C. § 4321 *et seq.*) process to evaluate effects of actions that could cause soil disturbance and requires planned mitigation measures for these activities, in accordance with applicable laws.

2. Land disturbing projects are required to be designed and constructed in accordance with the VESCL, the Virginia Stormwater Management Act (VSMA) (Title 62.1, Chapter 3.1, Article 15 of the Code of Virginia), and implementing regulations. Erosion and sediment control concerns are addressed by requiring the designer to provide an Erosion and Sediment Control Plan (E&SCP). This plan is submitted to the Water Program Manager, Natural Resources and Environmental Affairs (NREA) Branch, for review and approval. Inspection and compliance verification of specific land disturbing projects is accomplished by the NREA Branch in coordination with the Resident Officer in Charge of Construction (ROICC), Public Works Branch, or other organization responsible for the activity.

a. An E&SCP is a document that describes the potential for erosion and sedimentation for a specific land disturbing project. The plan must explain and illustrate the measures that will be taken to control erosion and sedimentation. While it is prudent to include the erosion and sediment control standards and specifications in

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contract documents, the erosion and sediment control plan itself should contain notes to ensure the controls are installed, inspected, and maintained properly. Site inspections are made regularly by NREA Branch to ensure proper maintenance is occurring and that the mitigation measures in place are working properly.

b. An E&SCP must contain sufficient information to adequately address the problems of erosion and sedimentation for a proposed project. The length and complexity of the plan should be commensurate with the size of the project, the severity of site conditions, and the magnitude of potential off-site impacts. The greatest level of planning and detail should be evident on plans for projects that are directly adjacent to flowing streams, highly developed areas, or areas of special significance where impacts may be costly or detrimental to the environment.

c. Chapter 3 of the "Virginia Erosion and Sediment Control Handbook" contains minimum standards and specifications for erosion control practices in the Commonwealth. Each of the minimum standards outlined in the handbook must be satisfied in the E&SCP. Modifications to Virginia standard practices or innovative erosion control practices may also be employed, but must be thoroughly described to the satisfaction of NREA Branch.

3. For land disturbing projects greater than or equal to one acre of disturbance, the operator (e.g., construction company) must also provide a Stormwater Pollution Prevention Plan (SWPPP) and apply for a construction stormwater permit from Virginia, in accordance with the VSMA and implementing regulations. The Virginia SWPPP requirement was developed in accordance with U.S. Environmental Protection Agency (EPA) regulations stating that facilities covered by stormwater permits must have a SWPPP. Industrial stormwater SWPPPs identify potential pollution sources which may be expected to affect the quality of the stormwater discharges (e.g., industrial activities) from Base. The industrial stormwater SWPPP must also describe Best Management Practices (BMPs), which include operating and maintenance procedures, treatment processes, and other management practices.

a. The "Virginia Stormwater Management Handbook" should be used to set minimum criteria, standards and guidelines for permanent stormwater management at each site. The SWPPP, permit application and the required permit fees submitted by the contractor, are reviewed and approved by NREA Branch, then sent to the Virginia Department of Environmental Quality for permit issuance.

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b. The SWPPP must outline the steps taken to ensure that degradation of stormwater quality and quantity is minimized during land disturbance. The SWPPP can cite the E&SCP to satisfy many of its requirements; however, it must also address other issues such as hazardous material/hazardous waste and fuel storage, usage and disposal during the project, how individuals will be trained in stormwater issues, and how stormwater inspections will be done.

c. In designated streamside management zones, known as Resource Protection Areas (RPAs), or other areas deemed critical by NREA Branch, the requirement for the permit and SWPPP drops from one acre to a land disturbed area of 2,500 square feet or greater.

### 4002. POINT SOURCE POLLUTION ABATEMENT

1. The Clean Water Act (CWA), 42 U.S.C. § 1362(14), defines a "point source" as "any discernable, confined and discreet conveyance, from which pollutants are or may be discharged." Point source pollution comes from industrial and sewage treatment plants, often via a discharge pipe, as well as storm sewers. Virginia Pollution Discharge Elimination System (VPDES) permits issued by VDEQ provide the specific requirements for point source pollution abatement at a particular site. MCBQ has five VPDES permits. Three permits, Mainside, Camp Upshur, and Stafford County, are for managing sanitary sewage. The remaining permits are for managing stormwater run-off associated with municipal and industrial activities.

2. The industrial stormwater permit (VA0002151) for MCBQ covers 18 outfalls that discharge stormwater that mixes with specific industrial activities conducted on Base. Industrial stormwater outfalls are sampled on a regular basis and are shown at Figure 4-1. Flow and pH are tested at all sites. Other items often tested are temperature, total suspended solids (TSS), and total petroleum hydrocarbons (TPH), depending on the industrial source contributing to stormwater discharged at the outfall.

3. The municipal separate storm sewer system (MS4) permit (VAR040069) for MCBQ addresses more generalized sources of additional contamination for stormwater. The MS4 permit is divided into six minimum control measures (MCMs): public education and outreach on stormwater impacts; public involvement/participation; illicit discharge detection and elimination; construction site stormwater runoff control; post construction stormwater management in new development and redevelopment; and pollution prevention/good housekeeping.

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

4. A Stormwater Management Plan (SWMP) is also required for [MS4] permits in Virginia pursuant to U.S. EPA regulations stating that facilities must develop and implement a program to address the six MCMS covered in the MS4 permit. The SWMP addresses each of these measures, as well as additional stormwater concerns, such as impacts on waters with Total Maximum Daily Loads (TMDLs), Low Impact Development requirements, and Watershed Management Planning.

5. New construction sites may also be point sources of polluted stormwater if they fall with U.S. EPA and Virginia regulations. Construction stormwater site pollution is abated through implementation of mitigation measures prescribed in the E&SCP, mandatory frequent inspections of mitigation measures and close supervision of contractors and other agents who are responsible for maintaining mitigation measures.

### 4003. NON-POINT SOURCE POLLUTION ABATEMENT

1. Nonpoint source pollution comes from many diffuse sources and is caused primarily through sheet runoff over the ground's surface rather than through a discernable, confined, and discrete conveyance. Nonpoint source runoff, similar to point source runoff, has the potential to pick up harmful toxins, excess nutrients, and sediments as it travels. These pollutants are then deposited into lakes, rivers, wetlands, coastal waters, and underground water supplies. Nonpoint source pollution can be difficult to detect, often going completely unnoticed for years. This characteristic makes nonpoint sources difficult to control.

2. MCBQ has used water quality monitoring stations to measure stream flow and pollutant levels in Base watersheds. Stations operated within the past 10 years are located per Figure 4-1. Sampling has historically been done in conjunction with the United States Geological Survey, Water Resources Division, at stations located at the South Fork of Quantico Creek, Chopawamsic Creek, Beaverdam Run, and Little Creek. Monitoring included the collection of nutrient samples, discharge measurements, sediment levels, E.coli sampling, and general water quality measurements. Per the South Fork Quantico Creek Watershed Management Plan, Appendix A, the station on Quantico Creek should be operated when Prince William Forest Park reports concerns about water quality coming from the watershed aboard MCBQ.

3. In the Ranges and Training Areas (RTAs) and at recreational sites, human wastes are collected and managed using commercial portajons via contracts issued by the MCBQ Logistics Division (G-4). It



## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

is important that the pumping and cleaning of these facilities is done on a regular basis and in a manner that does not cause discharges of fecal bacteria.

4004. ACCIDENTAL DISCHARGES. MCBQ has a variety of operational programs established to prevent the accidental discharge of pollutant materials. In the case of a hazardous material spill, MCBQ has a comprehensive set of plans to direct clean-up responses. Principle plans include the Oil Discharge Contingency Plan (ODCP), Spill Prevention Control and Countermeasures Plan (SPCC), and the Mission Assurance Plan. Emergency response teams are prepared to react and initiate appropriate clean-up actions in case unplanned events cause pollutant releases.

4005. DRINKING WATER SUPPLIES. The Base watersheds (Figure 4-2) supply water to four reservoirs: Smith Lake Reservoir, which supplies water to Stafford County and the Westside of MCBQ; Breckenridge Reservoir, which supplies water to the Mainside area of the Base; Lunga Reservoir, which is a secondary water source for both Smith Lake and Breckenridge Reservoir; and Lake Jackson, which provides water to Manassas in Prince William County. Drinking water for the Base comes from three sources, depending upon location. Mainside Water Treatment Plant produces potable water for MCBQ buildings east of Interstate 95. Facilities west of Interstate 95 receive potable water processed by Stafford County Utilities Department with water from Smith Lake Reservoir. Camp Upshur is serviced by two groundwater wells. With burgeoning human populations in this region, comprehensive water conservation programs are needed to ensure a continuous supply of potable water.

### 4006. WETLANDS

1. The U.S. Army Corps of Engineers (USACOE) and the EPA define wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions." Many wetlands are regulated under the CWA Section 404. The 1987 USACOE Wetland Delineation Manual provides the guidelines for making site-specific determinations for "jurisdictional wetlands" subject to the CWA regulations.

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

2. Wetlands are extremely productive ecosystems and sustain about 90% of the plants on the endangered species list. Many species of wildlife also prefer these lands. In addition to functioning as an important habitat for diverse species, wetlands provide an essential water management system, regulating stormwater and flood flows by absorbing excess water. Wetlands also filter water and serve as buffers against wave action and water flow to help protect shorelines from erosion.

3. Chapter 2 provides a description and hydrology map of the approximately 3,905 acres of wetlands at MCBQ. At the earliest conceptual stage of a land-disturbing project, wetlands must be delineated to determine the exact boundaries of the jurisdictional wetlands on the proposed sites. Department of the Navy guidance requires that all activities avoid impacts to jurisdictional wetlands, if at all possible. If impacts cannot be avoided, an Environmental Assessment under NEPA must be prepared and presented to the MCBQ Environmental Impact Review Board to present options for minimizing and/or mitigating the adverse impacts. The Base consults with the U.S. Army Corps of Engineers Office (USACOE), Dumfries, Virginia, to determine the need for permits for discharging material into wetlands. Some actions are allowable under Nationwide Permits. For those actions not covered under a Nationwide Permit, a Joint Permit Application must be submitted to the USACOE. The USACOE will disseminate the application to other regulatory agencies, including the Virginia Marine Resources Commission, VDEQ, and local (e.g., Stafford, Prince William, or Fauquier County) wetland boards. The Virginia Water Protection Permit program (Code of Virginia Title 62.1, Chapter 3.1, Article 15) and 9 VAC 25-210-1- *et seq.*) gives Virginia regulatory authority over activities in state waters, including wetlands, regardless of federal authority. Therefore, all wetland impacts on the Base typically require both USACOE and Virginia permits. The ROICC and NREA Branch will jointly ensure that applicable federal and Virginia permits have been secured prior to construction.

4. Executive Order 11990 (May 24, 1977) and Department of the Navy policy requires that projects result in "no net loss" or degradation of wetlands. Where wetland loss is unavoidable, mitigation by creating or restoring at least an equal acreage of wetlands, preferably of the same type, is required. For wetland losses subject to federal and Virginia permitting, mitigation is often required at 2:1 or greater replacement ratios. Mitigation for lost wetlands must be designed, funded and incorporated into each project.

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5. Prior to November 7, 2003, wetland mitigation on Department of Defense (DoD) lands needed to either be accomplished onsite by constructing replacement wetlands or by creation of a wetland mitigation bank (WMB). WMBs must be constructed prior to wetland losses, must be approved by regulatory agencies, and are designed to produce wetland credits that can be used as compensatory mitigation for future wetland losses. The construction of replacement wetlands is extremely expensive (on-site costs for forested wetland mitigation have been in excess of \$200,000 per acre at MCBQ). The long-term costs of a WMB may also be an expensive undertaking, but may be far less expensive than on-site mitigating on a case-by-case basis and may create more ecologically functional wetlands. MCBQ is considering options for the construction of a WMB at Merrimac Farm Wildlife Management Area where MCBQ holds a restrictive easement, including the rights to construct wetlands.

6. On November 7, 2003, DoD was given authority by 10 U.S.C. § 159, Section 2694b, to mitigate wetland losses by making payments to a commercial wetlands mitigation banking program or by paying an "in-lieu-fee" to a mitigation sponsor in accordance with "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks" or the "Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation Under Section 404 of the Clean Water Act". These compensatory mitigation methods are done in lieu of mitigating wetland impacts through the creation of wetlands on federal property. The legislation also specifies that payments made to a wetland mitigation banking program or consolidated user site may be treated as eligible project costs for military construction. Therefore, the costs of any wetlands mitigation required as a result of projects funded by Military Construction Appropriations (MILCON) at MCBQ may be programmed as part of the MILCON budget request for the project.

4007. FLOODPLAINS. Executive Order 11988 (May 24, 1977) requires federal agencies to avoid actions that directly or indirectly affect flood plains. This Order identifies floodplains as "lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum that area subject to a one percent or greater chance of flooding in any given year." Federal agencies are also required to take a leadership role in restoring and preserving the natural and beneficial values served by floodplains. MCBQ uses the NEPA process to evaluate the potential effects of actions proposed in floodplains.

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### 4008. CHESAPEAKE BAY

1. The Chesapeake Bay is a national treasure and a resource of worldwide significance. It is the largest estuary in the United States with a surface area of more than 2,300 square miles and a watershed that encompasses 64,000 square miles from Cooperstown, New York to the Atlantic Ocean at Virginia Beach, Virginia (Figure 4-3). In the late 1970s and early 1980s the Chesapeake Bay Program (CBP) instituted an intensive research project to determine the causes of the degradation in the Chesapeake Bay water quality as well the impacts to fish, shellfish and other living resources and their habitat.

2. The CBP today is a partnership between the state and federal agencies located in the Chesapeake Bay watershed that was formed to restore and manage the bay. Total federal holdings in the watershed are in excess of 1.5 million acres. Key provisions of the CBP in Virginia were to designate Resource Protection Areas (RPA) and Resource Management Areas (RMA). RPAs consist of sensitive lands at or near the shoreline, to include a buffer area of not less than 100 feet in width located adjacent to and landward of: tidal wetlands; nontidal wetlands connected by surface flow to tidal wetlands or tributary streams; and tidal shores and other lands necessary to protect the quality of state waters. RMAs are located contiguous to the entire inland boundary of the RPA and, where appropriate, include floodplains, highly erodible and highly permeable soils, steep slopes, and nontidal wetlands not included in the RPA. An RMA encompasses a land area large enough to provide significant water quality protection to the RPA. The Federal Government adopted a policy to favor the creation of forested buffers along streams in order to help achieve both nutrient reduction and habitat restoration goals in support of the Chesapeake Bay Program. DoD is a signatory to an partnership agreement to conduct restoration of the Bay. The Marine Corps has adopted the policies and BMPs set forth in the agreement and will comply to the maximum extent possible consistent with the military mission and budget constraints. Silvicultural activities are exempt from these regulations provided they adhere to the Virginia Department of Forestry's "Best Management Practices."

### 4009. COASTAL ZONE MANAGEMENT

1. The Coastal Zone Management Act (CZMA) (15 C.F.R. § 923.84) requires that, to the extent practicable, federal actions affecting any land/water use, or coastal zone natural resource, be implemented consistent with the enforceable policies of an approved state

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

management program. The CZMA authorizes states to administer approved coastal nonpoint pollution programs. Advance concurrence from the Virginia Coastal Resources Management Program within VDEQ, is required prior to taking an action affecting the use of subaqueous lands, water, or natural resources of the designated Virginia coastal zone. Lands solely subject to the jurisdiction of, or held in trust by, the Federal Government, its officers, or its agencies are not included in state coastal zone designations.

2. MCBQ will support the development and implementation of state coastal nonpoint pollution control programs on Marine Corps lands by identifying nonpoint sources, specifying corrective measures, and coordinating nonpoint source compliance efforts with state programs. MCBQ will identify areas of sensitive natural resources of the coastal zone, minimize the loss or degradation of coastal wetlands, and protect water quality.

### 4010. FORESTRY BMPs FOR WATER QUALITY

1. Forest management activities are exempted from the VESCL because they usually have less severe impacts to water quality from erosion and sediments and fall under different and unique mitigation techniques governed by the Virginia Department of Forestry (VDof). The VDof mitigation BMPs are practices implemented to reduce erosion and prevent or control water pollution specific to forestry operations. They were designed to achieve the following major goals:

- a. Minimize surface runoff waters originating from any type of forestry related soil disturbance.
- b. Maintain the integrity of all stream beds and banks.
- c. Prevent deposition of logging debris in stream beds.
- d. Prevent chemicals, pesticides, fertilizers or petroleum products from entering or degrading (directly or indirectly) streams, ground water or surface water.
- e. Establish streamside management zones (SMZs) along perennial water courses that filter sediment from overland flow and maintain stream temperature.
- f. Provide rapid revegetation of all exposed mineral soil areas through natural processes supplemented by artificial revegetation where necessary.

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2. Per the Silvicultural Water Quality Law in Virginia (§10.1-1181.2), VDOF BMPs are not mandated by law, but are voluntary compliance measures. However, in July of 1993, VDOF was given statutory responsibility to inspect harvesting operations for water quality degradation. Through this legislation, the VDOF has the authority to recommend corrective action, stop harvesting operations, and initiate civil penalties up to \$5,000 per day.

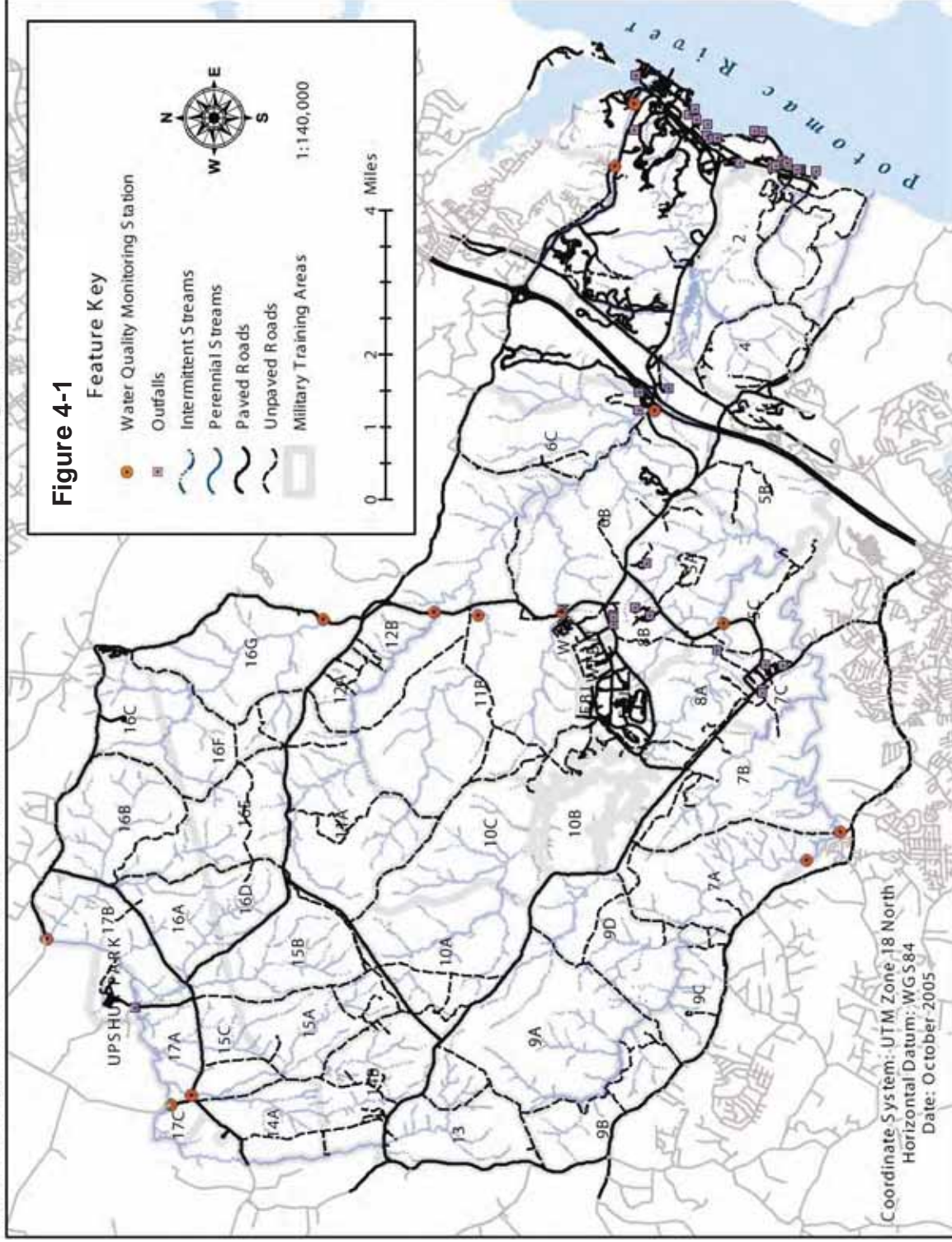
3. The major federal law governing the protection of wetlands and water quality is the CWA. Normal silvicultural (forest management) activities which may involve earth-moving are exempt from regulation under Section 404 of the CWA. Normal practices covered by this exemption include planting, seeding, cultivating, minor drainage and harvesting. Minor drainage constitutes simple connections from upland drainage facilities to a stream or water body. The silvicultural exemption does not include land-disturbing activities such as grading, leveling, filling in low spots or converting to upland. Any activity that converts a wetland into a non-wetland is not exempt from needing an ACOE permit. Conversion into a new use, such as clearing forested wetlands for pasture, crop land or development, is also not exempt and requires a Section 404 permit (VDOF 1997). Maintenance of existing drainage ditches, structures and fill is exempt from federal regulation provided there is no modification of the original design. Construction and maintenance of forest roads are exempt if the work is done in accordance with State approved BMPs (VDOF 1997).

4. Forest management actions at MCBQ will reflect full compliance with the above stated statutes and regulations in order to ensure the protection of wetlands and the maintenance of water quality.

4011. WORK PLAN. A list of projects, budget estimates and time lines for soil and water conservation programs is provided at Table 4-1.



Marine Corps Base Quantico: Outfalls & Water Quality Monitoring Stations





Quantico MCB: Watershed Areas

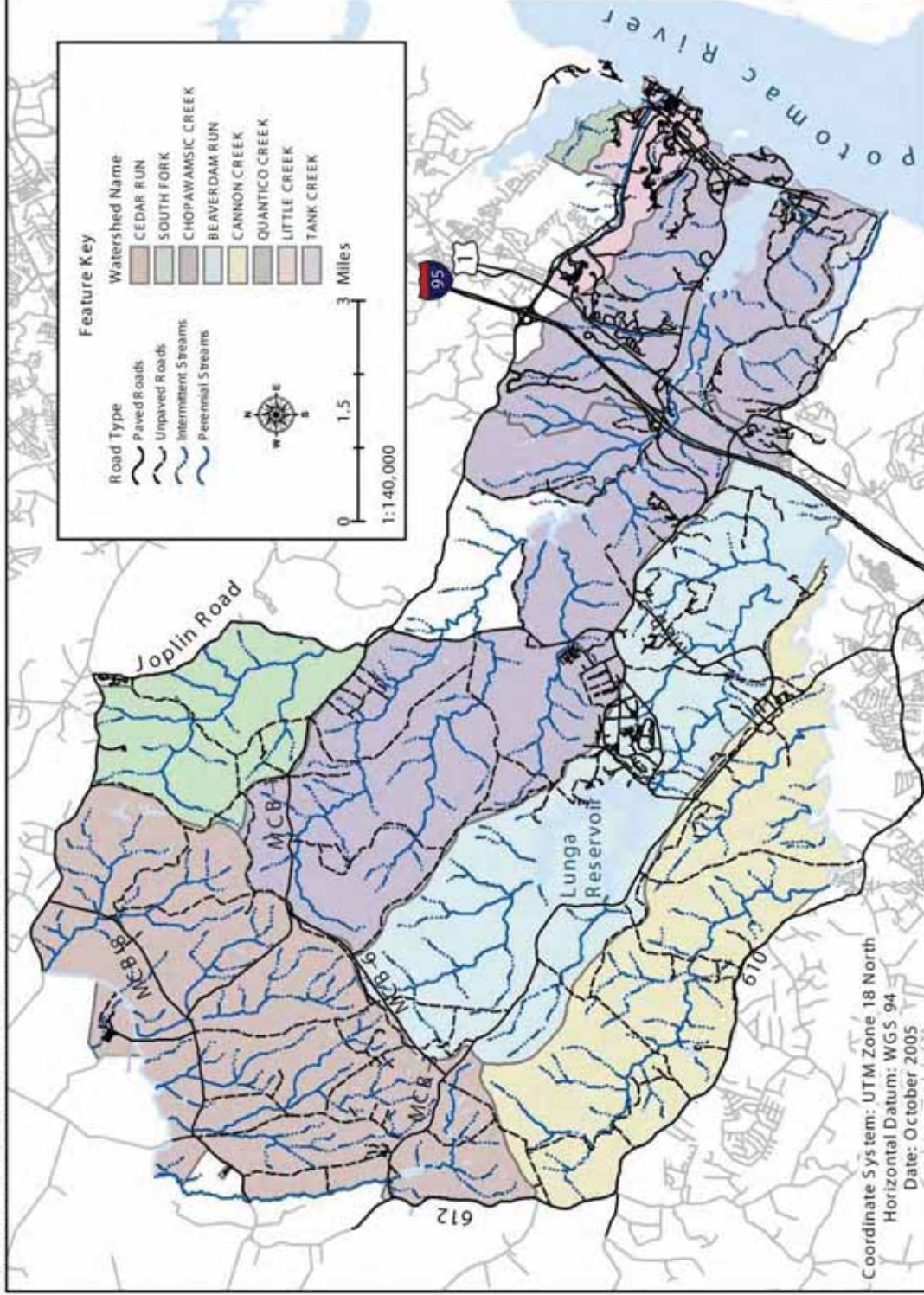


Figure 4-2.—MCBQ Watershed Areas

### Chesapeake Bay Watershed



Figure 4-3.--Chesapeake Bay Watershed

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Table 4-1. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
DRIVER I. TO PRESERVE, DEVELOP & MANAGE LAND & WATER RESOURCES						
1. Goal: To comply with Clean Water Act and Chesapeake Bay agreement by identifying, monitoring and mitigating actions that cause land disturbance and/or release of pollutants.						
1. Collect water quality data from South Fork Quantico Creek when necessary per the U.S. Department of the Interior watershed agreement.	B	67	69	71	73	75
2. Collect water quality data from other on-base streams to monitor pollutant loads.	C	100	100	100	100	100
3. Collect water quality data from permitted industrial stormwater outfalls to monitor pollutant loads in accordance with VPDES Permit #VA0002151.	A	50	50	50	50	50
4. Monitor construction projects to ensure that Virginia erosion and sediment control requirements are being implemented and provide guidance for personnel responsible for mitigation measures.	A	*	*	*	*	*
5. Mitigate wetlands losses through site-specific projects to create wetlands or by purchase/use of credits from a wetlands mitigation bank.	A	10	0	0	0	0

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Table 4-1. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
DRIVER I. TO PRESERVE, DEVELOP & MANAGE LAND & WATER RESOURCES (continued)						
6. Install 250 meters of vegetated shoreline buffers or engineer-designed structure to protect shorelines and riparian areas.	B	0		50	1,500	0
				.....▶		
7. Patrol and enforce trespassing and unauthorized use of ORV's in MCBQ watersheds.	A	*	*	*	*	*
		.....▶				
8. Increase shoreline/riparian protection measures to 500 meters.	C	0	0	0	1,500	0
					.....▶	
9. Measure sedimentation depth in Lunga and Breckenridge Reservoirs to evaluate dredging needs or potable water impacts.	C	0	0	0	0	125
						.....▶
DRIVER IV. TO IDENTIFY AND EVALUATE SOURCES OF ENVIRONMENTAL POLLUTION AND INCORPORATE MITIGATION MEASURES FOR RESTORATION OF AFFECTED NATURAL RESOURCES						
1. Goal: To evaluate and coordinate the installation of preventive methods to reduce and/or eliminate the potential release of pollutants that would be hazardous to the environment by impacting the soil, water or air.						
1. Execute ODCP, SPCC, and Mission Assurance Plans in response to accidental pollutant discharges.	A	*	*	*	*	*
		.....▶				

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Table 4-1. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2014	2015	2016	2017	2018
DRIVER IV. (continued)						
2. Inspect and maintain permanent storm water best management practices (BMPs) to ensure proper water quality and quantity control.	A	10	15	15	20	20
3. Develop educational materials and programs to ensure public education and awareness of storm water issues is addressed.	A	10	10	10	10	10
4. Implement a multifaceted water conservation program with emphasis on the use of water in industrial processes; the reduction of the generation of wastewater flows; and the operation and maintenance of equipment and devices installed on the waste distribution systems.	A	25	25	25	25	25
5. Properly service and maintain sewage holding tanks and septic systems at recreational and RTAs where sanitary sewer systems are unavailable.	A	<sup>2</sup> 10	10	10	10	10
<b>Subtotal for "A" projects</b>		<b>105</b>	<b>110</b>	<b>110</b>	<b>115</b>	<b>115</b>
<b>Subtotal for "B" projects</b>		<b>67</b>	<b>69</b>	<b>121</b>	<b>1,573</b>	<b>75</b>
<b>Subtotal for "C" projects</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>1,600</b>	<b>225</b>
<b>Total</b>		<b>272</b>	<b>279</b>	<b>331</b>	<b>3,288</b>	<b>415</b>

<sup>1</sup>Wetlands mitigation should be funded by the project that causes the unavoidable impact (usually construction funds).

<sup>2</sup>AC/S G-4 Logistics programs for the deployment and maintenance of porta-jons in RTAs. Estimated costs are for NREA recreation requirements.

(\*) indicates project costs are primarily labor related.

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CHAPTER 5

FOREST RESOURCES

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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 5

### FOREST RESOURCES

#### SECTION 1: INTRODUCTION

##### 5100. PURPOSE

1. The heavily forested lands of Marine Corps Base Quantico (MCBQ) are a unique and integral component of the military training environment. The diverse forest structure affords a variety of vegetative covers and landscapes, which provide vast flexibility for the development of assorted military training scenarios and exercises. To ensure that this valuable training resource remains functional requires an aggressive forest management program directed at the improvement and maintenance of forest health and diversity through regularly scheduled silvicultural treatments.

2. The purpose of this chapter is to provide long-range guidelines for management of the forest resource at MCBQ. This chapter will provide a brief assessment of resources, management concepts and operational goals for the restoration, protection, scenic enhancement, and sustained beneficial use of the forest resource.

##### 5101. REQUIREMENTS AND AUTHORIZATION

1. Forest resource management is mandated on Department of Defense (DoD) lands by DoD Directive Number 4700.4. This Directive states, "DoD forest lands shall be managed for sustained yield of quality forest products, watershed protection, wildlife habitat, and other uses that can be made compatible with mission activities."

2. This Directive further states, "forest products shall not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services."

3. Additional forest resource management guidance is provided in Chapter 11 of Marine Corps Order (MCO) P5090.2A.

4. Specific details for management of the forest resource at MCBQ will be outlined in this Chapter. Additional policy guidance is also established in Marine Corps Base Order (MCBO) 11015.1B "Woodland Tree and Shrub Management."

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5102. FOREST MANAGEMENT OBJECTIVES. This chapter will identify strategies, guidelines, and procedures for accomplishment of the following forest management objectives.

1. Maintain and improve forest health, to ensure a quality environment for the military training mission at MCBQ.
2. Manage MCBQ forest lands through timber harvests that are designed to maintain forest health and are compatible with military training.
3. Implement silvicultural practices that provide for diversity of forest tree species and other associated flora and fauna species, and maintain environmental integrity of forest ecosystems.
4. Provide for the management and control of wildfires and prescribed burning on all forest and range lands.
5. Identify, evaluate, monitor, and control (when required) forest insect and disease incidence using an integrated pest management approach (IPM).
6. Implement forest management actions that complement other multiple use requirements, such as fish and wildlife, recreation, and various land use and base support requirements.

## 5103. FOREST MANAGEMENT HISTORY

1. The forest management program was started at MCBQ in 1962. Over the years this program has continued to evolve and become more complex due to: changes in traditional forest management practices; new technologies; increased environmental restrictions at the local, State, and Federal levels; increased public involvement; and more intensive utilization of the forested lands for military training.
2. Forest management at MCBQ today involves maintaining vigorous, healthy, and sustainable forest ecosystems through the implementation of sound, scientifically proven silvicultural practices. These practices are designed to ensure biodiversity, to ensure the sustainability of all affected natural resources, to maintain environmental integrity and favorable public perception, and to provide a quality and diverse environment that fulfills the requirements for military training.

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### FOREST RESOURCES

#### SECTION 2: FOREST RESOURCE DESCRIPTION

##### 5200. GENERAL

1. MCBQ owns and utilizes 58,995 acres for military training.
2. Most of the developed area at MCBQ, east of Interstate 95, is known as the "Mainside" area, and contains about 7,900 acres. The area west of Interstate 95 is known as the "Guadalcanal" area and contains approximately 51,100 acres. This area is used intensively for all types of military training done by MCBQ to prepare officers for combat readiness. All live firing ranges and most dud ordnance areas are located on the Guadalcanal portion of the Base. Commercial forest management is practiced on much of the Guadalcanal area. Of the total 58,995 acres owned by MCBQ, approximately 52,090 acres (88%) are forested.

##### 5201. FOREST COVER TYPES

1. For forest management purposes, trees are identified by the groups or mixtures of tree species that commonly grow together within the forest. These mixtures, or species associations, have been classified by the Society of American Foresters (SAF), and are referred to as "SAF forest cover types" (Eyre 1980). Cover types have been established for the entire United States and Canada. From the forest inventory conducted on the Base in 1989-1991, 20 forest cover types were identified (Table 5-1).
2. Tree species occur naturally in various forest cover types based on environmental factors such as climate, soils, moisture availability, geographical location, natural selection, and natural succession. It is important to recognize the factors contributing to their existence on a particular site in order to manage them effectively. The primary merchantable tree species managed on the Base are listed in Table 5-2. Although individual species requirements are evaluated by the forester, management practices are directed primarily at the forest cover type.

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### 5202. FOREST INVENTORY, MAPPING AND VOLUMES

1. Effective management of the Base forest resource requires an accurate inventory of forested areas. A forest inventory of the entire Base area was completed during 1989-1991. Field information for each forest type was recorded and compiled in a computer database, which can be directly correlated with the graphical GIS cover type mapping. This information provides the forest manager with the ability to assess conditions of individual forest stands and entire forest compartments for both short and long range planning. In order to maintain a current and accurate database, changes in forested, developed, and open landscapes must be recorded as they occur. Changes are generated by timber harvesting, clearing for facility construction, and changes in military land utilization. These revisions should be updated at least semi-annually.

2. Forest volumes refer to the amount of cubic feet of pulpwood and board feet of sawtimber that are contained in the total forested areas of the base. This information was calculated from the forestry database, obtained during the 1989-1991 forest inventories. This data is presumably accurate within  $\pm 15\%$ , considering the inventory methods utilized. The total board foot volume of both pine and hardwood sawtimber is estimated to be 265,533,379 board feet. The total cubic foot volume of pine pulpwood is estimated to be 135,619 cords (1 cord = 128 cubic feet). Hardwood cubic foot volume is estimated at 158,590 cords. Table 5-3 shows the calculated total forest timber volumes. Compartments containing hazardous ordnance and duds were excluded from these totals, because timber volume inventories could not be conducted in these areas.

3. While these volume calculations are now dated, they are not expected to have changed significantly since proper forest resource management normally maintains consistent inventory volume levels. For example, reductions from sawtimber harvests are usually offset by increased growth rates in areas that are thinned or regenerated to fully stocked stands. Since the annual allowable harvest acreage has not been exceeded since the last forest inventory, any reductions in Base timber volumes would likely stem from the loss of land area through development or conversion to other non-forest uses.

### 5203. FOREST VALUE

1. The primary importance of forested land at MCBQ is to provide a landscape that supports the military mission. The significance of forested lands to military training and watershed protection has been addressed in Chapters 2 and 3, and 4. It is difficult to place a

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

monetary value on the many intangible benefits provided by a healthy forested ecosystem. The forest resource also supports outdoor recreation, a diversity of flora and fauna, and aesthetics.

2. The forest is also extremely valuable as a renewable natural resource. When managed appropriately it can provide a sustained yield of forest products indefinitely. These products provide essential items on which society is dependent, and foster employment opportunities such as logging, forest product manufacturing, retail product sales, and construction. While the value of all employment associated forest products is difficult to assess, the total value of the standing forest inventory is more easily determined. With the forest volume calculations from paragraph 5202 above, and using current market value, Table 5-3 shows that the value for the standing forest inventory at MCBQ to be at least \$52M. At MCBQ the sale of the forest products in this inventory pays for a significant amount of the forest management costs of maintaining a healthy forest and quality training environment.

3. Although it is difficult to assign a concrete economic value to the forest from the sale and manufacturing of forest products, the benefits to and from these activities cannot be overlooked. Considering the commodities provided and the variety of employment opportunities forest products generate, the losses would be much higher than the value of the standing forest inventory if this valuable renewable resource was not properly managed.

### 5204. REFERENCE

Eyre, F. H., Ed., 1980. Forest Cover Types of the United States and Canada. Society of American Foresters. 148 pp.



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Reforestation with white pine, holly, and eastern red-cedar at a reconditioned range near Lejeune Hall, MCBQ

TABLE 5-1. SAF FOREST COVER TYPE ACREAGES AT MCBQ.			
SAF COVER TYPE	COMMON NAME	# OF STANDS	ACRES
16	Aspen	1	13
23	Eastern Hemlock	1	25
44	Chestnut Oak	12	370
52	White-Black-N.Red Oak (NRO)	209	9,072
53	White Oak (WO)	13	349
57	Yellow Poplar (YP)	44	924
58	Yellow Poplar-Hemlock	2	35
59	Yellow Poplar-WO-NRO	548	18,936
61	River Birch-Sycamore	2	59
65	Pin Oak-Sweetgum	7	378
75	Shortleaf Pine	2	77
78	Virginia Pine-Oak	336	8,658
79	Virginia Pine	329	8,512
81	Loblolly Pine	191	2,823
82	Loblolly Pine-Hdwd	12	189
87	Sweetgum-Yellow Poplar	32	1,065
92	Sweetgum-Willow Oak	4	90
93	Green Ash	1	23
94	Sycamore-Sweetgum-Elm	4	78
108	Red Maple	16	408
TOTAL		1768	52,090

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TABLE 5-2. PRIMARY MERCHANTABLE TREE SPECIES AT MCBQ	
COMMON NAME	SCIENTIFIC NAME
Red Maple	Acer rubrum
Hickory	Carya sp.
American Beech	Fagus grandifolia
White Ash	Fraxinus americana
Black Walnut	Juglans nigra
Black Gum	Nyssa sylvatica
Sweet Gum	Liquidambar styraciflua
Yellow Poplar	Liriodendron tulipifera
American Sycamore	Platanus occidentalis
Bigtooth Aspen	Populus grandidentata
Black Oak	Quercus velutina
Chestnut Oak	Quercus prinus
Northern Red Oak	Quercus rubra
Southern Red Oak	Quercus falcata
Scarlet Oak	Quercus coccinea
White Oak	Quercus alba
Willow Oak	Quercus phellos
Loblolly Pine	Pinus taeda
Pitch Pine	Pinus rigida
Shortleaf Pine	Pinus echinata
Table Mountain Pine	Pinus pungens
Virginia Pine	Pinus virginiana
White Pine	Pinus strobus
Eastern Hemlock	Tsuga canadensis

TABLE 5-3. ESTIMATE OF FOREST VOLUMES AND VALUE FOR MCBQ			
	PULPWOOD (Cds)		SAWTIMBER (bd.ft.)
	<u>Pine</u>	<u>Hardwood</u>	<u>Pine and Hardwood</u>
Volume	135,619	158,590	265,533,379
Unit Price	\$20/cd	\$8/cd	\$180/Mbf (1000 bd.ft.)
Unit Value	\$2,712,380	\$1,268,720	\$47,795,940
Total Value	\$51,777,040		

# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 5

### FOREST RESOURCES

#### SECTION 3: FOREST REGULATION

5300. FOREST COMPARTMENT DESIGNATION. For forest management purposes, the total Base area at MCBQ has been divided into 85 administrative management units called "forest compartments." Forest compartment boundaries are designed to coincide with roads, streams and other identifiable ground features. Compartment boundaries also coincide with the operational military Training Area (TA) boundaries; although several compartments may be contained within a single TA. Figure 5-1 shows the location and designation of forest compartments. All planning and forest management actions are executed at the compartment level.

5301. FOREST MANAGEMENT ZONES. Forest compartment boundaries identify all land ownership and tenant leases within the confines of MCBQ. The presence of these interests, along with current military land uses, determine largely the extent and intensity of forest management operations in a given area. Accordingly, the 85 forest compartments have been grouped into management zones to drive management decisions. The map in Figure 5-1 shows the various compartments in each forest management zone. Table 5-4 shows the total acres and forested acres by compartment for each management zone. Management objectives for each forest management zone are described below.

1. Forest Management Zone 1. This zone is not restricted by range firing fans and needs to be managed by commercially harvesting timber to maintain forest health. Timber harvests should be compatible with training levels and directed at maintaining areas that are most problematic. The 2013 age class distributions for pine, hardwood, and mixed pine/hardwood forest types within this zone are shown in Figures 5-2, 5-3, and 5-4. These figures also depict the (balanced) age class distributions that would be achieved under full sustained yield forest management (although this is not the objective for this area). Further analysis of these age class distributions and their implications for maintaining training areas will be discussed in paragraphs 5303-5305. These paragraphs will also establish the requirements and guidelines for forest management in this zone, and variations utilized in other zones.

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### 2. Forest Management Zone 2

a. Forest management actions will be minimal in this zone due to the presence and frequent use of live firing ranges that limit management capabilities. Limitations in the zone are related to the distance that projectiles extend from the range, which prohibits access to these areas when ranges are active. Portions of a few compartments within this zone are somewhat accessible, however, most are rarely accessible.

b. Forest management objectives for this zone are to accomplish some dispersed harvesting and prescribed burning to improve forest health conditions, maintain species diversity and wildlife habitat, and reduce wildfire hazard potential. Additional management objectives include forest insect and disease management, and the establishment and maintenance of old growth and other unique forest ecosystems.

c. Figures 5-5, 5-6, and 5-7 show the current age classes (2013 data) for pine, hardwood, and mixed pine/hardwood forest types within this zone. The (balanced) age class distributions that would be achieved under sustained yield forest management are shown only to illustrate the deviation of these unmanaged stands from managed stands. Figures 5-5, 5-6, and 5-7 also show that higher levels of harvesting were prevalent in this zone in the past, as evidenced by the amount of acreages in the 11-20, 21-30 and 31-40 age classes.

d. The acreages are slightly overstated in Figures 5-5, 5-6, and 5-7 within the 0-10 age class. Most of the acreages in this age class represent forest stands for which no data was collected during the forest inventory due to access restrictions. Where no data was available, "0" was entered for age. In actuality, little harvesting has been done within this area within the past 25 years, due to increased military training activities on ranges. In the future, low-level timber harvesting in Zone 2 is expected to have an overall negligible effect on age class distributions. Other short and long term consequences of the lack of timber harvesting in this zone are readily predictable, as follows:

(1) Age class distributions (refer to Figures 5-5, 5-6, and 5-7) generally will not change in the future, however, there will be a natural shift toward much older age classes. This shift will be due to the lack of timber harvesting, meaning that regeneration will occur mainly through natural mortality (which creates small openings) and understory regeneration of shade

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tolerant species. Additional factors that could also contribute to regeneration capabilities within this zone include wind, ice, insects, diseases, and wildfires.

(2) Natural succession processes will enable the more shade tolerant hardwoods to replace old Virginia pine in both pure and mixed pine/hardwood stands. Planted loblolly pine in this zone will persist for an extended period during natural succession, based on its considerably longer lifespan than Virginia pine. However, loblolly pine also eventually will be replaced by shade tolerant hardwoods, such as beech and maple, and over the long term, shade tolerant hardwoods may also entirely replace existing stands of oak/hickory forests.

(3) While a complete transformation of all species to a beech-maple forest in this zone might require 150-200 years, the transition of pure pine and mixed pine/hardwood forest types to more shade tolerant hardwood types may proceed more rapidly, as the rate of old Virginia pine death and replacement progresses.

(4) As Virginia pine stands grow beyond maturity in this zone, they will become more susceptible to attack by insects and diseases. Additionally, without timber harvesting and removal of dead wood through firewood cutting in this zone, fuels on the forest floor will build up to levels which create hazardous conditions for wildfires. Disease, insect infestation and wildfires may also factor significantly in the rate of transformation to a beech-maple forest.

e. The lack of timber harvesting in Forest Management Zone 2 also has some benefits to the extent it allows for unique management opportunities to establish old growth forests, natural areas, and other diverse forest ecosystems. However, even with these unique management opportunities, the limitations on age class diversification and a diverse forest species structure within this zone present a higher likelihood of large-scale natural disasters. Given the access constraints for timber harvesting, the need for prescribed burning (which can be done in one day in most cases) becomes imperative to reduce fuel for natural disaster/wildfire impacts on MCBQ's ability to manipulate vegetation for wildlife enhancement and maintain unique ecosystems.

3. Forest Management Zone 3. The compartments in this zone contain relatively small acreages comprised of several MCBQ tenant-leased lands. Forest management objectives will be compatible with tenant organization requirements. The major

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objective in this zone will be to maintain healthy and visually appealing forested areas. This will be accomplished primarily through the application of thinning and selective harvesting.

4. Forest Management Zone 4. The compartments in this zone have development, water bodies, recreational areas, and other features or uses which require special management considerations. Compartments 76, 77, and 78, have unique considerations, but are more amenable for forest management harvesting. The remaining compartments in this zone offer little opportunity for harvesting. Forest pest management is of utmost importance in Zone 4, because of the requirements to protect forested landscapes for recreation, watersheds and reservoirs, and potential for negative impacts of pests to developed areas.

5. Forest Management Zone 5. This zone includes live firing ranges containing ordnance and duds, and is consequently restricted. Forest management activities in this zone will be directed at annual prescribed burning on firing ranges and in surrounding training areas to reduce wildfire occurrence and severity. Pest management-related problems in this zone will be on a case-by-case basis to determine the most compatible treatment solutions for military training.

6. Forest Management Zone 6. This zone consists of the town of Quantico. There are no Forest Management activities.

### 5302. FOREST GROWTH

1. Forest growth is determined by measuring the changes in frequency and dimension of trees in a given area over time. Major variables influencing forest growth include site characteristics (e.g, soil, nutrients, and moisture), tree density, and individual tree species characteristics. Forest growth measurements are useful for determining forest health, maintaining indefinite site productivity, and identifying periodic changes in forest growing stock volume.

2. Forest growing stock volume is usually measured in terms of marketable product dimensions to obtain a direct monetary value of the total forest inventory. Through periodic measurements of this inventory, annual growth can be determined. Annual growth must be established in order to support the "volume method" of establishing sustainable annual harvest levels. This method ensures that the net annual growth is available for harvesting

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on a sustained basis indefinitely (see paragraph 5305 below for a more detailed discussion of forest regulation methods).

3. Forest growth characteristics also help determine forest health and site productivity. While both are normally evaluated at the individual stand level, they require measurements of mean and periodic annual incremental growth, the age and the height of a small number of typical representative trees.

4. With forest growth data, MCBQ can also make forest health improvements and grow commercial tree species, as desired. Forest health and growth are maximized primarily through maintaining optimal tree density relative to site capability. Using growth data, the forester makes determinations of site capability, and applies the appropriate treatments to obtain the desired density or "stocking level."

### 5303. HARVEST ROTATION AGES

1. "Harvest rotation age" refers to the age at which mature forest stands are harvested and regenerated with new seedlings. Rotation ages are established based on the biological and economical maturity of various tree species of conifer and hardwood types. Other important age-dependent factors such as seed production, tree growth, and tree health are also considered in establishing harvest rotation age.

2. The term "harvest rotation" (or "rotation") refers to all events associated with maintenance and management of a forest stand from initial establishment at the seedling stage, through the final timber harvest removal and regeneration of a new stand. The following harvest rotation ages have been established at MCBQ:

a. Conifer forest types: Age 50 (40-60 years). Includes Virginia pine, loblolly pine, and shortleaf pine.

b. Conifer forest types: Age 100 (90-110 years). Includes white pine and eastern hemlock.

c. Hardwood forest types: Age 50 (40-60 years). Yellow poplar.

d. Hardwood forest types: Age 100 (90-110 years). Includes all hardwood forest types other than yellow poplar. In certain hardwood stands having sufficient basal area (BA) of



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high quality veneer trees with healthy crowns, the rotation age may be extended to 120 + years.

e. Mixed Conifer/Hardwood forest types: Some of the stands in this forest type will be converted to conifer forest types (approx. 1/3) and hardwood forest types (approx. 1/3), and managed on the appropriate 50 or 100 year rotation age, accordingly. The remainder of these stands (approx. 1/3) will continue to be managed as mixed pine/hardwood forest types on a 70-year rotation age (see paragraph 5404 for more detailed information on management of mixed conifer/hardwood forest types).

5304. SUSTAINABLE ANNUAL HARVEST. The "sustainable annual harvest" is the maximum amount of wood products that may be harvested from a forest area on a yearly basis. This level is based on the productive capability of the forest area, and is established to ensure that an equal annual sustained yield of forest products can be harvested perpetually, without depletion of the resource. There are 2 potential methods for determining and regulating the sustainable annual harvest, which are discussed in paragraph 5305 below.

### 5305. REGULATION OF FOREST HARVESTING

1. The harvesting of forest products is governed by the management objectives established in paragraph 5102 above. Additionally, paragraphs 5303 and 5304 established harvest rotation ages and identified the benefits for determination of sustainable annual harvest levels. These management objectives have been structured to ensure that quality military training and multiple use benefits are mutually supported by the forest resource. When sustainable annual harvesting levels are implemented, optimal age class diversity, tree growth, and production of forest products are realized. Forest health is also improved proportionately as tree growth and vigor are increased.

2. Equal annual levels of harvesting provide consistent returns from the sale of forest products, which in turn funds forest management operations. Consistent funding is essential to ensure stable, timely application of forest management treatments.

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3. Determination of sustainable annual harvest levels is accomplished by one of the following two methods:

a. Volume Method. As noted above, this method requires the determination of average net annual growth per forest area. The major problems with this method are that it is too labor intensive, and may not provide accurate information, unless sampling is sufficient to ensure that all forest types are represented proportionately. All stands are not sampled, so the collected data is actually an average for sampled stands within a forest type. Individual stand data for all stands is therefore, not available. For these reasons, this method is not used on MCB Quantico.

b. Area Method

(1) The area method of regulation has been utilized exclusively at MCBQ since 1988, and will continue to be the method of choice. Under this method equal amounts of forest area (acres) are harvested on an annual basis, rather than identifying specific areas based on volume according to net average growth. The amount of annual acreage to be harvested is determined by dividing the total compartment acres of forest type under management by the established rotation age (Paragraph 5303) for that forest type. The calculation is as follows:

$$Y = \frac{A}{R} \quad \text{where;}$$

Y = Annual Harvest  
A = Compartment Forest Type Acreage  
R = Rotation Age in Years

(2) A broader application of this method to MCBQ is illustrated in Tables 5-5, 5-6 and 5-7, below. For example, Forest Management Zone 1 contains a total of 35 forest compartments and 26,524 forested acres (see Table 5-4). Of those 26,524 acres, 6,190 are pine, 15,206 hardwoods, and 3,728 mixed pine/hardwood. Using the calculation above, Tables 5-5, 5-6, and 5-7 identify average sustainable annual harvest acreage for each of these major forest types within the entire zone. Specific management criteria for the mixed pine/hardwood type are established in paragraph 5404(1). For purposes of this illustration, one-third of the acreage of mixed types (3,728/3) are presumed to be managed as hardwood types, one-third as pine types, and one-third as mixed pine/hardwood types.

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(3) Summarizing the information in Tables 5-5, 5-6, and 5-7, the total sustainable annual harvest acres for Forest Management Zone 1 is calculated to be:

- Pine Forest Types: (124 + 25) = 149 acres
- Hardwood Forest Types: (152 + 12) = 164 acres
- Mixed Pine/Hardwood Types: (18) = 18 acres

(4) The acreage values above represent an average for compartments within Forest Management Zone 1. Actual annual harvest levels will vary somewhat due to the differences in proportions of forest types among compartments. Therefore, actual sustainable annual harvest levels must be calculated on an individual compartment basis using the same criteria established above.

(5) It is not desirable or practical to enter all areas of forest compartments every year for harvesting. Consequently a compartment sustainable annual harvest evaluation period of 10 years is utilized for planning purposes. The selection of the length-of-entry period determines the age class structure for the various rotation ages used in calculating harvestable acreage. For example, for pine stands within a compartment with an established rotation age of 50 years, an evaluation interval of 10 years will result in roughly 5 age classes of equal acreage (i.e., 50 year rotation age has 5, 10-year classes). This means that when a compartment is evaluated every 10 years for harvesting, MCBQ will be able to identify the appropriate proportion of pine forest type acreage to harvest. Similarly, for hardwood stands with a 100-year rotation age in the same compartment, there will be 10 age class divisions that will be assessed for potential harvesting.

(6) With the standardization associated with regular 10-year evaluation periods, there will be relatively equal acreage for harvesting. Since each age class is constantly advancing to the next age class after each 10-year interval, the acreage within a particular class will remain roughly the same as it advances towards maturity. Since harvesting is always conducted in the final mature age class, roughly only 20% of a 50-year rotation forest type is expected to be harvested every 10 years. Similarly, roughly only 10% of a 100-year rotation stand will be mature at each 10 year evaluation period, and thus available for harvesting. Upon harvesting the associated forest management treatment provides for the establishment of a new forest stand at an equivalent level to the sustainable annual harvest acreage for that forest type. For this reason, the sustainable annual

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

harvest is often referred to as the "allowable regeneration harvest."

(7) Forest stands are thinned to improve tree vigor, forest health, timber quality, wildlife habitat, and species diversity until they reach the end of the established rotation age. These thinnings are called "intermediate harvests" because they do not affect the overall age class structure of the stand. As such, they are not considered a part of the sustainable annual harvest acreage.

### 5306. ANNUAL HARVEST SCHEDULE

1. The annual harvest schedule is formulated to identify the sequence of forest compartments to be harvested for the future ten-year period (2015-2024). The initial harvest schedule was developed by prioritizing compartments with large acreages of over mature timber (both pine and hardwood), utilizing past harvesting history, providing for dispersal of harvests among compartments, and balancing the size and number of scheduled compartments on an annual basis.

2. Table 5-8 shows the ten-year harvest schedule, and the map in Figure 5-8 identifies the location of scheduled forest compartments. The annual harvest schedule only includes compartments in Forest Management Zone 1, which has been identified as manageable. This zone contains 35 forest compartments, which means that approximately 3.5 compartments should be looked at each year to assess critical forest management requirements.

3. The 10-year harvesting schedule will be closely followed; however, the schedule may be altered, where necessary, based on impacts from natural and environmental factors such as ice, snow, wind, and fire damage. Timber market conditions and changes in military land use requirements may also necessitate deviations from this schedule.

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TABLE 5-4. FOREST MANAGEMENT ZONE ACREAGE TABLE				
<b>(ZONE 1) MANAGEABLE (1-35)</b>				
<b>FOREST COMPARTMENT</b>	<b>TOTAL ACRES</b>	<b>FORESTED ACRES</b>	<b>OPEN</b>	<b>WATER</b>
1	1225	643	103	749
2	1161	1131	30	0
3	1211	1083	78	50
4	482	437	45	0
5	431	427	2	2
6	1270	1161	14	95
7	887	785	102	0
8	1773	1724	49	0
9	1731	1531	200	0
10	389	356	33	0
11	459	459	0	0
12	921	899	22	0
13	947	945	2	0
14	785	709	76	0
15	770	765	5	0
16	381	377	4	0
17	877	833	44	0
18	892	873	19	0
19	572	562	10	0
20	525	522	3	0
21	1148	1084	64	0
22	822	791	31	0
23	605	602	3	0
24	1321	1237	84	0
25	744	607	136	1
26	878	757	118	3
27	927	810	117	0
28	883	810	73	0
29	504	494	10	0
30	691	667	8	16
31	505	481	24	0
32	441	438	3	0
33	335	331	4	0
34	497	496	1	0
35	698	697	1	0
<b>TOTAL (ZONE 1)</b>	<b>28,688</b>	<b>26,524</b>	<b>1,518</b>	<b>916</b>

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TABLE 5-4. FOREST MANAGEMENT ZONES (CONTINUED)				
<b>(ZONE 2) LIMITED ACCESS MANAGEMENT (36-65)</b>				
<b>FOREST COMPARTMENT</b>	<b>TOTAL ACRES</b>	<b>FORESTED ACRES</b>	<b>OPEN</b>	<b>WATER</b>
36	431	425	6	0
37	656	352	304	0
38	462	442	20	0
39	326	294	25	7
40	132	132	0	0
41	695	664	31	0
42	642	565	74	3
43	749	745	4	0
44	579	578	1	0
45	418	418	0	0
46	829	569	260	0
47	908	902	6	0
48	443	438	5	0
49	467	463	4	0
50	290	288	2	0
51	968	952	16	0
52	686	671	15	0
53	689	681	8	0
54	1270	1252	18	0
55	1014	897	113	4
56	528	376	152	0
57	718	717	1	0
58	1224	1171	53	0
59	305	238	67	0
60	193	163	30	0
61	463	416	47	0
62	615	612	3	0
63	871	856	15	0
64	640	618	22	0
<b>TOTAL (ZONE 2)</b>	<b>18,211</b>	<b>16,895</b>	<b>1,302</b>	<b>14</b>

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TABLE 5-4. FOREST MANAGEMENT ZONES (CONTINUED)				
FOREST COMPARTMENT	TOTAL ACRES	FORESTED ACRES	OPEN	WATER
<b>(ZONE 3) TENANT LANDS (66-70)</b>				
66	<u>555</u>	<u>330</u>	<u>222</u>	<u>3</u>
<b>TOTAL (ZONE 3)</b>	<b>555</b>	<b>330</b>	<b>222</b>	<b>3</b>
<b>(ZONE 4) SPECIAL MANAGEMENT (71-80)</b>				
71	2580	1399	1110	71
72	1639	1241	323	75
73	101	76	25	0
74	168	85	82	1
75	817	267	67	483
76	336	239	97	0
77	1024	1024	0	0
78	1314	1267	0	47
79	<u>141</u>	<u>107</u>	<u>34</u>	<u>0</u>
<b>TOTAL (ZONE 4)</b>	<b>8,120</b>	<b>5,705</b>	<b>1,738</b>	<b>677</b>
<b>(ZONE 5) RESTRICTED ACCESS (81-90)</b>				
81	405	351	54	0
82	2501	1965	536	0
83	318	150	168	0
84	<u>192</u>	<u>178</u>	<u>14</u>	<u>0</u>
<b>TOTAL (ZONE 5)</b>	<b>3,416</b>	<b>2,644</b>	<b>772</b>	<b>0</b>
<b>(ZONE 6) QUANTICO TOWN (91)</b>				
91	<u>0</u>	<u>0</u>	<u>37</u>	<u>0</u>
<b>TOTAL (ZONE 6)</b>	<b>0</b>	<b>0</b>	<b>37</b>	<b>0</b>

TABLE 5-5. SUSTAINABLE ANNUAL HARVEST FOR PINE FOREST TYPES (FOREST MANAGEMENT ZONE 1)

Forest Type	Pine	Mixed Pine/Hardwood Basal Area >= 60% Pine
Acres	6,190	3,728/3
Rotation Age	50	50
Sust. Annual Harvest Ac	124	25



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TABLE 5-6. SUSTAINABLE ANNUAL HARVEST FOR HARDWOOD FOREST TYPES (FOREST MANAGEMENT ZONE 1)

Forest Type	Hardwood	Mixed Pine/Hardwood Basal Area $\geq$ 60% Hdwd
Acres	15,206	3,728/3
Rotation Age	100	100
Sust. Annual Harvest Ac	152	12

TABLE 5-7. SUSTAINABLE ANNUAL HARVEST FOR MIXED PINE/HARDWOOD FOREST TYPES (FOREST MANAGEMENT ZONE 1)

Forest Type	Mixed Pine/Hardwood Basal Area 41-59% Pine/Hdwd
Acres	3,728/3
Rotation Age	70
Sust. Annual Harvest Ac	18

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TABLE 5-8. TEN-YEAR TIMBER HARVESTING SCHEDULE FOR FOREST MANAGEMENT ZONE 1 (COMPARTMENTS 1-35).

<u>COMPARTMENTS</u>		<u>COMPARTMENTS</u>	
2015	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     19 20 30 34                 </div> YR (1)	2020	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     1 26 28 33                 </div> YR (6)
2016	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     17 18 21                 </div> YR (2)	2021	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     12 13 31 32                 </div> YR (7)
2017	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     3 14 15 16                 </div> YR (3)	2022	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     9 25 35                 </div> YR (8)
2018	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     7 8 11                 </div> YR (4)	2023	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     2 10 22 23                 </div> YR (9)
2019	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     24 27 29                 </div> YR (5)	2024	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     4 5 6                 </div> YR (10)

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

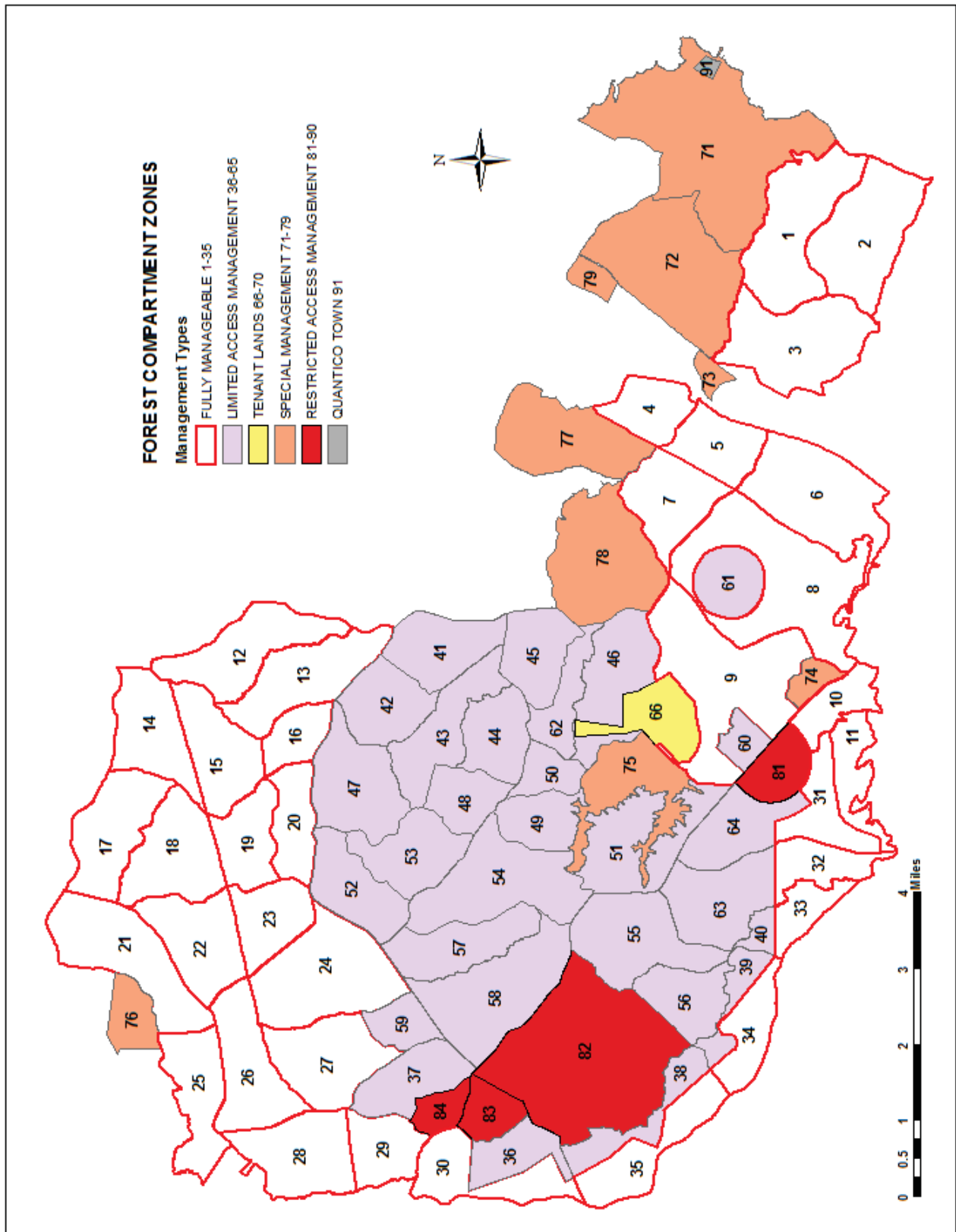


FIGURE 5-1. FOREST COMPARTMENT ZONE MAP

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

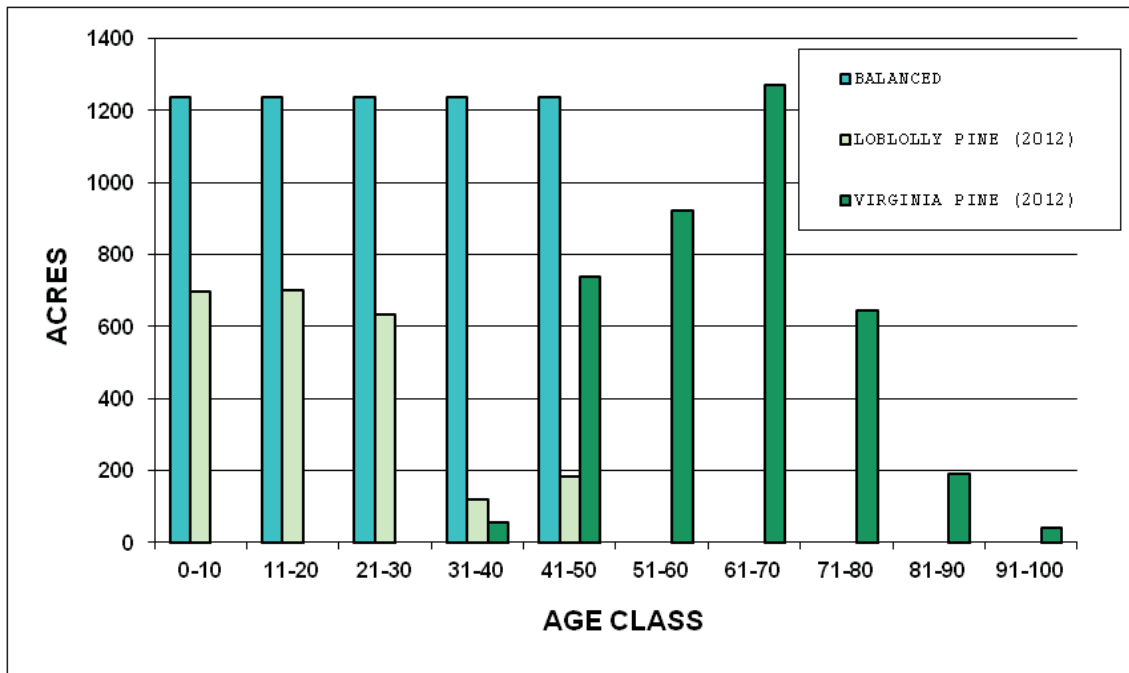


Figure 5-2. Acreages of Pine by 10-year age class for Compartments 1-35.

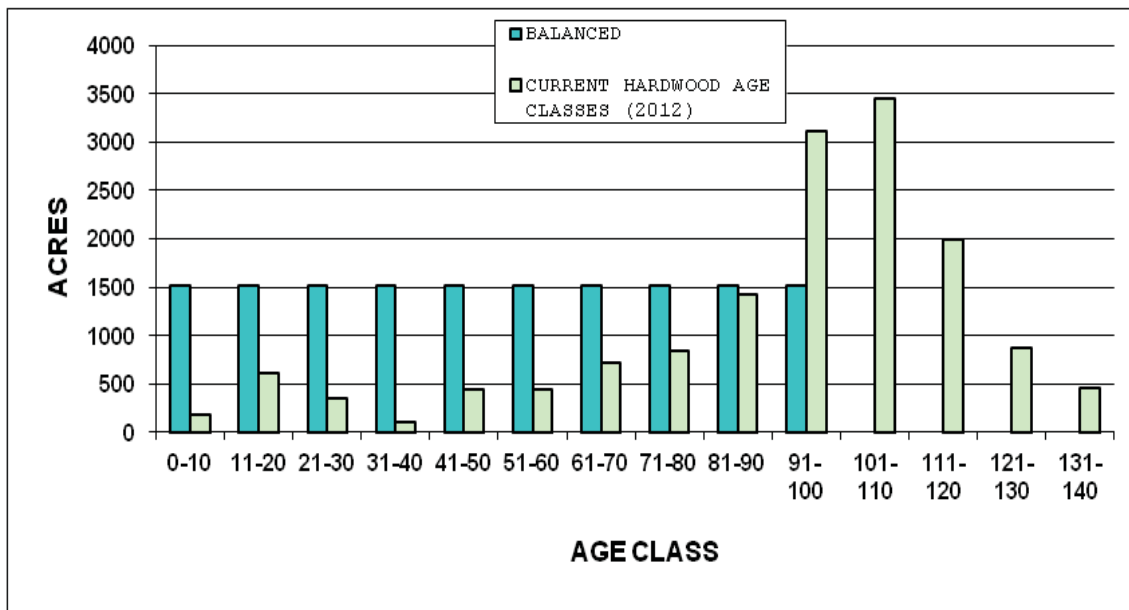


Figure 5-3. Acreages of Hardwood by 10-year age class for Compartments 1-35.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

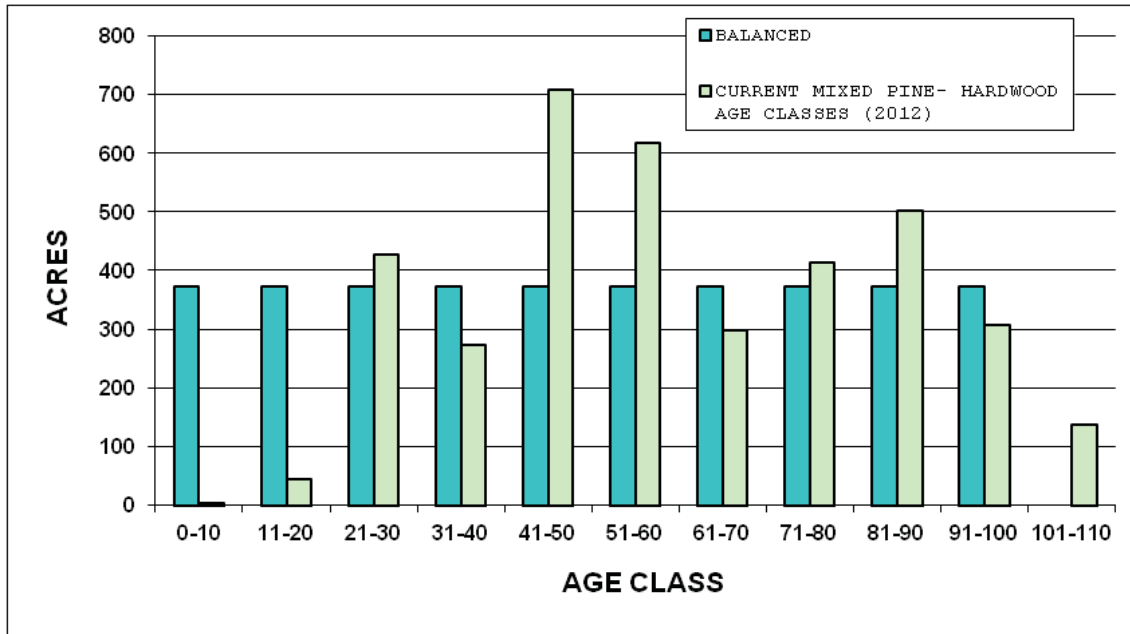


Figure 5-4. Acreages of mixed pine/hardwood by 10-year age class for Compartments 1-35.

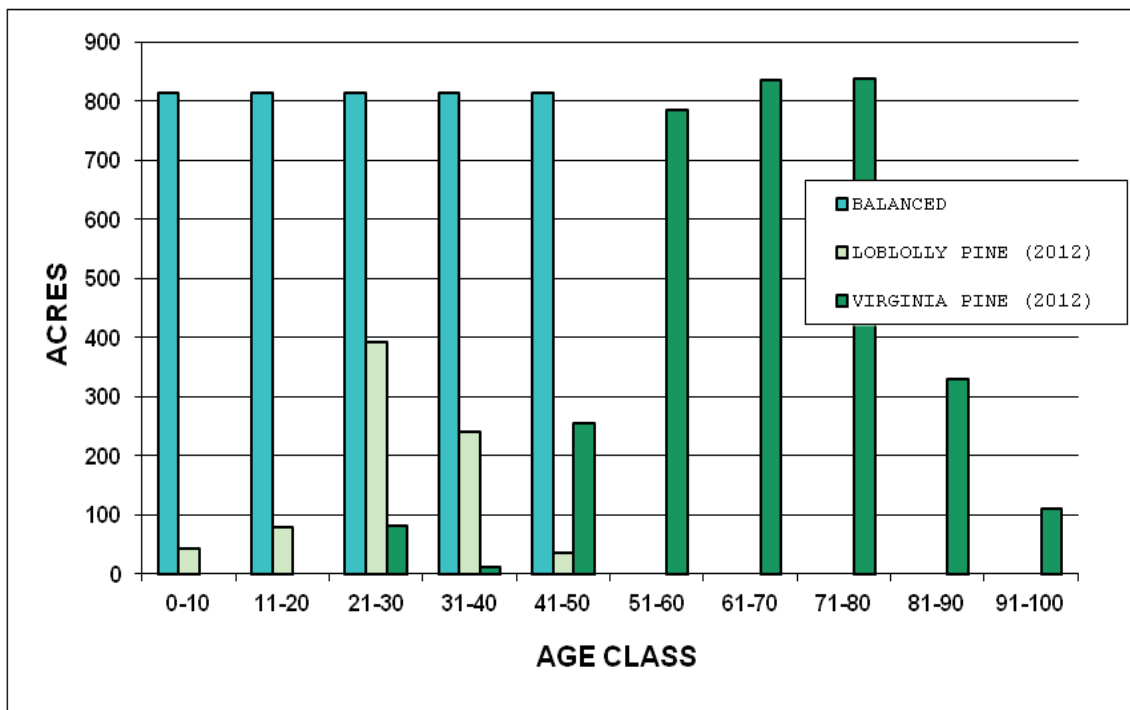


Figure 5-5. Pine acreages by 10-year age class for Compartments 36-65.

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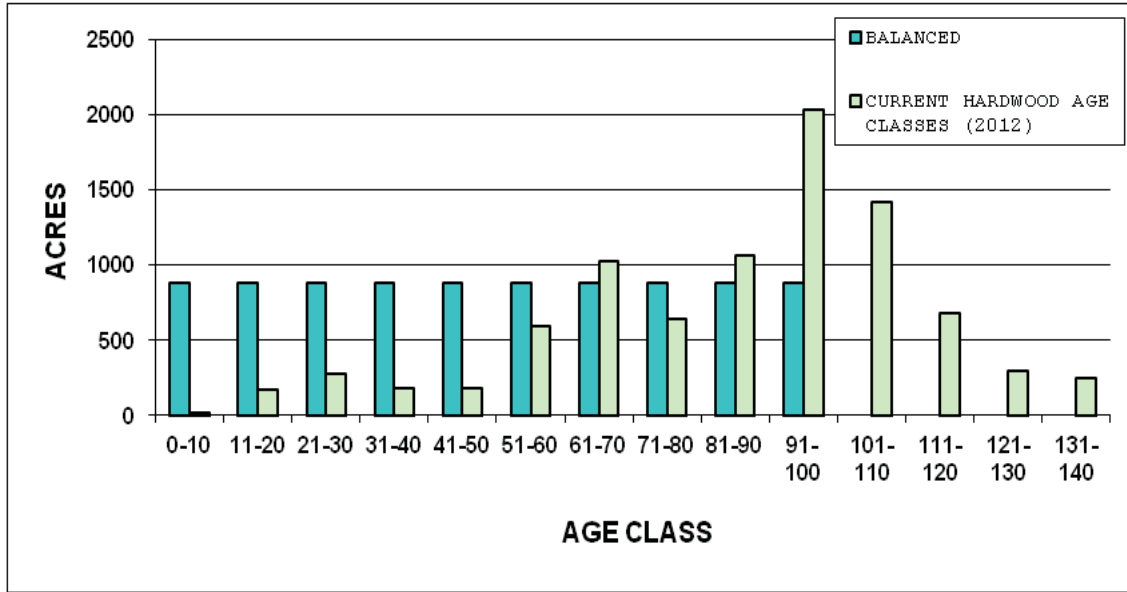


Figure 5-6. Acreages of hardwoods by 10-year age class for Compartments 36-65.

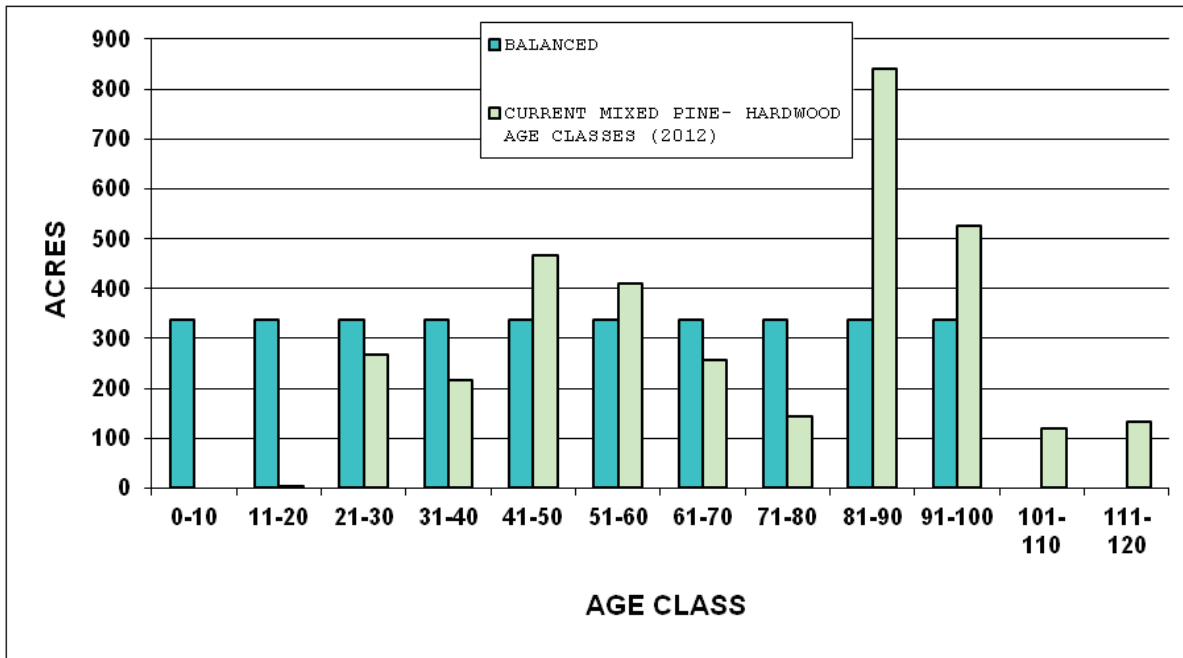


Figure 5-7. Acreages of mixed pine/hardwood by 10-year age class for Compartments 36-65.

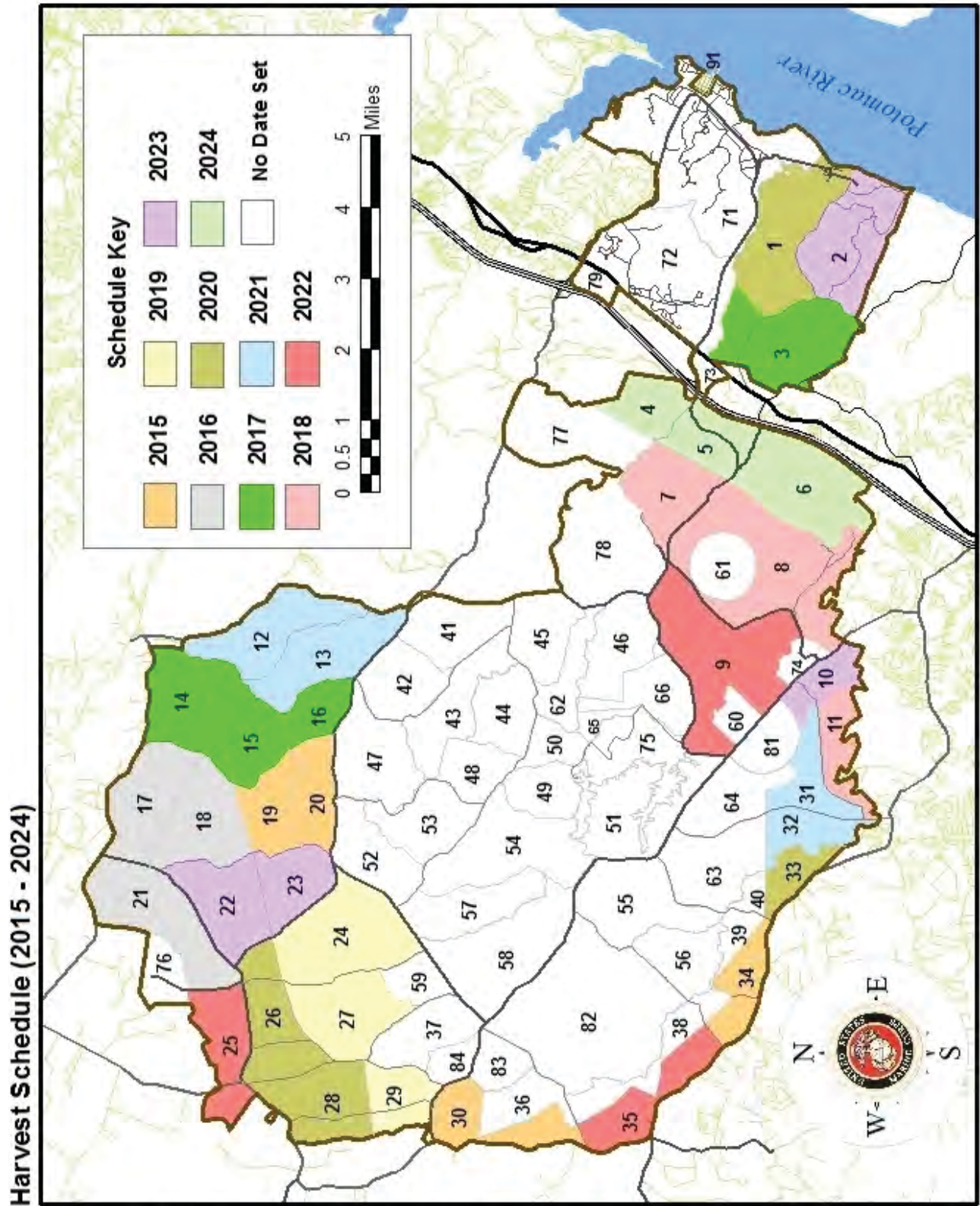


Figure 5-8 Harvesting Schedule (2015 - 2024)



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## CHAPTER 5

### FOREST RESOURCES

#### SECTION 4: SILVICULTURE

5400. DEFINITION. "Silviculture" is defined by the Society of American Foresters as "the science and art of cultivating forest crops...the theory and practice of controlling the establishment, composition and growth of forests". The immediate foundation of silviculture is silvics, which is the study of the growth and development of individual tree species. In addition to silvics, the practice of silviculture demands knowledge of related disciplines such as ecology, plant physiology and pathology, entomology, hydrology, and soil science. Silvicultural practices will be designed to achieve the forest management objectives identified in paragraph 5102.

5401. MCBQ SILVICULTURAL HISTORY. Since the beginning of professional forest management at MCBQ in 1962, several types of silvicultural practices have been applied to forest stands. Pine stands were the major emphases of management, primarily because of the abundance of overmature stands in poor condition. A limited amount of hardwood stands were occasionally harvested, although the importance of doing so was limited by the absence of perceived threats to hardwoods at the time, and available staffing. Beginning in 1991, the MCBQ Forestry program began more intensive hardwood management, primarily because of the effects of the gypsy moth. Regardless of this influence, the move toward more intensive hardwood management was appropriate due to the large acreages of hardwood stands that were beyond rotation age, and exhibiting poor health. Hardwood acreages have historically been much higher than conifer acreages at MCBQ by a ratio of roughly two to one. Hardwood management is more complex, compared to conifers, because of the larger number of hardwood species that usually grow in association. Hence, as focus increased on hardwood management, the silvicultural management decisions at MCBQ have become increasingly difficult due to varying and conflicting species requirements.

#### 5402. SILVICULTURAL GUIDELINES

1. The application of silviculture involves the development of a "silvicultural prescription" for an individual forest stand,

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which is the basic management unit. All forest stands within a given forest compartment are analyzed for required silvicultural treatments. Once the best treatments are selected to obtain the desired management objectives, a prescription is written for the stand outlining how to apply the necessary treatments. The treatments may all occur at one time or be spread out over 10 to 20 years, or more. Silvicultural prescriptions follow the same 10-year evaluation schedule used for sustainable annual harvesting within compartments (see paragraph 5306).

2. An analysis of forest stands within a scheduled compartment is accomplished by reviewing existing stand inventory data and conducting a field examination. Silvicultural prescriptions are then developed by the forester in concert with established allowable harvest levels and other management objectives and guidelines. These prescriptions will incorporate provisions for maintaining and improving forest health conditions; long-term sustainability of forest resources; current and projected land uses; diversity of plant and animal communities; the balance of age classes within forest compartments; and the spatial distribution of harvests. Silvicultural prescriptions will also incorporate measures to prevent negative impacts to soil and water resources, habitat for animal and plant communities, and aesthetic qualities of the forest. To achieve forest management objectives, silvicultural practices will attempt to:

a. Maintain or improve forest characteristics for the primary purpose of military training, and when not in conflict with military training, for consumptive and non-consumptive uses of the forest resource for the public.

b. Control forest stand structure (shape, size, position, etc.).

c. Control tree species composition (desired mixes of tree species in a forest stand).

d. Optimize tree stocking (number of trees per acre).

e. Prevent or minimize effects to trees from damaging agents (insects, disease, fire, wind, ice, animal, etc.).

f. Preserve site qualities of legally protected, unique, or otherwise valued resources, such as historical, soil, water, plant, animal, visual, and recreational.

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3. Silvicultural prescriptions must evaluate a number of factors, including the required treatments of the forest stand, how these treatments will affect the ecosystem, the logistical requirements for implementing these treatments, the availability of personnel and resources, and the associated costs of implementation. The proposed actions in a silvicultural prescription must be complementary to the military mission and other known land uses. Complex silvicultural prescriptions require input from a variety of base military and civilian personnel.

4. The cost of forest management operations, including salaries, are ultimately funded through the sale of forest products. All silvicultural prescriptions must be economically viable, meaning that costs associated with implementing silvicultural actions are not expected to exceed the income derived from the sale of forest products for any fiscal year.

### 5403. SILVICULTURAL SYSTEMS

#### 1. Definition

a. A "silvicultural system" consists of the methods chosen for site preparation, reforestation, various intermediate treatments (e.g., thinning), and the final regeneration harvest at the end of one growing cycle. Harvest methods within a silvicultural system are categorized as either promoting new forest stands (regeneration harvests) or are intended to maintain vigor and improve composition and structure of existing stands (thinnings or other intermediate treatments). The primary component of a silvicultural system is the method of regeneration harvest. In fact, silvicultural systems are sometimes identified simply by the names of the regeneration harvest methods, but these do not technically define entire silvicultural systems.

b. Silvicultural systems are generally divided into two types depending on how the timber resource is to be regulated and maintained over time. Even-aged silvicultural systems include the regeneration harvest methods of clearcut, seed-tree, and shelterwood which are intended to produce stands of trees which are roughly equal in age, whether or not they are equal in size. Uneven-aged silvicultural systems include the regeneration harvest methods of single-tree and group selection intended to create stands of trees which vary in both age and size. Silvicultural systems begin with one or more of these

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five regeneration harvest methods; however, various applications of these methods are utilized. Specific applications vary the harvesting in terms of intensity, pattern, and selection of species targeted for removal, based on the existing stand conditions and management objectives. The selection of a harvest method, or silvicultural system is primarily influenced by tree species characteristics, such as tolerance to shade, susceptibility to windthrow, adaptability to soil and moisture conditions, biological and economical age of maturity, seed production and dispersal, tolerance to fire, and vulnerability to insects and disease.

5404. PRIMARY SILVICULTURAL SYSTEMS AT MCBQ. This Section briefly describes the most common silvicultural systems anticipated for use at MCBQ during the term of this Integrated Natural Resources Management Plan. Slight deviations from these systems may occur as necessary, particularly in the timing of intermediate treatment applications. These treatments are applied as needed, which often do not correspond with the normal 10-year compartment entry period. Due to specialized equipment requirements, the forest products derived from intermediate treatments are normally marketed separately from those derived from regeneration harvests. Intermediate treatments are discussed in further detail in paragraph 5405. Some basic tenets that apply to all silvicultural systems include:

- Even-aged and uneven aged regeneration harvest units shall not normally exceed 40 acres. Average harvest unit size will be approximately 20 acres.
- Rotation ages shall be 50 years for pine stands, 100 years for hardwood stands other than yellow poplar, and 50 years for yellow poplar.
- Mixed pine/hardwood stands will be managed as one third pine, one third hardwood, and one third to remain as mixed pine/hardwood. The rotation ages for individual forest types will apply to the respective proportions managed as pine and hardwood within mixed stands. The remaining proportion managed to remain a mixed stand will be managed on 70-year rotation.
- Harvest units shall be irregular in shape to maximize edge for wildlife and for aesthetics.
- Den and cavity trees shall be retained for wildlife in harvested stands. In units that require prescribed burning, several snags (dead or nearly dead trees)

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which are well away from the edge of a harvest unit will also be retained.

1. Primary Conifer and Mixed Conifer/Hardwood Silvicultural Systems. The primary conifer forest type at MCBQ is Virginia pine. Loblolly and shortleaf pines are minor conifer forest types. The mixed Virginia pine/oak forest type (SAF 78) (Eyre 1980) is transitional between Virginia pine and the eventual climax forest, composed of oaks, other hardwoods and Virginia pine. Due to the vast difference in rotation ages, (50 for pine and 100 for hardwood) these mixed stands are extremely difficult to maintain and manage as mixed pine/hardwood stands. Thus, where possible, mixed stands will be converted to either pure pine or pure hardwood stands, depending on the relative percentage of distribution within the mixed stand. Mixed stands with 60% or more of the basal area in pine are relatively easy to convert to pure pine types. Likewise, mixed stands that contain 60% or greater hardwood basal area are relatively easy to convert to pure hardwood types. Conversion of mixed pine/hardwood stands to either pure hardwood or pure pine types will be promoted when these percentages exist. Mixed pine/hardwood stands which contain roughly 50% pine and 50% hardwood basal area (range of 41% to 59%), are difficult to convert to either pine or hardwood and will continue to be managed as mixed pine/hardwood stands on a 70 year rotation. Maintaining mixed pine/hardwood stands will perpetuate a component of the naturally occurring mixed pine/hardwood type, thereby maintaining biodiversity of forest ecosystems without complicating overall forest management.

a. System A: Virginia Pine (SAF 79) & Pine/Hardwood Mix (SAF 78) Silvicultural Systems. Virginia pine forest types may be managed by clearcutting and converting to loblolly (SAF 81) or shortleaf pine (SAF 75). The objective is to maintain the acreage of pine timber types on MCBQ, but to convert to a more fire tolerant pine species due to the frequency and wide distribution of wildfires on the Base. Loblolly and shortleaf pines also are better timber producing species, are more easily thinned to control the stocking, and have a minor impact to training from their density for a short period of time. The same system will be followed for mixed pine/hardwood (SAF 78) forest types, which have 60% or greater pine basal area. For both Virginia pine and mixed pine/hardwood forest types, the following procedures apply to the clearcut and conversion to loblolly and shortleaf pine forests:

- Clearcut harvest at age 50.

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- Site prepare by broadcast burn or mechanical piling and burning.
- Plant loblolly or shortleaf pine on 10' x 10' or 12' x 12' spacing.
- Conduct survival and competition surveys, and replant or release trees to the desired stocking and composition.
- Prescribe burn beginning at periodic intervals thereafter, not more than every ten years.
- Thin at approximate ages 20 and 40 (2 times) according to an appropriate stocking guide.
- Regenerate by clearcut or seed-tree harvest at age 50.

b. System B: Virginia Pine (SAF 79) & Pine/Hardwood Mix (SAF 78) Silvicultural Systems. Virginia pine forest types may also be managed by clearcutting and allowing natural regeneration to Virginia Pine (SAF 79). Where appropriate, the objective is to maintain a natural component of the native Virginia pine type. Primary applications of this system include: minimizing the size of contiguous areas planted with loblolly and shortleaf pine under other silvicultural systems, and minimizing the consequential fuel loading of loblolly or shortleaf pine needles in certain areas of the Base, such as the Base perimeter or around developed facilities. A component of the Virginia pine type should be maintained in portions of most compartments; however, it should be used judiciously in the appropriate areas and circumstances. For example, natural regeneration of Virginia pine results in dense thickets that normally remain as such, for up to 20 or more years. These stands are not conducive to training in most cases, thus the impacts to training from this system should be carefully evaluated prior to selection. The same system will be followed for mixed pine/hardwood forest types (SAF 78) having 60% or greater pine basal area. For both Virginia pine and mixed pine/hardwood forest types, the following procedures apply to the clearcut and natural regeneration of Virginia pine:

- Clearcut or seed-tree harvest at age 50.
- Allow natural regeneration. Require tree-length skidding in contracts to ensure that all slash is brought to landing. This eliminates the requirement for broadcast burning in the unit, which destroys pine seeds in the litter layer.

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- Conduct regeneration surveys early (1st and 2nd year). If necessary, provide supplemental planting of genetically improved Virginia pine on 20' x 20' or wider spacing.
- Regenerate by clearcut or minimal seed-tree dispersion harvest at age 50.

c. System C: Virginia Pine/Hardwood Mix (SAF 78) Silvicultural Systems. These mixed forest types may be managed by using a removal harvest of Virginia pine and allowing a natural conversion to hardwood. This prescription is applied to mixed stands with hardwood basal area greater than 60%, recognizing that natural succession is more advanced in this stand since the greater component is hardwood. The pine component of this mixed stand would not normally survive through the 100 year hardwood rotation, so it is harvested. The following procedures apply to the harvesting Virginia pine and allowing natural conversion to hardwood:

- Thin at age 50. Remove Virginia pine and all poor formed, suppressed, and otherwise undesirable hardwoods.
- Natural regeneration of Virginia pine will occur in some openings where existing pine is removed. However, reproduction will favor species with tolerance to shade, and a two-aged stand will develop until final harvest.
- Shelterwood or other even-aged regeneration harvest of hardwoods at age 100.

d. System D: Virginia Pine/Hardwood Mix (SAF 78) Silvicultural System. Near equal distribution Virginia pine/hardwood mix forest types may be clearcut harvested and allowed to regenerate again as Virginia pine/hardwood mix (SAF 78). This system recognizes the difficulty in converting a stand that is less than 60% pine or 60% hardwood to a pure type of either component. Mixed pine/hardwood stands are very difficult to manage on long rotations (100 years) due to the short life span of Virginia pine; however, a 70 year rotation age for clearcutting will maintain a stand of similar species composition through regeneration. The following procedures apply to the clearcut and natural regeneration of Virginia pine/hardwood mix forest types:

- Clearcut harvest at age 70.



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- Allow natural regeneration. Require tree-length skidding in contracts to ensure that all slash is brought to landing. This eliminates the requirement for broadcast burning in the unit, which destroys hardwood and pine seeds in the litter layer.
- Thin to reduce basal area at age 40-50, if necessary and feasible.
- Clearcut harvest at age 70.

### 2. Primary Hardwood Silvicultural Systems

a. System A: Shelterwood Harvest (Normal). May be applied to hardwood stands where the desired regeneration is hardwood with high to intermediate shade tolerance. Intermediate shade tolerant species for this silvicultural system include oak species, such as black, white, chestnut, and northern red oaks. Other species that will also benefit include hickory, beech, blackgum, and red maple. The system may also be utilized for regenerating stands with slightly less shade tolerant species, as long as the harvest ensures that the remaining trees do not create a heavy shade canopy, and are removed as soon as the site is fully occupied by the desired regeneration. The following procedures apply to the shelterwood harvest and regeneration of intermediate to high shade tolerant species:

- Apply seed cut of shelterwood system at age 100. Select appropriate basal area of residual trees to favor desired species regeneration requirements.
- Conduct regeneration/stocking survey 5-8 years after seed cut. If regeneration is adequate, apply removal harvest of residual "shelter" trees at 10 years after seed cut. If regeneration is inadequate, wait 5-8 years and reevaluate.
- Adjust stocking and release crop trees using a pre-commercial thinning by age 20, if necessary.
- Apply free thinnings at ages 50 and 80.
- Apply seed cut of shelterwood system at age 100.

b. System B: Shelterwood Harvest With Emphasis on Gypsy Moth Defoliation Risk Reduction. This system can be applied to stands which have a relatively pure component of species which are highly susceptible to gypsy moth infestations (SAF 16, 44, 52, 53, 59). The objective is to reduce the defoliation

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potential by gypsy moths over the long term by increasing species diversity in these stands. Species that are less susceptible to defoliation and provide mast for wildlife will be increased in the entire stand through harvesting, regeneration, and thinning applications.

- Apply seed cut of shelterwood system at age 100. Promote species diversity by increasing the percentage of tree species less preferred by gypsy moths throughout the entire stand. Tree species yellow poplar, hickory, walnut, ash, beech, blackgum, and pine. Also leave dispersed healthy oaks with dominant crown positions for seed production.
- Aerial spray or otherwise control gypsy moths (if required) to ensure survival of residual trees until regeneration is adequate.
- Conduct regeneration/stocking survey 5-8 years after seed cut. If regeneration is adequate, apply removal harvest of residual "shelter" trees at 10 years after cut. If regeneration is inadequate, wait 5-8 years and reevaluate.
- Adjust stocking and species composition through Application of a pre-commercial thinning by age 20.
- Apply sanitation thinnings at 50 and 80 years to further reduce gypsy moth susceptibility.
- Apply seed cut of shelterwood system at age 100.

One variation to this basic procedure is to leave the residual seed/shelter trees, even after the stand is adequately stocked. This retains some large trees on the site for wildlife and aesthetics. This application, however, should leave a minimal number of seed trees to avoid suppressing regeneration and also minimize losses from leaving the most valuable timber trees on the site. Another slight variation entails inter-planting some gypsy moth resistant species such as pine, ash, or yellow poplar to diversify the stand. On poor, dry sites where regeneration is difficult, and a single non-resistant species such as chestnut oak may dominate, pine should be inter-planted to maintain a mixed stand throughout the rotation.

c. System C: Single Tree or Group Overstory Retention Harvest. This silvicultural system may be applied to hardwood stands where maintenance of a continuous cover of mature trees is necessary for military training, to meet certain wildlife management objectives, or where heavier types of harvests are

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visually unacceptable. There are two types of harvest associated with this silvicultural system: single tree or group harvesting. Both methods are an attempt to convert even-aged stands into uneven-aged stands. Single tree harvesting is generally ineffective for areas desiring reproduction of oaks, or anything other than the most shade tolerant species. Group harvesting can promote regeneration of most hardwood species, including oaks and less shade tolerant species as long as the harvested group of trees is .25 to .5 acres in size. Although complex and technically difficult to administer, these applications are effective where applicable. With either of these harvest types, age class distribution is manipulated within the stand, as opposed to over the entire forest compartment with the other methods. The following procedures apply to either or both the single tree and group overstory retention harvesting as indicated:

- Apply single tree (age 100) or group (patches/strips) selection harvest at age 80-100. In single tree system, harvest trees in distinct size (or age) classes according to an appropriate stocking index designed for maintaining uneven-aged structure. In group selection system, harvest circular patches or rectangular strips of trees, well distributed throughout the entire stand. Harvest approximately 20% of the total stand area.
- Allow to naturally regenerate.
- Adjust stocking within the regenerating areas by crop tree release, as necessary.
- Repeat the above steps every 20 years.

d. System D: Streamside Management Zone (SMZ) Single Tree Selective Harvest Silvicultural Systems. This procedure will be applied within SMZ stands or portions of stands (primarily SAF type 57). The SMZ is approximately 50-75 feet wide on each side of perennial or intermittent streams. The widths of the SMZ may vary, depending on slope, erosion potential, drainage, and the type of vegetation present. SMZs will be managed to maintain specific tree species that are best suited to the moisture conditions on individual sites, fulfill wildlife needs and satisfy timber management objectives. Species such as yellow poplar, beech, green ash, and blackgum should be favored as the streamside residual trees under this silvicultural system. Upland oaks and hickories should be maintained on drier portions

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of the SMZ. The following procedures apply to the SMZ single tree selective harvesting:

- Harvest 20 percent of the basal area in these areas using a single tree selection harvest. Remove a few dominant trees as well as off-site, diseased, poorly formed or otherwise undesirable trees. Retain den, cavity, and large diameter trees, as recommended to meet fish and wildlife management objectives in this zone.
- Allow to naturally regenerate.
- Repeat single tree selection harvest, but not more frequently than every 20 years.

5405. INTERMEDIATE TREATMENTS. "Intermediate treatments" are defined as those measures taken after stand establishment, which are intended to enhance the growth, vigor, and value of the selected crop trees. They may also be referred to as "cultural treatments" or "timber stand improvements". This section provides a brief description of the types of intermediate treatments anticipated for use at MCBQ.

1. Release. This is a treatment to free desirable young trees from the competition of undesirable trees through various means, including chainsaw, power brush cutter, brush axe, chemicals, heavy equipment, and prescribed burning. Chemical methods include aerial spraying, backpack spraying, hand application of pelletized chemicals, and tree injection. Hand labor methods include gas-powered chainsaw or brush cutter, and brush axe. Mechanical release using heavy equipment is accomplished through use of bulldozers with drum-chopper attachments, heavy duty bush hogs, and large cutter head systems which mulch woody stems up to six inches in diameter. Prescribed burning can be cost-effective for restraining the growth of competing vegetation, while enhancing the quality of wildlife habitat. It cannot be used, however, until the desired species have developed bark thick enough to provide fire resistance. Several of these methods have been tried over the years at MCBQ with varying degrees of success and expense. Of the methods mentioned, the ones most likely to be used during the term of this plan are chainsaw/brush cutter, prescribed burning, and both aerial and hand application of chemicals. For the chemical application methods, a site specific environmental assessment will be written to address impacts of these actions on a case-by-case basis. Additionally, chemical applications in or near

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waterbodies may require a Virginia Pollutant Discharge Elimination System permit.

2. Thinnings. Thinnings are applied to immature stands to increase vigor of remaining trees, to control species composition, and to regulate density of stands. They are the most effective means of manipulating stand composition and stocking, while providing valued raw materials of pulpwood, firewood, and sawtimber. Thinnings can be applied "commercially" or "pre-commercially", referring to the merchantability of the trees being cut. Under commercial thinning, the cost of doing the work is less than the value of the trees, resulting in an income generating sale contract. Under pre-commercial thinning, the trees are typically left on the site and the work is paid for by the Government under a service contract. While the objectives of thinning can be achieved pre-commercially, it is wasteful, cost-prohibitive, and can add large amounts of woody fuels that increase wildfire potential. For these reasons, thinnings will be accomplished almost exclusively on a commercial basis at MCBQ. The primary thinning methods are low, crown, selection, and geometric. Free thinning is a combination of several of these methods applied simultaneously. Sanitation and salvage thinnings recover some value from the trees, but are undertaken in stands which have been damaged by insects, disease, or fire, for the primary purposes of reducing the potential spread of insects and disease. Due to the complexity of the thinning methods listed above, they have only been mentioned, rather than providing detailed descriptions of each.

3. Pruning. Pruning for forest management purposes is labor intensive and expensive, and therefore difficult to justify. It is regarded as a special treatment to improve form and value of selected quality trees. Pruning has been applied primarily to black walnut and fruit trees around old home sites, through the use of MCBQ Natural Resources and Environmental Affairs conservation volunteer labor or Marine crews. It is anticipated that this type of work will continue on a small scale through the use of volunteer labor. Pruning can be used to improve aesthetic quality and site visibility (for security purposes) in developed areas that are adjacent to woodlands. If pruning was necessary on a large scale, this type of work would be performed through a service contract, as it is not a funded forest management function.

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### 5406. SITE PREPARATION AND REFORESTATION

1. Site Preparation. Site preparation is the term for cleaning up previously harvested areas. It reduces logging debris to improve aesthetics, decrease impediments for foot travel through woodlands by military and recreational users, diminish the sites wildfire potential, and to eliminate or impede existing seed sources and advanced reproduction on a site. The principal obstacles to establishing regeneration are residual slash from harvesting operations, and existing vegetation on the site. The types of site preparation commonly used under these circumstances include various mechanical, chemical, and prescribed burning methods. The amount of preparation required will vary and may only be accurately determined after the harvest operation is complete. However, the expected form of site preparation will be specified in the site specific stand prescriptions, which are developed prior to harvesting. Treatment selection will be based on effectiveness, economics, and environmental impacts. Greater emphasis on utilization of the timber and woody debris will be stressed in future logging contracts. This should help minimize the labor and risks involved with site treatments after harvest. The following site preparation treatments are proposed for use at MCBQ:

a. Prescribed Burning. Harvested areas may be either broadcast burned or spot burned. Broadcast burning is done after a bulldozer exposes a narrow trail of bare soil encircling the unit. This method can be applied when there is a relatively continuous woody fuel layer to carry it. Spot burning is applied where small scattered piles of woody fuels exist which would not carry a broadcast burn. The typical application of broadcast burns is in pine stands that are clearcut, where conversion to another pine species requires a reduction of existing seed sources and competing vegetation. This may also be used in hardwood stands to reduce the amount of woody debris left after a logging operation. All prescribed burns are conducted under a burn plan, as described in paragraph 5602.

b. Mechanical Piling. This site preparation treatment includes piling of logging debris and undesirable standing trees by bulldozer. The bulldozer should ideally be fitted with a root rake blade for this type of operation; but a straight blade can be used provided the operator is experienced enough to not displace topsoil. The resulting piles should be relatively free of soil. The resulting piles are normally burned prior to planting to better utilize the site and to clean up. Occasionally these piles may be left unburned as they provide

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habitat for some wildlife species and often create islands of vegetation different from that of the surrounding site.

c. Felling of Residuals. This site preparation treatment requires either hand labor using a chainsaw or a bulldozer to cut or push over the residual trees on a site following a clearcut harvest. These methods remove undesirable advanced reproduction and seed sources from the site to be regenerated. They are usually employed where there are sufficient residual stems to restrict growth of the desired reproduction. This method is less site disturbing than mechanical piling, and is appropriate for sites on which minimal site preparation is needed. However, prescribed burning may also be needed after felling if a more thorough level of site preparation is desired.

2. Reforestation. As forest stands approach maturity they lose vigor and become less healthy. By this time, they are nearing the end of the rotation age (see paragraph 5303). Provisions must be made for the regeneration or "reforestation" of these stands prior to harvesting. Site and species requirements for regeneration are carefully evaluated. The regeneration requirements determine the type of harvest system to be applied. Reforestation will be accomplished by one of two methods: natural (from seed, stump, or root sprouts) or artificial (by planting). These methods are discussed below.

### a. Natural Regeneration

(1) This is the process of obtaining a new forest stand from seed trees left on the site, seed in the litter layer, and/or from stump and root sprouts from trees removed in the harvest operation. Natural regeneration of hardwood (deciduous) trees is achieved by the seed tree, single-tree selection, shelterwood, or group selection regeneration harvest methods. The single tree selection, shelterwood (at 50-65 residual basal area), and group selection (less than .25 acres) methods encourage the regeneration of tree species that are shade tolerant to moderately shade tolerant. Most of the MCBQ conifer species are shade intolerant, and require the clearcut and seed-tree systems for successful natural regeneration.

(2) The advantage of natural regeneration is that it is relatively inexpensive to implement initially. However, natural regeneration is difficult to control. The number of regenerated seedlings can be as high as 10,000-30,000 per acre. Reducing the seedling density and releasing preferred crop trees (see paragraph 5405) can be very laborious and costly. Early



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attempts to perform crop tree release are usually unsuccessful, because the cut vegetation sprouts back vigorously and quickly returns to the previous conditions. Normally it is best to wait until about age 15-25 to perform these treatments. By this time, natural competition will have reduced the number of stems per acre by 75% or more. Prescribed burning may supplement certain applications; however this method is selective toward fire tolerant species and may not provide sufficient species diversity or preferred crop tree retainment. This burning method deserves further evaluation to determine its applicability for the variety of tree species at MCBQ.

### b. Planting

(1) Seedlings are planted on sites where certain tree species cannot be regenerated naturally, where a conversion to another species is desired, or where additional supplemental regeneration is required to provide diversity or assure the establishment of adequate regeneration. Planting is normally performed by hand using bare-rooted seedlings. Planting is normally employed in Virginia pine stands that are clearcut, since Virginia pine cannot be selectively harvested and conversion to loblolly or shortleaf pine is preferred in most cases. Table 5-9 details the reforestation by planting efforts for the 18-year period 1988-2013. During this period, approximately 1,138,484 seedlings were planted on 2,225 acres.

(2) Planting has a considerable advantage over natural regeneration, in that stand density can be better controlled by manipulating tree spacing during planting. Control over species composition of the new forest stand is also more easily maintained via planting as opposed to natural regeneration. Additionally, most tree nurseries now offer pine seedlings of superior genetic quality such that growth and form of these trees over natural ones are improved by as much as 25-30%. These seedlings usually grow faster than competing vegetation and quickly establish dominance on the site.

(3) Currently, the technology for producing hardwood seedlings of commercial timber species for planting is not as advanced as conifers. This is primarily because conifers are hardier and better adapted to surviving on a wider variety of sites. Thus, while some success has been achieved with planting green ash seedlings at MCBQ, attempts to plant white and red oaks were unsuccessful. Due to the limited success and high cost associated with planting hardwoods, natural regeneration will be the primary means for regenerating hardwoods.

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(4) Planting is usually accomplished by a service contract issued through the Contracting Officer (CO), Public Works Branch.



Contract reforestation workers planting loblolly pine seedlings with hoe-dad tools after a timber harvest in Training Area 16D.

### 5407. REFERENCES

Eyre, F. H., Ed., 1980. Forest Cover Types of the United States and Canada. Society of American Foresters. 148 pp.

Smith, D. M. 1986. The Practice of Silviculture. John Wiley and Sons, New York. 527 pp.

Wenger, Karl F. 1984. Forestry Handbook. John Wiley and Sons, New York. 414 pp.

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Various silvicultural practices visible in this photo, including clearcut (center foreground), group selection (right of clearcut), strip shelterwood (left of clearcut), and single-tree selection cut (northern edge of powerline).

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TABLE 5-9. REFORESTATION AT MCB QUANTICO (1988-2013)

<b>YEAR PLANTED</b>	<b>ACRES PLANTED</b>	<b># TREES PLANTED</b>
1988	130	76,000
1989	114	67,000
1990	245	132,300
1991	171	95,000
1992	233	127,000
1993	234	123,500
1994	122	52,000
1995	0	0
1996	102	43,400
1997	102	55,000
1998	0	0
1999	108	59,000
2000	102	50,500
2001	0	0
2002	95	54,000
2003	0	0
2004	0	0
2005	69	38,000
2006	86	46,784
2007	117	47,000
2008	36	16,000
2009	0	0
2010	44	19,000
2011	62	19,000
2012	53	18,000
2013	0	0
<b>SUM</b>	<b>2,225</b>	<b>1,138,484</b>
<b>AVG</b>	<b>86 ac/yr</b>	<b>44,788/yr</b>

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## CHAPTER 5

### FOREST RESOURCES

#### SECTION 5: SALE OF FOREST PRODUCTS

##### 5500. INTRODUCTION

1. Management of the forest resource is accomplished through the application of stand treatments defined by silvicultural prescriptions (paragraph 5402). Currently, these treatments can only be implemented if they generate sufficient revenues to be cost effective and support staffing. Consequently, forest management decisions must be assessed for profitability, which sometimes can be viewed as conflicting with higher land management principles. Hopefully future funding for forest and shade tree management will be less dependent on timber sale revenue.

2. The application of silvicultural treatments is achieved primarily through timber harvesting designed to maximize utilization (and income) of forest products removed. At MCBQ these forest products include firewood, pulpwood and sawtimber of both pine and hardwood tree species, and some veneer timber. Forest products are marketed through contracted timber sales advertised and awarded through sealed bid to the highest bidder.

##### 5501. LOCAL ECONOMY AND MARKETS

1. A number of factors influence the marketing of MCBQ's forest products, which are referred to as standing timber (or stumpage). The single most important one is demand. Despite the fact that MCBQ is surrounded by heavily developed areas, the demand for timber products is relatively strong and stable. There are several mills located within the marketing area that produce somewhat diverse products using generally similar forest products. The common use of forest products creates a slightly competitive market among local forest product providers. The timber supply from surrounding areas south and west of the Base currently are at sufficient levels such that MCBQ does not command top dollar for its products. Prices received for stumpage are considered to be slightly above average.

2. Economic drivers often dictate the price that MCBQ can demand for its products. Since about 2003, rapid development in



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the entire area surrounding MCBQ has caused timber prices to decrease slightly, due to the large amount of cheaper timber available from clearing to accommodate the development. The recession of 2007-2008 also resulted in very low prices for pine products, while at the same time greatly increased prices for hardwood sawtimber, which have remained through 2013. Local demand is also balanced by International demand for forest products, which tends to raise the price of timber. Also, periodic large scale catastrophes, such as Hurricane Sandy, also impact the demand and thus prices within the local timber market. Over the long term, MCBQ anticipates that some of the recent economic drivers will stabilize and that prices will generally increase due to the depletion of the local timber supply available through heavy development in the surrounding areas. International demand, recessions and catastrophic needs on the other hand will remain variable, and the impact on pricing is difficult to predict. Generally speaking, MCBQ has been able to market its timber fairly consistently over the years despite the impacts from economic fluctuations.

3. Environmental factors also have the tendency to impact MCBQ's forest product revenues. Problems were encountered during 1993 and 1994, when there was an excessive amount of gypsy moth killed timber on the local market. Due to the widespread abundant supply of this type of timber, it became difficult to sell except at low prices. Fortunately, all dead timber was soon liquidated through timber sale and firewood contracts. Also, two military-specific factors have sometimes adversely affected the Base's ability to market timber:

a. Real/Perceived Metal Contamination. Forest products contaminated by metal from military operations (e.g., shrapnel) can destroy milling equipment such as head saws, chipping saws, and firewood processors. This becomes very expensive, and mills are reluctant to bid on timber if they presume it to be contaminated with metal pieces. This factor has been largely mitigated at MCBQ through better identification of the areas of possible contamination, thereby dispelling of the myth among local mills that all trees at MCBQ contain metal. MCBQ has also been able to mitigate the impacts of metal contamination through replacing of timber with like quantities and quality in uncontaminated areas.

b. Cessation of Harvesting to Accommodate Training. Contract harvesting operations have occasionally been halted because of certain military training exercises. Contractors cannot afford to have their equipment sitting idle, and may be

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reluctant to establish a contract with MCBQ if there is a risk that they may be forced to shut down operations, even infrequently. In particular, the "Limited Access Management Compartments Zone" (Compartments 36-65), (Figure 5-1) is one such area where contracting services may be impacted by this factor, due to the frequency of training that could hinder contractor operations (e.g., range firing or unexploded ordnance impact areas). Training exercises in the remaining areas of the Base are more compatible with contract timber harvesting operations. The National Environmental Policy Act (NEPA) process helps ensure that advanced planning and coordination with the Operations Division will minimize the potential impacts to contractors in these areas, and conflicts have been averted.

4. Regardless of the expected timber sales revenue, the following sound marketing practices for MCBQ's forest products are followed to ensure accurate tracking and adjustment of MCBQ's sales processes:

a. Advertise timber sale contracts to all interested bidders to promote maximum competition. Allow adequate time for sale area examination and contract review.

b. Administer contracts equitably and consistently.

c. Conduct periodic questionnaire surveys to update the list of potential bidders to improve marketability of forest products, and to identify new product markets. Adjust timber sale contract size, pay units, species and product types, to meet market demand and conditions.

d. Extend advertisement into further market areas for high value products, such as veneer and grade sawlogs.

e. Maintain at least a two-year inventory of marketable timber sales with diverse products to enable advertisements to coincide with optimal market demands.

### 5502. TIMBER SALE PLANNING

1. Introduction. Forest management objectives and annual sustainable harvesting requirements were established in Sections 1 and 3 of this Chapter. The sequence of forest compartments to be harvested from 2015 to 2024 was also identified (paragraph 5306). Silvicultural examinations will be conducted on scheduled forest compartments to evaluate individual forest



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stand conditions, and prescribe the necessary treatments to improve forest health, and achieve other multiple use forest management objectives. These silvicultural prescriptions are normally implemented through timber harvesting, which is accomplished through contracted timber sales. Considerable effort is required to fulfill the many tasks associated with planning a contract timber sale. This effort must be duplicated several times to fulfill the annual harvesting goals.

2. Definition. "Timber sale planning" is the process of identifying and scheduling the sequence of events and work necessary to achieve the annual harvest requirements.

3. Requirements. Development of the 10-year forest compartment harvesting schedule (paragraph 5306) is the first step in the timber sale planning process. Once established, annual and multi-year timber sale plans can be developed.

### a. Annual Timber Sale Plan

(1) The annual timber sale plan is developed for those forest compartments scheduled for harvest in a given year, using the 10-year planning process. It should be noted that review begins at least 2 years ahead of the scheduled harvest year, to allow adequate time for the completion of planning requirements. The annual timber sale plan should include the following:

- A list establishing the order of review for compartments scheduled for harvest.
- A quarterly schedule establishing dates for the completion of significant planning events (by compartment).
- A quarterly schedule showing the status of completion of significant planning events (by compartment).

(2) The annual timber sale plan is implemented by examination of each forest compartment scheduled for harvest, according to the established order of review. Timber sale proposals are then prepared for each compartment. Specific planning events necessary for the completion of a sale proposal are listed below:

- Assemble a timber sale planning file containing all available compartment information, maps, etc.
- Preliminary review of timber sale planning file data prior to field reconnaissance.

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- Conduct forest stand examinations to determine treatment requirements, and develop silvicultural prescriptions.
- Conduct additional field visits to evaluate specific site characteristics relative to timber sale layout and design requirements.
- Calculate the sustainable annual harvest requirements for the compartment based on area regulation method.
- Develop a timber sale harvest plan that achieves the sustainable annual harvest, includes adequate dispersion of harvest units, contains additional alternatives for varying harvest unit locations and treatments (where economically feasible), meets present and future forest management road access requirements, maintains environmental integrity, and satisfies all other forest management objectives.
- Provide the proposed harvest plan to Head, Fish/Wildlife and Agronomy Section, NREA Branch to obtain input for wildlife management consideration.
- Provide the proposal to The Basic School (TBS) and Range Management Branch to obtain input for military training resource considerations.
- Provide the proposal to NEPA personnel for review.
- Arrange for a project scoping meeting with all other applicable personnel.
- Develop NEPA documentation (an Environmental Assessment (EA) or Categorical Exclusion (CE) if Appropriate) for the project, based on environmental site analysis requirements and relevant issues identified in the scoping meeting. Include feasible alternatives.
- Present the NEPA documentation at the quarterly Environmental Impact Review Board (EIRB) meeting to obtain project approval.
- Obtain signature/approval of project on a Finding of No Significant Impact (FONSI) or Decision Memorandum (DM).
- Begin the timber sale preparation phase (Section 5504).

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b. Multiple Year Timber Sale Plan. Multiple year timber sale plans are formulated the same as annual plans, but cover a period of 3-5 years. Multiple year timber sales plans should be initiated a minimum of 2 years prior to the first year covered by the plan period to allow for completion of all events necessary for a timber sale proposal. These events include the items mentioned in 5503(3)(a)(2) (minimum of 4-6 months), the timber sale preparation phase (additional 6 months), seasonal surveys for small whorled pagonia (a threatened plant species, that can only be completed during a 1-2 month time frame in early summer), and any historical and archaeological surveys that may be required. The purpose for maintaining a three-year advance timber sale planning schedule is to provide a 1 to 2 year reserve inventory of packaged timber sale proposals. This will help to ensure continuity in maintaining the annual sustainable harvesting requirements, and provide predictable levels of receipts from the sale of forest products. It will also allow MCBQ to adjust advertising sales to coincide with market demands and increase revenue obtained from the sales.

### 5503. FOREST ACCESS ROADS

#### 1. Utilization

a. The roads and trails at MCBQ are used to provide routes of travel for military training, fire control, timber harvesting, other forest/wildlife/natural resources management activities, and dispersed recreational activities. These roads are vital to the accomplishment of the military and natural resources management missions. The current network of roads at MCBQ has been classified into four categories, including:

- Class I. Paved roads
- Class II. Improved Roads
- Class III. Semi-improved Roads
- Class IV. Unimproved Roads & Trails

b. Class I roads are smooth, paved or concrete surfaces. Class II includes roads that are well graveled and ditched. Class III includes dirt roads containing portions of graveled and un-graveled surfaces, with or without ditching. Class IV roads and trails contain no gravel, and are not routinely maintained, except for occasional clearing of vegetation by hand.

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c. Forest management activities such as thinnings, timber harvesting, forest pest management, and fire control are dependent on an adequate road system. The road requirements for fire control are discussed in Section 6, paragraph 5602. Timber harvesting requires a road system that will support, at a minimum, tractor trailer trucks for transporting logs and logging equipment to and from the harvest site. Generally Class I and II roads meet timber harvesting requirements, whereas Class III and IV roads usually do not.

### 2. Assessment of road requirements for timber harvesting

a. Necessary road adjustments/improvements are assessed in conjunction with timber sale planning within a forest compartment. The goal is to design an effective and economical transportation system that will satisfy present and future forest management and military requirements within a given forest compartment. Planning guidelines for achieving this goal are listed below.

- Determine the present and future road access requirements of the entire forest compartment to ensure that the minimal amount of road improvements, reconstruction, and new construction are constructed.
- Ensure direct access to harvest units adjacent to roads, with short, temporary entrances to loading decks for units adjacent to roads.
- Utilize existing skid trails when possible to avoid constructing temporary roads.
- Utilize existing roads and trails if possible.
- Any upgrades of existing roads or new construction should include design standards to ensure proper drainage, erosion control, water quality protection and minimal maintenance. Gates should be installed to control access.
- New construction requirements for planned road systems should be implemented incrementally at each 10-year entry period to distribute costs proportionately according to land area and timber values accessed.

b. These guidelines are designed to ensure that road improvements and new construction are kept to a minimum; but appropriate to support long term use. Road access requirements will be planned and coordinated with TBS, Operations Division,

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and the Facilities Maintenance Section (FMS), G-F, to ensure that mission requirements of all concerned activities are met.

3. Implementation. Road improvements and new road construction for timber harvest access are accomplished primarily by the Forestry Section, with additional support from Facilities Maintenance Section (FMS) when required. In order to ensure that road work is completed on schedule, implementation should be started at least 1 to 2 years in advance of the planned completion of the timber sale preparation.

### 5504. TIMBER SALE PREPARATION

1. Definition. "Timber sale preparation" is the process of implementing all layout and design features of the timber sale plan, including: the transportation system requirements; delineating harvest unit boundaries; determining harvest unit land area; marking timber for removal; determination of timber volumes; estimating sale value; and preparation and advertisement of the timber sale contract.

2. Requirements. The MCBQ Timber Sales Forester is responsible for completion of the tasks associated with timber sale preparation as designated by the timber sale plan. These tasks include; locating and painting sale boundaries, marking trees with paint (if necessary), tallying measurements of trees designated for harvesting as part of the timber cruise used to calculate sale volumes, flagging skid trails for the logging operation, avoiding designated sensitive areas such as SMZ's, archaeological or threatened species sites, and locating log loading decks for efficient operations. Road access requirements usually demand the longest time periods for completion because of weather influences that restrict activities. For this reason, it is important that road work be initiated as soon as possible after a timber sale plan has been approved. The average large timber sale requires approximately 6 months for completion of all sale preparations (including advertisement). Extensive guidance on timber sale preparation can be found in the Forestry Office "Timber Sale Preparation Manual."

### 5505. TIMBER SALE CONTRACTS

1. Purpose. Upon completion of all timber sale field preparation tasks described above, a timber sale contract is

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prepared and reviewed by an authorized Navy contracting officer. This contract is specifically written to ensure that the timber sale planning objectives are accomplished, and environmental integrity maintained. The contract includes specific penalties for deviation from its terms and requirements, and failure to complete contractual obligations.

2. Structure/Composition. The timber sale contract consists of three parts: General Terms and Conditions (standard clauses), Technical Specifications, and Sale Area Maps.

a. The "General Terms and Conditions" section of a sales contract contains standard or "boiler plate" clauses applicable according to the size of the contract and the equipment needed. For convenience, timber contracts are divided into two types, large and small sale contracts. This classification relates to the dollar value of the contract, and the type of equipment permitted under the contract. Large sale timber contracts include those sales with an estimated value greater than \$5,000. These contracts permit the contractor to utilize skidders and other heavy equipment for timber harvesting. Large sales provide the bulk of forest product revenues, and thus are the primary driver for when sustainable annual harvest requirements are applied to a compartment. These contracts contain more contract clauses and provisions (28), because of their more complex requirements. Small sale timber contracts include those sales with an estimated value less than \$5,000. Most of these contracts are issued for firewood sales of 5 to 30 cords (occasionally 31-100 cords). The types of equipment permitted to operate on these areas are usually limited to pickup trucks, or low impact skidding machinery such as a small tractor. Small timber contracts provide only a small amount of the total contract revenues received. There are 19 standard clauses that are common to all small dollar-value timber contracts.

b. The "Technical Specifications" section of a sales contract contains the information, conditions, and requirements that are unique to a given sale. This part contains clauses which describe the work to be done, the estimated species and product volumes, the method and amount of payment units, the merchantability specifications of the forest products included in the sale, descriptions of specific operational procedures to be followed to ensure environmental protection, and penalties for specific areas of non-compliance.

c. The "Sale area maps" section of a sales contract is usually included with the General Terms and Conditions, but are

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a separate essential component of the contract. Two maps are normally included: (1) a map identifying the general timber source location in relation to other surrounding features such as, roads and other recognizable landmarks; and (2) a map identifying the specific individual payment unit and cutting unit boundaries, usually on a topographic map.

3. Authority. Timber sale contracts are issued under the authority of a warranted Contracting Officer (CO) through the Department of the Navy, Naval Facilities Engineering Command Washington, Washington Navy Yard, D.C. All timber sales contracts are administered either by the CO or a designated Contracting Officer's Representative (COR). The CO is a Federal Government employee who has the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. A COR is a Federal Government employee(s) delegated by the CO who performs daily monitoring of contractor performance, serves as the overall project technical representative, and has oversight for the Technical Specifications (Section II of the timber sale contract). For timber sales purposes, the COR for timber sales contracts often consists of one or more individual(s) in the Forestry Section.

5506. EMERGENCY HARVESTING. Occasionally, forest areas are damaged by natural causes such as insects and diseases, fire, ice, snow, and wind. These agents usually cause rapid deterioration of the affected forest products, and consequently decrease product value. It becomes necessary to salvage harvest this timber as soon as possible to prevent a total loss of value and the spread of insects and diseases to surrounding healthy forest stands. If the timber is not cleaned up and marketed while it is salable, then the Base must bear the responsibility and expense of cleaning up these areas to render them suitable for training. As such, emergency harvesting in these circumstances requires special attention in two areas:

1. NEPA. Emergency harvesting projects must be evaluated through the NEPA process. Because of the short time requirements necessary to complete all tasks, it is essential that the NEPA process also be completed as quickly as possible.

2. Contracting. Federal contracting regulations allow some flexibility to expedite contracting procedures to accommodate emergency salvage harvesting requirements. Options for these situations include: (1) modifying active large timber contracts to include additional timber at the contract product prices, or



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at negotiated prices that are agreeable to the Government and the contractor; or (2) a new contract. New contracts require considerably more time in order to draft the contract, contact potential bidders, provide site visits, and solicit formal bids for the timber even in emergency circumstances (i.e., 2-3 weeks). Thus, where available, modifying existing large timber contracts is the preferred and most efficient method of addressing emergency harvesting needs.

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## CHAPTER 5

### FOREST RESOURCES

#### SECTION 6: FOREST PROTECTION

##### 5600. FOREST HEALTH

###### 1. Introduction

a. The heavily forested environment at MCBQ is a unique and important component of the overall Marine Corps training mission. Monitoring and maintaining forest health is vital to assuring that this mission component remains viable. This requires a long term commitment of personnel and resources to properly identify and manage forest health related problems.

b. A healthy forest is neither static nor one without dead and dying trees. Forests are constantly changing as a result of natural forces, such as insects, diseases, fire, and competition for nutrients and other life sustaining resources. Severe climatic forces such as frost, ice, drought, and wind can add additional stresses to the forest and affect forest health. Human activities such as training, recreation, and forest management can also have a direct or indirect affect on forest health conditions. The MCBQ Forestry Section monitors these factors and their effects on forest health. Insect and disease problems are often caused by poor growing and stagnant forest conditions; typically the result of naturally overstocked and older forest stands. Therefore, one of the most important aspects of forest health maintenance is to improve growing conditions in the forest to reduce the incidence and severity of forest health-related problems. Growing conditions of the forests at MCBQ are improved through regularly-scheduled timber harvests and intermediate treatments such as timber stand improvement practices. In areas of the Base where timber harvesting and forest management practices are limited by live firing fans, however, management actions may be more reactive to forest health problems rather than proactive.

###### 2. Guiding Principles

a. The basis and principles of "ecosystem management" were addressed in Chapter 3 of this plan, however, ecosystem management principles also are important to implementing forest health management strategies. It is extremely important that

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the interactions between ecosystems be understood and evaluated for factors that may affect forest health. As a general rule, implementing strategies that preserve and complement natural ecological systems and promote biological diversity usually also are the best options for ensuring continued success in forest health maintenance.

b. An effective means of preserving/complementing natural ecological systems, promoting biological diversity and maintaining long-term forest health is to apply silvicultural practices that continually improve growing conditions for the remaining trees in a stand. The prescribed treatments improve species diversity and improve the spatial distribution of size and age classes. This also provides a very diverse forest structure, which will reduce the likelihood of forest pests and climatic factors causing widespread, catastrophic destruction as sometimes occurs in large, continuous, homogeneous forests. A healthy, vigorously growing forest will tolerate environmental stresses significantly better than an unhealthy one, and will be less susceptible to attack from forest pests. Improvement of the overall health of forest ecosystems is accomplished through the use of forest silvicultural treatments implemented at the basic management unit level, the forest stand. These treatments are aimed at maintaining optimum stand stocking and density levels. Improvement thinnings, sanitation/salvage harvests, and regeneration harvesting of mature forest stands promote vigorous and healthy forests.

c. When serious forest pest problems occur, they will be evaluated with an Integrated Pest Management (IPM) approach. The IPM approach consists of applying detection techniques for pest population levels, monitoring changes in these populations over time, and selecting the appropriate control measures for a given site. IPM control measures may include solutions such as natural or biological controls, mechanized or hand labor techniques, the use of silvicultural practices, chemical control agents, and other strategies. IPM typically utilizes a combination of control measures, and generally favors sanitation practices and biological controls over chemical intervention. Pest management actions should be based primarily on population analysis and management objectives for a particular site. Other factors such as land use, access needs, environmental constraints, size of the area, and the value of the resources also influence pest management decisions. If implemented properly, the IPM approach will produce effective population control results that are environmentally friendly.

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### 5601. INSECT, DISEASE, AND OTHER FOREST THREATS

1. Forest Pest Management. A number of forest pests could become problematic for the training and environmental protection missions of MCBQ. The Forestry Section monitors forest pest problems and provides technical oversight for IPM solutions. Forest health problems are categorized below by their potential for causing large scale environmental or economic problems and for their potential to cause problems for forest-based training exercises. The insects, diseases, and miscellaneous forces are categorized below into three general categories, in descending order of significance. This ranking is based on past incidence and current knowledge of the pest's influence in this region. Pests may be categorized differently in other regions, where environmental conditions and the availability of suitable host trees differ. Insects and diseases may also combine with other insects, diseases, and environmental or weather related stresses to form a complex, which normally causes more serious problems than any of the individual components.

2. Primary Health Threats. These pests and miscellaneous influences are considered to be the most serious threats to MCBQ woodlands. They also represent the most likely threats to personnel safety. They have the potential to cause severe problems related to property damage and natural resources protection, and may require costly preventative and/or clean-up measures.

a. Hardwood Insects:

- (1) Gypsy Moth (European and Asian) (*Lymantria dispar* spp.)
- (2) Asian Longhorned Beetle (*Anoplophora glabripennis*).
- (3) Sirex Wood Wasp (*Sirex noctilio*).

b. Conifer Insects:

- (1) Ips Engraver Beetle (*Ips avulus*, *Ips grandicollis*, *Ips calligraphus*)
- (2) Southern Pine Beetle (*Dendroctonus frontalis*)
- (3) Hemlock Woolley Adelgid (*Adelges tsugae*)

c. Hardwood Disease: Oak Decline (a disease/insect complex)

d. Conifer Disease: Stem Decay Fungi - red heart (*Phellinus pini*)

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### e. Miscellaneous:

- (1) Climatic extremes (snow, ice, and wind)
- (2) Wildfires

3. Secondary Health Threats. These are considered to be moderate threats for causing safety, economic, or aesthetic problems. They may cause localized, small to moderate sized outbreaks, or short term problems. However, they are not likely to cause a significant impact to the military training or environmental protection mission. Some secondary invaders are also included, which may be part of a more serious disease complex. Some have caused significant problems in places where land management practices, abundance of suitable host trees, or specific environmental factors favor their development.

### a. Hardwood Insects:

- (1) Eastern tent caterpillar (*Malacosoma americanum*)
- (2) Elm spanworm (*Ennomos subsignarius* Hubner)
- (3) Fall cankerworm (*Alsophila pometaria* Harris)
- (4) Forest tent caterpillar (*Malacosoma disstria*)
- (5) Hickory bark beetle (*Scolytus quadrispinosus*)
- (6) Red oak borer (*Enaphalodes rufulus* Haldeman)
- (7) Two-lined chestnut borer (*Agrilus bilineatus* Weber)
- (8) White oak borer (*Goes tigrinus* Degeer)
- (9) Emerald Ash Borer (*Agrilus planipennis*)

### b. Conifer Insects:

- (1) Black turpentine beetle (*Dendroctonus terebrans* Olivier)
- (2) Loblolly pine sawfly (*Neodiprion taedae linearis* Ross)
- (3) Nantucket pine tip moth (*Rhyacionia frustrana*)
- (4) Pales weevil (*Hylobius pales* Herbst)
- (5) Virginia pine sawfly (*Neodiprion pratti pratti*)

### c. Hardwood Diseases:

- (1) Oak wilt (*Ceratocystis fagacearum*)
- (2) Shoestring (Armillaria) root rot (*Armillaria mellea*)
- (3) Thousand Canker Disease (disease/insect complex of

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walnut - fungus *Geosmithia morbid* and walnut twig beetle *Pityophthorus juglandis*).

d. Conifer Diseases:

- (1) Annosum root rot (*Heterobasidion annosum*)
- (2) Beech bark disease (fungus/insect complex caused by fungi of *Nectria* spp. and beech scale insects *Cryptococcus fagisuga* and *Xylococculus betulae*)
- (3) Butt rots (*Polyporus*, *Hericium*, and *Pleurotus* spp.)
- (4) Eastern gall rust (*Cronartium quercuum*)
- (5) Fusiform rust (*Cronartium quercuum* f.sp. *fusiforme*)
- (6) Brown Cubical Rot (*Phaeolus schweinitzii*)

e. Miscellaneous:

- (1) Air pollution (particularly ozone)
- (2) Animals (beaver, deer)
- (3) Mechanical (logging and construction site damage, military vehicles, bullets, hunting stands)
- (4) Nematodes

4. Minor Health Threats (Nuisances). These normally cause only minor economic or aesthetic impacts. They may become nuisances or cause localized problems on shade and ornamental landscape plants. They are not expected to cause major disruptions to land uses or natural resources at MCBQ, either due to their normal mode of action or the relatively low numbers of suitable woodland host trees available at MCBQ.

a. Hardwood Insects:

- (1) Carpenterworm (*Prionoxystus robiniae* Peck)
- (2) Japanese beetle (*Poppillia japonica* Newman)
- (3) Locust borer (*Megacyllene robiniae* Forster)
- (4) Locust leafminer (*Odontota dorsalis*)
- (5) Orange striped oakworm (*Anisota senatoria*)
- (6) Variable oakleaf caterpillar (*Heterocampa manteo*)

b. Conifer Insects:

- (1) Hemlock wooly adelgid (*Adelges tsugae*)

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- (2) Common bagworm (*Thyridopteryx ephemeraeformis*)
- (3) Ambrosia beetles (*Platypus* spp.)
- (4) Southern pine sawyer (*Monochamus titillator* Fabricius)

c. Hardwood Diseases:

- (1) Anthracnose (misc. fungi species of sycamore, dogwood, oak, walnut, and maple)
- (2) Black knot (*Dibrotryon morbosum*)
- (3) Butternut canker (*Sirococcus clavignenti juglandacearum*)
- (4) Chestnut blight (*Endothia parasitica*)
- (5) Corticium root rot (*Corticium galactinum*)
- (6) Damping off (misc. fungi)
- (7) Dutch elm disease (*Ceratocystis ulmi*)
- (8) Hispidus canker (*Inonotus hispidus*)
- (9) Hypoxylon canker (*Hypoxylon* spp.)
- (10) Powdery mildew (*Microsphaera alni* and *Philactini guttata*)
- (11) Nectria canker (*Nectria galligena* and *N. magnoliae*)

d. Conifer Diseases

- (1) Littleleaf disease (*Phytophthora cinnamomi*)
- (2) Pine tip blight (*Diplodia pinea*)

e. Miscellaneous

- (1) Animals (voles, mice, sapsuckers)
- (2) Hail
- (3) Lightning
- (4) Salt (for melting ice on roads and walkways)
- (5) Spider mites (*Oligonychus* and *Eotetranychus* spp.)

5. Management History and Future Actions for Primary Health Threats. Only a few pests or miscellaneous influences are currently considered to be serious threats to the forest resources at MCBQ. They are discussed in more depth below. These threats will be given the most consideration when forest management actions are proposed. Detailed plans will be developed as these threats become imminent.



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a. European Gypsy Moth (*Lymantria dispar* Linnaeus)

(1) Between 1990 and 1995, this insect caused significant destruction to MCBQ forests. Because of the magnitude of the problems and the level of organization in place for this hardwood defoliator, it was addressed in a separate "Gypsy Moth Management Plan". Although a written formal plan was not finalized until 1996, major management priorities and strategies for an IPM approach were developed and utilized when aerial spraying began in 1990.

(2) Surveys for male moths, larvae, and/or egg masses have been conducted annually at MCBQ since 1981, to track the population trends of the gypsy moth. The male moth counts began to increase steadily between 1986 and 1990. Egg mass surveys conducted in the fall of 1989 indicated that moderate to heavy defoliation would occur over portions of the Base in 1990, unless suppression efforts were initiated. Aerial spraying began in the spring of 1990 and continued each year through 1995. Roughly 40,000 acres were treated during those six years. The total acres treated reflect substantial areas of retreatment, rather than 40,000 different acres of treatment.

(3) Between 1990 and 1995 MCBQ received funding for suppression activities from the United States Department of Agriculture, Forest Service (USFS). This funding was appropriated by Congress for forest pest suppression on federal lands. Requests for funding were made through Headquarters Marine Corps, LFL and the DoD Armed Forces Pest Management Board, by completing USFS Form FS-3400-2, "Forest Pest Management Proposal." Funding received by MCBQ for the six year period of 1990 through 1995 totaled \$696,000.

(4) Due to aerial suppression efforts throughout Virginia, a naturally occurring virus (NPV or *Nuclear Polyhedrosis*) which attacks gypsy moth larvae, and an introduced fungus (*Entomophaga maimaiga*), the gypsy moth population crashed in late 1995. Annual surveys showed that the population remained at extremely low levels in 1996 and 1997. From 1998-2001, trapping surveys indicated a gradual, continual increase in average male moth populations on the Base. A few individual survey areas experienced more rapid male moth increases, particularly in 2000 and 2001. Egg masses, however, were basically non-existent between 1995 and 2000. In 2001, egg mass surveys identified two areas with defoliation potential. These two areas containing 125 acres were successfully treated by aerial spraying in May 2002. From 2003 to present, no

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treatments have been required. Gypsy moth populations are expected to follow a general trend of periodic, isolated outbreaks in small areas that may require treatment. Large-scale sustained outbreaks of gypsy moth are not anticipated.

(5) To date, complete eradication of the gypsy moth was neither achieved nor the goal of past efforts. One of the primary initial management objectives for this pest was to minimize the destruction by the initial onslaught, as large populations of the pest moved southward into the area. USFS funding for aerial spraying was limited to protection of those areas that were mission essential. This included reservoirs and associated watersheds, recreation areas, housing areas, roadside buffer areas, and those training areas that were vital to protect. Within these limitations, protection of all susceptible forest areas at MCBQ was not possible. As a result, hardwoods (primarily oaks) in untreated areas were defoliated and died.

(6) Immediate short term effects of past infestations were the loss of a portion of the mature oak component that is valued for wildlife and timber; hazards of dead trees for Marines in the training areas; and increased hazards from wildfires due to additional fuel loading and dead standing trees that readily ignite. Most accessible dead timber was harvested, which helped to reduce safety hazards for Marines. Remaining dead trees have increased foraging areas for woodpeckers and sites for cavity nesting birds. The long term effects of past infestations are expected to be less severe. Most of the historically affected areas are regenerating heavily with oak seedlings. Only a small number of pure white oak and chestnut oak stands experienced complete mortality. These areas will require at least 40 or more years for new trees to begin producing quantities of acorns that are important for wildlife, and at least 60-70 years to produce timber adequate for harvesting.

(7) Overall, the past management strategies employed for the gypsy moth at MCBQ are considered highly successful. Mission essential forest components were protected and overall damage was minimized during widespread epidemic population levels. Current management objectives for the gypsy moth are to continue to monitor population levels closely and conduct timely suppression activities, if required. Forest management harvesting treatments will include prescriptions which reduce defoliation potential in susceptible stands. This requires increasing species diversity within these stands. While this

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may have the affect of reducing the oak component in purer stands, oak regeneration will be favored in all other stands where it is a minor component. The overall goal is reducing susceptibility, while increasing species diversity and broadening the range of oak distribution.

b. Southern Pine Beetle (*Dendroctonus frontalis* Zimmerman). Considered one of the most destructive pests of pines in the Southern U.S., this insect attacks and often kills most species of pine, especially loblolly, shortleaf, Virginia, pond, and pitch pines. It bores under the bark and girdles trees of various sizes. During outbreaks, it colonizes and even kills vigorous and healthy trees. Natural control factors such as diseases, parasites, predators, and weather, help maintain beetle populations at low levels and bring cyclic outbreaks under control. Where natural control factors are insufficient, IPM control techniques may be initiated for populations which become problematic. Effective IPM measures for Southern Pine Beetles include rapid salvage and utilization of infested wood, piling and burning all non-salable infested wood, cutting and leaving infested trees on the site (where additional potential hosts trees are not proximal), and chemical control (on high value landscape trees). Potential host trees within the uninfested buffer strip along the leading edge of the infestation are also removed or thinned as part of IPM to reduce probability of infestation to healthy surrounding trees. The best defense is to keep pine stands growing vigorously. The MCBQ Forest Management Program continues to maintain an aggressive course to thin loblolly pine stands and regenerate decadent Virginia pine stands.

c. Ips Engraver Beetles (*Ips avulsus*, *Ips grandicolis*, *Ips calligraphus*). Ips Engraver Beetles are the second most lethal pine tree insect the Southern U.S. behind the Southern Pine Beetle. Ips Engraver Beetles usually attack injured, dying, or recently felled trees and fresh logging debris. Infestations are particularly common in trees weakened by drought or lightning strikes. Controlling these pests requires prompt removal and utilization of actively infested trees, making sure that the bark and slabs are destroyed. Insect parasites and predators, woodpeckers, and weather provide natural controls. Chemical control is seldom warranted under forest conditions, but may be used to protect pines in developed areas. Preventive practices include minimizing physical damage to trees caused by military vehicles, fire, metal contamination from bullets and ordnance, logging and construction equipment, and the elimination of pine logging slash through prescribed burning.

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d. Oak Decline. The term "oak decline" is not reserved for any single disorder or syndrome. It is actually a slow acting complex of diseases. It results from the interactions of physiologically mature oaks under stress from pathogens, insects of opportunity, mechanical injury to roots, nutrient deficiencies, or changes in soil salinity. Often, the root systems of stressed trees are colonized by the shoestring root rot (*Armillaria mellea*) or *Ganoderma* fungi, ordinarily non-aggressive decomposers that become more aggressive as it colonizes. The most prominent and persistent symptom oak decline is progressive crown dieback over several years from the top downward and from the outside inward. Trees in the red oak group are more prone to oak decline mortality than those in the white oak group. The two-lined chestnut borer (*Agrilus bilineatus*) attacks trees severely weakened by oak decline, and is often the agent directly associated with tree death. Control must target prevention of the primary causal agent(s). This requires keeping trees healthy through silvicultural treatments, including stand sanitation thinnings, and judicious use of insecticides. Fertilization and irrigation are tools which can be employed to promote the health of landscape trees, but are generally considered too costly and impractical to apply to the forest environment.

e. Stem Decay Fungi. Both hardwoods and conifers are affected by many species of stem decay fungi in generally the same manner. A succession of microorganisms colonizes stem wounds or dying branches and prepares the tissue for invasion by fungal spores. Healthy trees have inherent barriers in their anatomy to resist decay, and are able to supplement these barriers by compartmentalizing the affected area through the production of defensive chemicals. Repeated wounding compromises the tree's ability to compartmentalize decay, and therefore increases the risk to stem decay. Although stem decay does not directly kill the trees, mortality may result when affected trees are windthrown or break off at a weak point caused by stem decay. The red heart fungus (*Phellinus pini*) is a common and serious example of a stem decay fungus. It is a problem with over-mature Virginia pine stands at MCBQ, and often causes tangled masses of trees from breakage and windthrow. MCBQ addresses the impacts from stem decay by harvesting and regenerating mature pine stands before the condition has the chance to advance to the point that the stands become unmerchantable or impede training.

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f. Asian Longhorned Beetle (*Anoplophora glabripennis*). The Asian Longhorned Beetle (ALB), classified in the wood boring beetle family, Cerambycidae, is a serious threat to hardwood trees and has no known natural predators in the United States. Tunneling ALB larvae enter the tree and once infested, it will normally die within 1-2 years. Adult ALBs start to emerge from infested trees as the weather gets warmer and are most active during the summer and early fall, when they can be seen on trees, branches, walls, outdoor furniture, cars and sidewalks. In the U.S. ALBs have killed thousands of urban trees and, if unchecked, have the potential to destroy millions of forest acres. ALB grows and reproduces within native hardwood trees of the following genera: *Acer* (maple), *Aesculus* (horse chestnut), *Betula* (birch), *Celtis* (hackberry), *Fraxinus* (ash), *Platanus* (sycamore), *Populus* (poplar), *Salix* (willow), *Sorbus* (mountain ash), and *Ulmus* (elm). Non-native ornamental trees commonly used in the U.S. that may also provide habitat for ALB infestations include *Albizia* (mimosa), *Koelreuteria* (golden rain tree), and *Cercidiphyllum* (katsura tree). The pest is present in the Northeastern U.S. and was also found in Ohio in 2011. To date there have been no known ALB infestations on MCBQ. The likelihood of the pest being introduced to MCBQ in the future is unknown, but the expected impacts of such an introduction would be serious due to the significant amounts of red maple, sycamore, river birch, hackberry, green ash and white ash on Base - all favored hosts. Controlling ALB is very difficult once established in an area, and treatments are generally effective in protecting non-infested trees from becoming infested. Removal of the host trees and susceptible trees within a minimum of one-eighth mile from the infested tree is the primary means of control. Pesticides can reduce ALB populations in individually treated trees, and is often used to protect valuable shade trees. However, pesticide treatment is very expensive and is not practical in the forest setting.

g. Hemlock Woolly Adelgid (*Adelges tsugae*)

(1) The Hemlock Woolly Adelgid (HWA) is a tiny (i.e., less than 1/16-inch long), dark reddish-brown to purplish-black insect native to Japan that attacks hemlock trees. It was first reported in the Eastern U.S. in 1951 near Richmond, Virginia, and has since migrated to a geographical range spanning from northeastern Georgia to southeastern Maine; and as far west as eastern Kentucky and Tennessee. In its native Japan, HWA causes little damage to hemlock trees, as natural enemies are present and Japanese hemlock trees also show some signs of natural resistance. In the U.S., this insect attacks two particular

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species of hemlock, eastern (*Tsuga canadensis*) and Carolina (*Tsuga caroliniana*), and severely damages or kills the trees within a few years. As HWA matures, it produces a covering of wool-like wax filaments to protect itself and its eggs from natural enemies and prevent them from drying out. This "wool" (ovisac) is most conspicuous when the HWA is laying eggs. Ovisacs can be observed from late fall to early summer on the underside of the outermost branch tips of eastern and Carolina hemlock trees.

(2) Cultural, regulatory, chemical, and biological controls can reduce HWA's rate of spread and protect some trees. Chemical control is a short-term solution to HWA spread to individual trees in readily accessible areas, but is not feasible in forests. Repeated foliar sprays using horticultural oils and insecticidal soaps are effective when trees can be saturated to ensure that the insecticide comes in contact with HWAs. Several systemic insecticides have also proven effective on large trees when applied repeatedly to the soil around the base of the tree or injected directly into the stem. The best hope for managing HWA in the U.S. appears to be biological control, such as natural enemies that feed on HWA. Current natural HWA enemy's native to the Eastern U.S. are somewhat effective at minimizing the spread of HWA, but have not been shown to be effective at significantly reducing populations to prevent tree mortality. Lab tests using natural enemies from the HWA's native environment are being conducted to evaluate potential introductions into the U.S. environment for more effective control; however, such tests take a number of years to ensure that they can be safely introduced into the U.S. without causing unintended consequences. Nevertheless, some supplementation to native U.S. natural HWA enemies will probably be required to maintain HWA populations below damaging levels. Impacts to forest and shade trees at MCBQ are not expected to be high. The few known stands of hemlock on Base are small, scattered, and isolated. HWA has already been detected at low levels in most of these stands, and some have been treated with soil injected pesticides. To date, very few, if any, of the treated trees have died.

h. Sirex Wood Wasp (*Sirex noctilio*). Sirex Wood Wasp (SWW) is a species of horntail wasp native to Europe, Asia, and Northern Africa that has shown the ability to attack a wide variety of North American pine species. Unlike native woodwasps that attack only dead and dying trees, SWWs can attack living pines which means they have a larger potential for significant spread. SWW lay two eggs within live pines that are covered



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with a mucoid substance and a symbiotic fungus for the larvae to feed on once they hatch, but which is toxic to trees and aids in their decline. This species attacks all species of pine that are native to MCBQ and has been found on Base. The uncontrolled spread of SWW population throughout the Base could be very problematic, as pine and mixed pine/hardwood types account for about 25-30% of the forested acreage on MCBQ. There is evidence that biological control agents may be effective in controlling this pest - particularly a parasitic nematode (*Deladenus siricidicola*) which infects SWW females and ultimately causes them to lay infertile eggs that are filled with nematodes. This process sustains and spreads the nematode population, and potentially creates a natural cycle for controlling SWW spread below damaging levels. Through monitoring SWW spread across MCBQ, staff can evaluate the potential to mass-rear the parasitic nematodes in a laboratory setting for inoculation into infested trees. Other native parasitoids have been introduced into SWW populations with some success in their control, and also will be evaluated for potential use at MCBQ.

i. Climatic Extremes. The effects on trees from climatic extremes such as drought, wind, and ice are infrequent, but are sometimes severe. These forces stress trees, causing them to utilize stored carbohydrate and nutrient reserves. This stress often leads to colonization by secondary organisms, which ultimately may cause declines in growth, wood quality, or tree mortality. In pine stands, these secondary invaders include southern pine and ips engraver beetles, which can become problematic if not treated promptly. While extremes of weather are unavoidable, the effects on the forest resource can be managed to a degree. Rapid cleanup of dead and damaged trees is vital to keep the effects isolated. Timber sales for sanitation and salvage must proceed quickly, before the value of the wood deteriorates and secondary invaders begin to grow and spread to surrounding healthy trees. If the trees are allowed to deteriorate to the point that they are unmarketable, the standing dead trees become a safety hazard and Base liability.

j. Wildfire. Wildfires, or brush fires, are probably the most serious stresses to forest health at MCBQ. Nearly all wildfires are the result of pyrotechnic devices used in military training exercises. Although natural and human-caused fire may have been a part of the early history of this region, it has been largely excluded from the landscape in modern times. When fire is used under controlled conditions in appropriate places, and with prescribed objectives, it is a valuable tool for the control and manipulation of vegetation. Wildfires usually have



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detrimental affects, however. Many wildfires leave undesirable scarring on trees, introducing vulnerability to secondary invaders of rot, stain, and insects that enter fire wounds. Hot fires are particularly damaging to young trees and trees with thin bark, and frequently kill advanced seedling/sapling regeneration. Sprouting is usually vigorous following most wildfires. Although the forest is not permanently destroyed, it may become severely altered to a state which is unsuitable for training, and may require a number of years to recover. Therefore, prevention of wildfires and quick response to suppress fires is essential to avoid large scale forest health and aesthetic problems. Detailed information on wildfire suppression and the application of prescribed fire are provided in the following paragraph.

### 5602. FIRE MANAGEMENT

1. Introduction. The management and use of fire is an important aspect of the overall forest health management mission to protect training capabilities. This section discusses both the control of wildfire and the use of prescribed fire for mission readiness and natural resources stewardship at MCBQ. A wildland fire suppression program helps to ensure protection of life, facilities, and forest resources, and is especially necessary at MCBQ due to high frequency of wildfires associated with the use of incendiary devices in military training. Controlling forest fires reduces the risk to human life and property both on Base and in the heavily populated surrounding areas, as well as the risks to natural biological communities. A prescribed fire program is used both as a preventative measure to minimize the areas susceptible to large scale forest fires, and as a land management tool. The management of both wildland fire and prescribed fire requires trained, knowledgeable, and experienced personnel.

### 2. Wildfire Authority and Responsibility

a. Authority. Primary guidance and responsibilities of brush fire fighting are outlined in MCBO P11320.1, Fire Protection/ Prevention Program, Chapter 1 and Appendix A; and also in the Wildland Fire Management Plan for MCBQ.

#### b. Responsibilities

(1) Incident Command. The Incident Command System (ICS) will be utilized in wildfire suppression efforts. This system,

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established by the National Wildfire Coordinating Group and used by many State and Federal Agencies tasked with wildland firefighting, is outlined for implementation at MCBQ in MCBO P11320.1. According to this Order, fires caused by training are reported to the Range Control Section, Range Management Branch, Operations Division. Range Control has responsibility for notifying both the Quantico Fire Department and the Forestry Section whenever training-related fires are reported. If the fires are not suppressed promptly by the training units on the scene, QFD and/or the Forestry Section will respond to the incident. Upon arrival on the incident, QFD and the Forestry Section will assume the role of incident commander(s) in a "unified command structure." The problem director and training unit will remain on the scene and render necessary assistance. The Incident commanders IC(s) shall serve as coordinator(s) of all firefighting resources at their disposal, including personnel, heavy equipment, and helicopters in directing suppression activities. All other non-training-related fires are reported directly to the Quantico Fire Department (QFD) through the emergency 911 dialing system, and will be addressed in a similar fashion to training-related fires.

(2) The Forestry Section IC shall also serve as the on-scene advisor for natural resource protection during fire suppression activities. Where unique, sensitive, or specially protected natural resources are of concern, he shall help assure judicious use of heavy equipment in addressing the fire.

(3) Other organizations and their strategic roles in fire prevention and suppression include:

(a) Fire Protection/Prevention Branch: Unified incident command with Forestry; initial attack firefighting personnel and equipment; primary manpower and organizational control.

(b) Range Management Branch, Operations Division: Dissemination of fire danger classification (FDC) level and enforcement of specific requirements; notification of fires in training areas to appropriate Base personnel; provide military firefighting personnel and equipment; provide training area access; ensure personnel safety around live ordnance zones; coordination of requests for helicopter support.

(c) HMX-1: Helicopter support for fire reconnaissance and aerial water drops (Figure 5-9).



Figure 5-9. Valuable fire suppression support is provided by the HMX-1 Helicopter Squadron using a "Bambi Bucket" for water delivery.

(d) FMS: Heavy equipment support for fire suppression; construction and maintenance of permanent firebreaks.

(e) TBS and Officer Candidates School (OCS): Reserve firefighting personnel support.

(4) FDC

(a) In accordance with MCBO P11320.1, the MCBQ Forestry Section is responsible for establishing FDCs for the Base. This classification serves as the primary gauge for determining if certain military training operations utilizing incendiary devices should be rescheduled, due to high or hazardous fire conditions. The classification also alerts TBS and OCS of the impending risks of fire development and the requirement to maintain a designated squad to reduce response time in the event of a fire. The Forestry Section utilizes a FDC system that was developed by the Virginia Department of Forestry (VDF) to assess weather conditions to determine fire danger. The system incorporates numerical values for temperature, relative humidity, wind speed, foliage green-up condition, and days and amount of rain since last rainfall. These values are totaled to produce a summary rating, which is directly correlated to a FDC level. The Forestry Section has adapted the summary ratings to fit the existing Base FDC Levels defined in MCBO P11320.1.

(b) FDCs (1) and (2) represent "normal" conditions in which fire activity is low and control is relatively easy.

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FDC (3) represents the "caution" level at which fires can become serious if not extinguished when small. Munitions that initiate fires are restricted in FDC (4) (High) and FDC (5) (Hazardous). Exceptions to these restrictions may be granted in FDC 4, provided that the pyrotechnic devices are utilized in a fire resistant area in accordance with MCBO P11320.1. Exceptions to the restrictions are not permissible in Fire Danger Classification 5 (Hazardous).

(5) Assessment of Damages. The Head, MCBQ Forestry Section has responsibility for estimating any significant loss of timber or other natural resources caused by wildfires. This estimate is provided to the Head, Fire Protection/Prevention Branch, who reports this information in the DoD Fire Incident report, as required by MCBO P11320.1.

c. Safety and Training. Public and firefighter safety shall be the first priority in wildfire management, and all wildfire suppression actions and prescribed fire plans will reflect this commitment. No resource or property values are worth endangering lives. MCBQ Forestry Section personnel shall receive firefighting training commensurate with duties outlined in their position descriptions. When properly trained, Forestry Section employees will participate in the wildland fire program, as the situation and their level of training warrants. Training is available through the U.S. Forest Service, VDF, and other Federal Agencies. Forestry Section personnel shall wear proper protective equipment and clothing, and observe the standard firefighting orders during all wildfire suppression activities.

### d. Firebreaks

(1) Purpose and Need. Wildfires at MCBQ are caused primarily by military training exercises in and around live firing ranges and other areas where incendiary devices such as pop-up illumination and trip flares, smoke grenades, and tracer rounds are used. When firebreaks are properly installed and maintained, fires caused by military training can be managed and kept to a minimal size. The effectiveness of firebreaks also reduces the required amount of down-time for military training for firefighting purposes, and the likelihood of fires escaping MCBQ lands and creating property damage.

### (2) Firebreak Plan

(a) The network of existing roads and improved trails at MCBQ provides access and containment boundaries for

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most fires. Large streams and water bodies also serve as natural firebreaks. However, these features do not make a reliable firebreak system to contain fires within a small manageable area before they grow and cause damage. A firebreak system which forms a complete containment zone around areas with the highest fire incidence, such as live ordnance ranges and certain portions of training areas, is essential to properly manage fires and maintain these areas before they develop into larger fires. This is the fastest and most effective way to control fires with minimum manpower, equipment, and danger, while also minimizing the affects on training activities.

(b) In the late 1990's, the MCBQ Forestry Section, Range Management Branch, and Fire Protection/Prevention Branch identified deficiencies in the MCBQ firebreak system, and the Forestry Section took the lead in developing a plan to correct these deficiencies. The Firebreak Plan was completed in January 1999 detailing the location, design, and material specifications for creating and maintaining effective firebreaks. The Firebreak Plan primarily utilizes existing trails and roads wherever possible to minimize costs and limit environmental disturbances. Where new construction is required, the Firebreak Plan requires that firebreaks be designed as semi-improved roads (with spot graveling), for access by firefighting brush trucks. Features such as crowning, parallel ditching, and the installation of culverts and water diversion turnouts are incorporated under the Firebreak Plan to promote proper surface drainage and ensure long term utilization.

(c) A categorical exclusion (CE) was prepared for the Firebreak Plan, and presented before the Environmental Impact Review Board (EIRB) on May 12, 1999. This project was approved by the Board for implementation. A copy of the Firebreak Plan is available for review in the Forestry Office. The map in Figure 5-10 details the location of all firebreaks. Much of the required construction of firebreaks anticipated under this plan has been completed, thus maintenance activities by FMS are the primary remaining functions of the plan (e.g., removing down trees and leaves, ensuring that gravel is applied to keep firebreaks drivable, and routine maintenance for proper drainage and to prevent vegetation from overtaking them). Of particular importance is controlling grass and tree growth within the firebreaks to avoid them becoming ineffective. Vegetative growth must be controlled under the Firebreak Plan by the use of herbicides or by mechanical methods (i.e., grading). Mechanical firebreak vegetative maintenance under the plan, must account for erosion and sediment run-off problems by adding

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gravel to help prevent rutting of soft, disturbed, exposed soil. Alternatively, chemical treatment with a granular or sprayed herbicide may provide a less-costly option for controlling both pre-emergent and post-emergent vegetation, with retreatment required every 2-3 years. The Forestry Section will continue to evaluate and update maintenance requirements for the Firebreak Plan to ensure that they remain functional.

(d) Changes in training activities may necessitate additions or adjustments to firebreaks. These changes will be evaluated and implemented as needed in accordance with the Firebreak Plan, to ensure that the firebreak system remains functional to promptly control fires.

### 3. Prescribed Fire

a. Purpose. Prescribed burning is a vital tool in the MCBQ Forest Management program - particularly in the areas of forest stand establishment and maintenance. It is used for site preparation prior to reforestation, for reduction of fuels in the understory of established stands, and for reduction of competing vegetation in timber stand improvement. Prescribed fire is utilized on grasslands and woodlands within, and immediately surrounding, weapon firing ranges, to eliminate or reduce the risk of fires from incendiary devices used in training exercises. Prescribed burning is also an important land management tool for creating and maintaining grassland and woodland habitats for certain wildlife species.

b. Open-Air Burning and Smoke Management. MCBO 6240.2A, the Air Pollution Episode, Standby Emission Reduction Plan and Open Air Burning Policy, designates activities that require special authorization to address air pollution and smoke concerns from prescribed burning. The policy includes procedures for addressing air pollution according to individual alert stages, such as whether bans have been placed on burning due to stagnant or unsuitable atmospheric conditions. MCBO 6240.2A also accounts for weather and wind conditions to ensure that prescribed burning occurs only when weather and wind conditions do not obstruct visibility to vehicles and aircraft. In accordance with that Order, any open air burning requires approval of either the Head, MCBQ Forestry Section or the Head, Fire Protection/Prevention Branch, unless prior blanket approval of such burning has been granted or the activity is explicitly exempt from needing authorization under the Order. Specific authorization must be obtained from the Commander, MCBQ for any

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exceptions to the open air burning policy other than those listed in the Order.

### c. Requirements

#### (1) Annual Prescribed Burning Plan

(a) The Head, MCBQ Forestry Section has responsibility for coordinating and implementing the Base prescribed burning program. In compliance with MCO P5090.2A, an annual prescribed burning plan must be prepared by the Forestry Section each year by October 1. This plan describes all proposed prescribed burning requirements at MCBQ for the upcoming fiscal year, including detailed descriptions of unit locations, types and methods of burning, equipment needed, manpower and safety requirements, and acceptable weather and fuel parameters. The annual plan further defines additional compliance requirements for effectively and safely conducting prescribed burning. All annual burning requirements are submitted to the Head, Forestry Section, who will evaluate proposals to ensure that they can be safely conducted and incorporated into the annual plan. The burning plan must also be developed in coordination with Range Management Branch to incorporate military training requirements, and reviewed by the Head, Fire Protection/Prevention Branch, and Head, Facilities Maintenance Section.

(b) Figure 5-11 shows the live-fire ranges that have high fire incidence due to the types of munitions fired. Annual prescribed burning of these ranges in late Winter and Spring is necessary to prevent delays or cancellation of military training. Ranges are burned under favorable weather conditions when training is not taking place. Prescribed burning creates a fire resistant area, which eliminates the requirement to stop training for fire suppression activities. Without prior burning, wildfires start under unfavorable weather conditions and can be difficult to control or prevent from escaping to surrounding training areas. Consequently, military training must be halted in surrounding areas until fires are controlled. The fire resistant areas created by prescribed burning provides additional options for granting a waiver to fire pyrotechnics in Fire Danger Classification level (4), according to the criteria established by MCBO P11320.1.

(c) Annual burning is also essential on ranges to maintain target visibility and prevent woody vegetation from becoming established. Due to extensive use, the ranges with the



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highest priority for burning include Training Area 9A (range complex impact area), Range 15A, and Range 3A. Frequent training and suitable weather requirements are factors that greatly limit available days for burning. With these limitations, and the large number of acres to burn, every opportunity must be utilized to complete all planned range burning requirements. QFD and Range Management Branch personnel assist in range burning operations. Burning is conducted on ranges in late winter and spring, when grasses are dry and dormant. Rarely, a few days of burning may be available in mid to late fall, but only after several frosts have turned the grass brown. Normally, temperatures and relative humidity levels do not allow sufficient drying of fuels to conduct prescribed burns on ranges in the winter months.

(d) Range 5 is close to the base perimeter and therefore should be burned along the unmaintained perimeters periodically to prevent hazardous conditions from building up. Charlie Demolition and Murphy Demolition Ranges are not shown on Figure 5-11, because these areas are currently being maintained by mowing, which eliminates the need for prescribed burning. These demolition ranges should be kept at a low height in the fall and winter seasons to prevent intense, fast moving fires. Once these ranges turn green, around 1 May, there is little danger of fires starting until after frosts in November, unless drought conditions occur. During drought conditions, the grass should also be kept low on these two ranges to reduce fire intensity. The fuel supply area (MCB 2) should also maintain the grass at low levels during periods when the grass is not actively growing.

(e) Firebreaks are lacking on several range areas. Additional firebreak construction is needed on Range 12, Weapons Training Battalion (WTBn) and the WTBn Pop-up Range (P 305), Goettge Demolition Range, and Range 3A eastern extension). These ranges currently cannot be prescribed burned without these firebreaks in a condition that permits driving and an adequate fuel break to accommodate back-burning.

(f) Currently, training requirements do not necessitate annually burning OP 13, GP-44, Range 11, and the Range 14 complex. These ranges will be burned as needed to control vegetation and aid in wildfire suppression.

(g) Wildlife habitat management burns are primarily conducted at the same time of the year as live-fire range management burns. Figure 5-11 shows additional areas that are

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continually maintained for wildlife habitat by prescribed burning. These areas are normally burned at 1-3 year intervals and may have various alternating burned and unburned units or patterns, to meet specific brood or foraging habitat requirements for various species. Where compatible with military training requirements and overall Base fire management objectives, wildlife burning units are located between and adjacent to ranges, to provide a continuous grassland corridor. Additional information on prescribed burning for wildlife habitat management is provided in Chapter 6.

(h) Forest management burns are not shown in Figure 5-11, because their location varies from year to year over the Base area. They are included in the annual prescribed burning plan, however. Forest management and wildlife management units which require frequent or repeated burning will not be located in close proximity to the Base perimeter. Special precautions will be taken when conducting site preparation burns for forest management in these areas. Burning shall be conducted under weather parameters of the prescription which would be considered very cautious rather than minimal. For example, calm or low wind, highest acceptable humidity, and not experiencing drought conditions.

(2) Daily Prescribed Burning Plan. A written daily burn plan must be completed before initiating a prescribed burn. The Virginia Department of Forestry Form 69 will be utilized. This plan documents the location, size, fuel types, acceptable and predicted weather parameters, purpose and objectives, smoke management considerations, burning plan strategy (including personnel and equipment requirements), safety and notification procedures, a topographic map of the unit and surrounding area, and an escaped fire management plan. The Head, Forestry Section or his designated representative, will have final approval of all daily prescribed burning plans. Burning will not be conducted if weather conditions are out of prescription, personnel and equipment resources are inadequate, or smoke management considerations have not been properly evaluated.

### (3) Implementation

(a) The person implementing a prescribed burn will be referred to as the "burn manager". The Head, Forestry Section will designate burn managers based on their qualifications and experience. Burn managers will also have successfully completed the Virginia Department of Forestry (VDF) "Certified Prescribed Burn Manager Program." Compliance with

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Code of Virginia, Chapter 11, Title 10.1, article 6.1, sections 10.1-1150.1 through 10.1-1150.6, provides that "any prescribed burning conducted in compliance with the requirements of this article, state air pollution control laws, and any rules adopted by VDF shall be in the public interest and shall not constitute a nuisance" and "shall not be liable for any damage or injury caused by or resulting from smoke." In addition to certification, VDF Form 69 is used on all prescribed burns at MCBQ, to ensure compliance with all aspects of article 6.1.

(b) The Forestry Section has developed a prescribed burning check-list which is utilized prior to the day of the burn. This check-list emphasizes essential tasks that must be completed in preparation for the burn. After VDF Form 69 is completed but prior to initiating the burn, the VDF go/no-go check-list will be completed. A "no" response to any item on this list will delay implementation until compliance with the item has been met. All appropriate County and Base authorities will be notified prior to conducting prescribed burning.

### 5603. REFERENCES

U.S.D.A., Forest Service Technical Report R8-GR 5, "Insects and Diseases of Trees in the South", June 1985.

U.S.D.A., Forest Service Agricultural Handbook No. 558, "A Field Guide for Ground Checking Southern Pine Beetle Spots", 1980.

U.S.D.A., Forest Service General Technical Report NE-171, "Silvicultural Guidelines for Forest Stands Threatened by the Gypsy Moth", January 1993.



Head Forester Bill Cross, the "Burn Boss", leads a nice prescribed burn for fuel reduction and wildlife habitat improvement in Training Area 11A.







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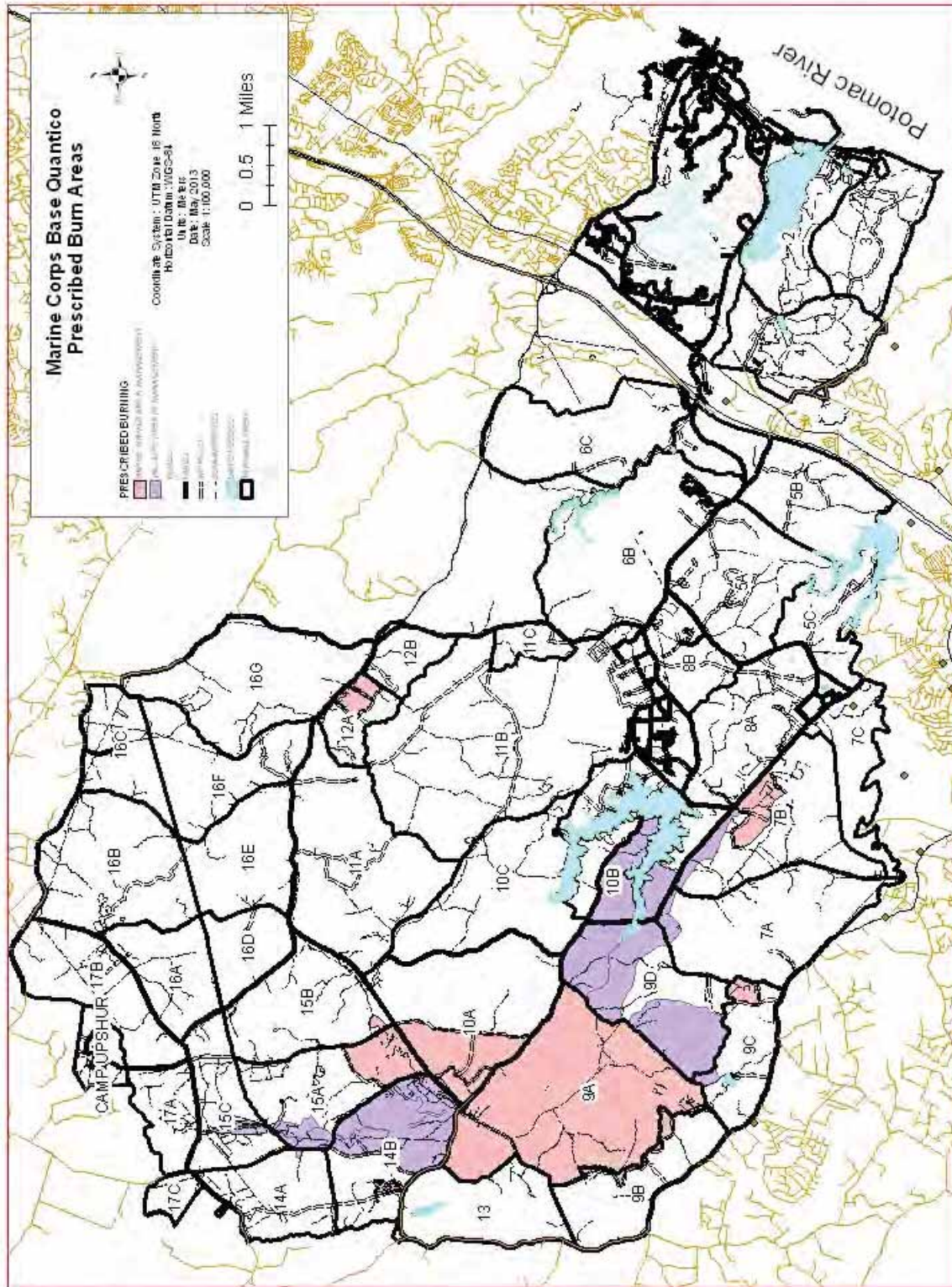


FIGURE 5-11. PRESCRIBED BURNING AREA MAP

# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 5

### FOREST RESOURCES

#### SECTION 7: RECOMMENDED PROJECTS AND WORK PLAN

##### 5700. RECOMMENDED PROJECTS

1. Chapter 5 has provided an assessment of the forest resource and its importance to the military training mission. This Chapter has also detailed long-range management concepts and operational goals necessary to accomplish the forest management program. Forest management falls largely within Driver II of this INRMP, which is to "support and enhance the preservation of all animal and plant life endemic to the Base ecosystem with sound management practices that meet the requirements of all applicable Federal, State and local laws and regulations." Three major goals specific to forest management have been identified within Driver II:

Goal 6. To perpetuate a diverse forest environment that fulfills the requirements for military training; maintain a healthy forest ecosystem; provide for diversity of plant and animal species; identify and control potential forest insect and disease problems; and assure a sustainable yield of renewable forest products.

Goal 7. To provide for the management and control of wildfires from military training exercises through an aggressive fire management program which: manages a fire danger classification system to assess fire potential; assures a well built and maintained firebreak system around areas with high fire incidence; strives for safe and effective fire suppression by trained personnel; and minimizes risk of fire escaping MCBQ lands to surrounding private property.

Goal 8. To provide for the managed application of fire (prescribed burns) to: meet military training, forestry, wildlife management, and resource protection goals; perpetuate a fire-maintained ecosystem where appropriate; and help reduce intensity and frequency of fires on ranges and training areas with high fire incidence.

The projects recommended for the accomplishment of these goals are described below.



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### 2. Goal 6 Recommended Projects and Descriptions

a. Forest Management Planning and Administration. Complete long-range forest management planning requirements of the Integrated Natural Resources Management Plan (INRMP). Develop annual program and budget requirements. Review and update applicable Base Orders and SOPs, requisition resources for forestry projects, complete required forestry program reports, provide personnel with appropriate training, and direct personnel in accomplishment of program objectives. Maintain accountability of receipts from the sale of forest products. Update the INRMP as required.

b. Complete NEPA Requirements for Forestry Projects. Conduct planning and scoping meetings, complete NEPA documentation (CE or EA) and present before the Environmental Impact Review Board (EIRB). Ensure that historic, cultural, archeological, and threatened and endangered species surveys are completed.

c. Review other applicable NEPA projects. Review all NEPA projects that have potential for affecting forest resources. Provide recommendations to mitigate impacts. Support timber removal requirements when possible (through contract logging), and ensure that proper value is received for salable timber.

d. Evaluate and treat 3-7 forest compartments each year for forest health maintenance

(1) Forest Compartments 1-35. Conduct annual evaluations of 3-5 forest compartments for forest health maintenance according to the 10-year entry schedule, and implement treatments through timber harvesting and other forest stand improvement methods. Integrate military training and wildlife management requirements into harvesting projects. Maintain spatial distribution of age classes, diversity of forest species, and harvest levels within established sustained yield guidelines. Maintain riparian habitat and streamside management zones to protect water quality. Minimize soil disturbance and erosion.

(2) Forest Compartments 36-65. Accomplish some disbursed harvesting and prescribed burning in 1-2 forest compartments per year to improve forest health conditions, species diversity, wildlife habitat, and reduce wildfire potential. Establish and maintain old-growth forests and other unique forest ecosystems. Control insect and disease outbreaks promptly to prevent large-scale infestations in these older, less vigorous forest stands.

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e. Road Access Requirements. Complete annual forest management road access improvements six to twelve months prior to advertisement of timber contracts. Complete rough-in and drainage work, grade, and apply gravel. Maintain road or trail before, during, and after contractor usage.

f. Timber Contracts. Complete site layout of units to be treated through timber harvests. Conduct appraisals of units and products to be sold. Complete timber contract and distribute advertisements. Provide tours of contract area for prospective bidders and conduct sealed bid opening. Schedule contractor access to timber sale units. Administer contract provisions for compliance. Maintain current and accurate documentation of contractor activities, progress, and compliance.

g. Site Preparation and Reforestation. Complete annual site preparation and planting on harvested sites and any open areas requiring regeneration to forest cover. Complete all requirements necessary for contract planting. Complete necessary actions for natural regeneration. Evaluate regeneration through surveys to ensure that stands are adequately stocked with preferred species.

h. Forest Insects and Disease Management. Monitor and appropriately survey for populations of serious forest pests such as gypsy moths, emerald ash borer, hemlock woolly adelgid, southern pine beetle, and others. This is generally accomplished through careful observation by knowledgeable professionals, followed by specific surveys and aerial reconnaissance flights. Infected areas of the most serious threats to forest health, personnel or property should be treated promptly in accordance with sound integrated pest management techniques and practices.

i. Natural Damages to Forest Resource. Monitor natural atmospheric damages to the forest resource from ice, snow, and wind, often associated with storms with heavy precipitation. Conduct ground surveys and reconnaissance flights when appropriate to determine extent of damages. Implement timely salvage operations before product value is lost and to prevent insects and diseases from spreading to surrounding healthy stands.

j. Urban Forest Management and Arboriculture. Provide inspections and recommendations for hazard tree removal, fertilization, pruning, and similar appropriate cultural practices. This includes shrub and tree pest management, landscaping plans, and species selection and placement in the more developed areas. Develop a master plan for planting trees for energy savings, rehabilitation of disturbed or sites, and for general aesthetics.

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k. Maintain Forestry Vehicles and Equipment. Maintain and repair all forestry equipment to ensure that it remains functional for intended lifespan (vehicles and heavy equipment purchased with Forestry funds, truck mounted fire pumps, chainsaws, brush cutters, leaf blowers, prescribed burning equipment, assorted hand tools, timber marking equipment, etc.).

l. Timber Stand Improvement (TSI). Pre-commercially thin or release crop trees by brush cutting 20-30 acres annually. Control species composition, release the most desirable "crop" trees, and improve growth and vigor in young dense stands. This would improve utility of many areas for training and improve wildlife habitat.

m. Upgrade equipment maintenance and storage building (Bldg. 27009). This is an under-utilized metal building since it needs electricity, plumbing, a hard surfaced floor, insulation, and temperature control. This is needed for storage of pumper trucks to prevent freezing, general workshop and equipment maintenance. This requirement is also listed in Chapter 9.

n. Label Base Champion Trees. Use metal identification tags to identify Base champion trees. These tags would list the common name and genus and species, as well as champion tree status. Use Global Positioning System (GPS) UTM coordinates to map the tree locations to help provide some degree of protection.

o. Develop Educational/Recreational Trails, or Picnic Areas. Based on requirements, location and suitability develop additional educational or recreational trails, and/or picnic areas around Base to improve the quality of life for Marines and civilians at MCBQ.

p. Heavy Equipment Purchase. Purchase a small, more maneuverable and readily transportable bulldozer to replace the old (1988) bulldozer that was turned in. This bulldozer could be used for forest management operations and utilized in smaller site preparation work as well as forest access road, trail, and firebreak maintenance. It would also be used as added safety on prescribed burns, to manage the gravel storage site, and for burning and maintenance of the Base's woody debris brush pile.

### 3. Goal 7 Recommended Projects and Descriptions

a. Fire Danger Classification. The Forestry Section will maintain a basic weather station at Building 27007 (Log Cabin) to observe and record weather parameters used in fire danger forecasting. Weather data will be used to determine the FDC level

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and report it to Range Management Branch, Operations Division during periods of active fire danger.

b. Firebreaks. Continue implementation of the approved 1999 Firebreak Plan for MCBQ. Forestry will work with FMS to help ensure that firebreak construction and maintenance is ongoing and completed to satisfactory level for the areas. Routine maintenance is necessary to keep the firebreaks in functional condition. This includes grading, spot gravelling, cleaning ditches and culverts, and possibly herbicide application to eliminate grasses on the firebreak road surface. FMS has primary responsibility for firebreak construction, maintenance and obtaining funding for this work. Forestry may assist, but only to a level that manpower, equipment, and funding permits.

c. Wildfire Suppression. Help ensure protection of life, facilities, and natural and cultural resources; prevent fires from escaping to surrounding private lands; and minimize impacts on military training. Maintain readiness capabilities according to FDC as specified in MCB Order P11320.1. The Base Fire Chief and the Head, Forestry Section, have responsibility for managing wildfire suppression activities. Additionally, Forestry has the responsibility of being the on-scene advisor for natural and cultural resource protection. The Head, Forestry Section will assist the Fire Chief in reviewing and updating those portions of MCBO P11320.1 pertaining to wildfire suppression, as required.

d. Safety. Firefighter and public safety will be the first and foremost priority at all times. Ensure that personnel involved in wildfire suppression wear proper personal injury protection. Observe safety precautions for firefighting, use of hand tools, equipment, and vehicle operation at all times. Stress attentiveness to the "Standard Firefighting Orders" and "Situations That Shout Watch Out". Ensure that effective communications are maintained at all times with all fire suppression personnel working on the incident.

e. Training. Training in wildfire suppression is available through in-house instruction by Forestry Section and Fire Department personnel, and through training courses taught by the Virginia Department of Forestry, U.S. Forest Service, and other Federal Agencies. Personnel involved in wildfire suppression shall receive adequate training and fulfill wildfire suppression responsibilities that are commensurate with their level of training and experience.

f. Equipment. Maintain fire suppression equipment in operable condition and replace non-functional items. This includes backpack

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pumps, fire tools, leaf blowers, chainsaws, truck mounted water pump units, and Bambi buckets.

g. Develop a Base fuel and fire risk model and plan and incorporate into GIS system. Establish a baseline risk of fire spread potential for various fuel types. Assess conditions, prioritize risk and treatment requirements.

h. Reduce fuel loading and fire risk near developed areas. Cut and remove brush, use heavy equipment, prescribe burn where possible, and install firebreaks to help reduce high fire risk and fuel loading in and around developed areas on the Base perimeter.



**Small bulldozer standing by on a prescribed burn, which could be utilized to establish a firebreak and help with spot fires that often occur.**

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### 3. Goal 8 Recommended Projects and Descriptions

a. Prescribed Burning Program. Administer the Base prescribed burning program. Ensure that all prescribed burning is conducted safely and under proper established guidelines and conditions. Complete annual burning on ranges to minimize down time for military training and reduce risk of escaped fires. Complete all other burning requirements for training areas, wildlife and forest management. Ensure that prescribed burning requirements are compatible with fire management objectives. Evaluate all training areas to assess fuel loading and ignition hazards. Incorporate appropriate treatments through prescribed burning and other actions.

b. Update Base Orders Pertaining to Prescribed Burning. Review MCBO 6240.5A annually. Update portions pertaining to prescribed burning as required to ensure current status.

c. Prescribed Burning Plan. The Forestry Section will prepare an annual prescribed burning plan by February 1. The prescribed burning plan will provide detailed descriptions of controlled burning requirements for ranges, training areas, forest management, and wildlife management. The plan will also detail all other considerations and requirements such as documentation, safety, equipment, manpower, weather and fuel constraints, smoke management and notification procedures. Implementation of the plan will be coordinated by the Forestry Section.

d. Procedures and Guidelines. Explicit procedures to be followed for conducting prescribed burns will be detailed in the annual prescribed burning plan. Overall requirements are detailed in paragraph 5602, (3) of this INRMP. Prescribed burning will comply with all guidelines and procedures, Base regulations, and laws governing the Virginia Certified Prescribed Burn Manager Program to ensure that smoke management requirements are addressed and liability for smoke nuisance are minimized.

e. Proper Protective Equipment and Clothing. Personnel involved in prescribed burning will wear proper protective clothing and equipment. Supervisors will ensure that adequate protective equipment and clothing is available for employees.

5701. WORK PLAN . The 5-year work plan and estimated budget for the forest management program is provided at Table 5-10. These projects do include estimated labor costs and many of those costs are reimbursed by forest product revenue generated under this INRMP.



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Table 5-10. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
DRIVER II. To support and enhance the preservation of animal and plant life endemic to the Base ecosystem.						
6. Goal: To perpetuate a diverse forest environment that fulfills the requirements for military training; sustains the yield of forest products; identifies and controls potential forest insect and disease problems; maintains healthy forest ecosystems; and provides for a diversity of animal and plant species.						
1. Forest management planning and administration.	A	60	62	64	66	68
2. Prepare NEPA documentation for forestry projects (timber harvesting, aerial spraying, etc.)	A	18	20	22	24	26
3. Review NEPA projects affecting forest resources.	A	10	10	10	10	10
4. Evaluate and treat 3 to 7 forest compartments per year for health and possible timber management.	A	34	36	38	40	42
5. Forest road construction and improvements.	A	52	54	56	58	60
6. Gravel purchase (road upgrade and maintenance).	A	50	60	60	70	70
7. Timber sale contract preparation, advertisement, and administration.	A	50	52	54	56	58
8. Complete annual site preparation and reforestation related to commercial timber sales.	A	44	46	48	50	52
9. Forest insect and disease management. Monitor, evaluate, and manage forest health threats (IPM).	A	10	12	14	16	18



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 5-10. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
10. Urban Forestry/Arboriculture	A	20	30	30	40	40
11. Maintain/replace forestry tools and equipment.	A	5	5	5	5	5
12. Timber Stand Improvement (TSI) - Pre-commercially thin/release 30-40 acres annually.	A	0	20	25	30	35
13. Equipment purchase (small dozer)	B	100	0	0	0	0
14. Equipment purchase (trailer for bulldozer)	B	0	25	0	0	0
15. GPS, map, and label Base "Champion Trees" with ID tags.	B	1	1	1	1	1
16. Develop recreational trails, picnic areas, by Eagle Scout projects or volunteers	B	3	3	3	3	3
7. Goal: To provide for the management and control of wildfires from military training exercises through an aggressive fire management program that: establishes a fire danger classification system to assess fire potential; provides for an adequate firebreak system around areas with high fire incidence; provides for safe and effective fire suppression by personnel competently trained; and minimizes the likelihood that fires will escape from Base lands to surrounding private property.						
1. Administer and maintain MCBQ fire danger classification system.	A	5	6	7	8	9
2. Annually inspect maintenance needs of firebreak system. Assist FMS in routine maintenance with heavy equipment work as needed.	A	10	12	14	16	18

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 5-10. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
3. Review and develop wildfire policy and procedures for MCBQ	A	10	10	0	0	0
4. Serve as co-incident commander and resource protection advisor on wildfire control activities.	A	12	13	14	15	16
5. Purchase equipment and software for real-time field mapping of fire incidents.	A	3	2	1	1	1
6. Train NREA natural resources personnel on wildfire suppression.	A	5	4	4	4	4
7. Maintain and replace fire suppression equipment and safety gear (pumpers, backpack cans, drip torches, Personal Protective Equipment).	A	5	5	5	5	5
8. Develop a Base fuel and fire risk model and plan, incorporate into GIS system.	B	25	2	2	2	2
9. Reduce fuel loading and fire risk near developed areas on perimeter.	B	0	20	25	30	35
8. Goal: To provide for the managed application of fire (prescribed burns) to: meet military training, forestry, wildlife management, and resource protection goals; perpetuate a fire-maintained ecosystem where appropriate; and help reduce intensity and frequency of fires on ranges and training areas with high fire incidence.						
1. Prepare the MCBQ annual prescribed burning plan to meet all Base burning requirements	A	11	12	13	14	15
2. Coordinate Base prescribed burning program and ensure that proper procedures are followed by those conducting burns on Base.	A	13	14	15	16	17

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 5-10. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
3. Provide input for periodic review/update of MCBO 6240.2 and other fire related orders.	A	2	2	2	2	2
4. Assess fuel conditions in training areas and implement appropriate actions to manage fuel loading.	A	3	3	3	3	3
5. Comply with the Virginia Certified Prescribed Burn Manager Program and stay current on other appropriate training.	A	3	3	3	3	3
6. Provide proper personal protective clothing, equipment, and tools for prescribed burning.	A	4	4	4	5	5
<b>Subtotal for "A" projects</b>		<b>439</b>	<b>497</b>	<b>511</b>	<b>557</b>	<b>582</b>
<b>Subtotal for "B" projects</b>		<b>129</b>	<b>51</b>	<b>31</b>	<b>36</b>	<b>41</b>
<b>TOTAL A + B</b>		<b>568</b>	<b>548</b>	<b>542</b>	<b>593</b>	<b>623</b>

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CHAPTER 6

FISH AND WILDLIFE RESOURCES

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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 1: FISHERIES MANAGEMENT

6100. GOALS AND OBJECTIVES. Goals established for the Marine Corps Base, Quantico (MCBQ), Virginia fisheries management program are to (1) maintain self-sustaining fish populations where possible to provide quality, sustained fishing for the recreational enjoyment of sport fishermen (Figure 6-1), and (2) perpetuate all native species of aquatic fauna that may occur here. Accomplishment of these objectives will consist of a combination of the following practices: (1) regulation of the creel size and length of fish allowed to be harvested; (2) enforcing Virginia and MCBQ fishing regulations; (3) physical manipulations (e.g., water level manipulations or placement of fish shelters); (4) biological manipulations (e.g., supplemental stocking or species introductions); and (5) protection of water quality through control of both point and non-point source pollution.

6101. FISHERIES HABITAT RESOURCES. Surface water resources of MCBQ are shown at Figure 2-2. The four primary watersheds, Aquia Creek, Cedar Run (Occoquan Creek watershed), Chopawamsic Creek, and Quantico Creek all drain into the Potomac River, a tributary of the Chesapeake Bay (Figures 4-2 and 4-3). All watersheds contain various native non-game fish species. Nine impoundments ranging in size from 1 to 477 acres support self-sustaining warm water fisheries. The lower Chopawamsic Creek expands into a shallow 377-acre tidal open water riverine wetland that is an important nursery area for Potomac River fishes. The Base owns about 4.0 miles of shoreline along the Potomac River and 2.0 miles of shoreline along the tidal portion of Quantico Creek. Water open for recreational fishing is described below. Designated fishing areas are shown on the map at Figure 6-2.

#### 1. Lunga Reservoir

a. Lunga Reservoir is the largest and most popular body of water on the Base. It contains 477 acres, has a watershed of 6,880 acres and has water storage capacity of 1.75 billion gallons. It provides the secondary water supply for the Base water treatment plant. The Marine Corps Community Services Division (MCCS) operates Lunga Park, which includes a boat house, campsites, picnic areas, boat rentals, and two boat launching ramps. Self-sustaining populations of largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), chain pickerel (*Esox niger*), black crappie (*Pomoxis nigromaculatus*), warmouth (*L. gulosus*), and brown bullhead (*L. nebulosus*) (U.S. Fish and Wildlife Service 1985) have been present in Lunga Reservoir over the past 40 years. Lunga Reservoir and Lunga Park were closed to recreation in April 2012 and remain closed as of April 2015 for ongoing military munitions response program (MMRP) clean-up actions. The MMRP is addressed in Chapter 4.

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b. The following changes in fisheries composition of Lunga Reservoir have occurred over the past 40 years:

(1) Striped (*Morone saxatilis*) bass were stocked in Lunga Reservoir by the U.S. Fish and Wildlife Service (USFWS) during the 1970s and early 1980s, with the last stocking occurring about 1984. That practice was discontinued due to concerns about habitat limitations in Lunga Reservoir. Virginia Department of Game and Inland Fisheries (VDGIF) biologists suggested that Lunga Reservoir might be suitable for hybrids between striped bass and white bass (*M. chrysops*) but that hybrids were not being stocked in waters connected to tributaries of the Chesapeake Bay.

(2) Redear (*L. microlophus*) sunfish were stocked by the USFWS from 1987-1989 to establish a population in Lunga Reservoir. The redear attains greater size in this region than bluegill and has done very well, now being a common sunfish species that can attain citation size (> 1 pound).

(3) Walleye (*Stizostedion vitreum*) were stocked in Lunga Reservoir by the VDGIF from 1990-1992 concurrent with the construction of a rock reef in an effort to establish a viable population. Annual stocking resumed in 1996 for several years but was discontinued after 2000. Walleye reached about 8 pounds in size but lack of reproduction, low survival, and low catch rates influenced the decision by VDGIF to not continue the walleye stocking effort.

(4) White perch (*Morone Americana*) became very abundant in Lunga Reservoir during the 1990s. In a 2005 study, white perch evaluated by otolith sectioning ranged in age from 6 to 13 years, with most exceeding 10 years of age. Based on 2011 fishing reports and gill netting studies (MCBQ unpub. data), white perch have been declining but a yellow perch (*Perca flavescens*) fishery has been increasing.

(5) Channel catfish (*Ictalurus punctatus*), once common in Lunga Reservoir, seem to have largely disappeared from the reservoir. No channel catfish were detected during a gill netting study conducted in the fall of 2011.

c. Water Quality Studies. In 1989, field studies were conducted by NREA Branch to determine the dissolved oxygen and temperature profile of Lunga Reservoir. The primary purpose of the study was to determine the potential suitability of Lunga Reservoir to support walleye, a cool water fish. Results showed that the reservoir becomes thermally stratified and oxygen deficient (less than 3 ppm) at depths greater than 3 meters from June - September, inclusive. A thermocline was present at the time of the studies from 6-12 feet deep. A more detailed study, showing similar results, was conducted in 2004-2005 by the U.S. Geological Survey (USGS) (Lotspeich 2007). Water quality parameters were very similar to other reservoirs in the region and no reportable levels of any contaminants or pesticides were found.

d. Submerged Aquatic Vegetation (SAV). Late in 2005, it was determined that much of the benthic area of Lunga Reservoir was carpeted by musk-grass (*Chara spp.*). The musk-grass resembles a

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

vascular plant and probably causes no harm other than interfering with fishing. Bladderwort (*Utricularia spp.*) was found in some of the shallower regions of the reservoir, and Hydrilla (*Hydrilla verticillata*) was detected in 2010 near the Lunga boathouse. There have been no additional surveys for SAV in Lunga since April 2012 when the area was declared off-limits during MMRP operations.

### 2. Breckenridge Reservoir

a. Breckenridge Reservoir is located in Training Area (TA) 6 on the main stem of Chopawamsic Creek, 5.2 miles inland from the Potomac River. This 47-acre reservoir is the principal water supply for MCBQ and has 12,902 acres of watershed. Breckenridge Reservoir is a very steep-sided reservoir with depths up to 45 feet at the dam. The reservoir was drained and the dam repaired in 1965. It was subsequently restocked with 10,000 largemouth bass, 50,000 bluegill, and 5,000 channel catfish. Channel catfish were also stocked in 1984. A gravel boating ramp is accessible from New Breckenridge Road located off of MCB-1.

b. The Breckenridge tailrace is characterized by six small staircase impoundments that were constructed in 1967-68 in an attempt to create suitable trout habitats. Concrete weirs with flashboard gates regulate water levels in these pools; however, three of the weirs have been badly breached by floodwaters and are in disrepair.

c. Dissolved Oxygen Studies. In 1989, field studies were conducted in Breckenridge Reservoir by NREA Branch to determine the dissolved oxygen and temperature profile. At that time, the reservoir became stratified from late June - September and formed a thermocline from 3-9 feet deep. As such, Breckenridge Reservoir appeared to be slightly cooler than Lunga Reservoir and stratified a little later in the Spring. The USGS completed a subsequent water quality study in 2009 of Breckenridge Reservoir and reported similar temperature-dissolved oxygen profile as the NREA study (Lotspeich 2012). These studies reported a much lower stratification profile in the water column relative to other water bodies in the region. This was perhaps due to the operation of aerators near the spillway.

d. SAV. In September 2005, hydrilla had formed a dense wall of vegetation along all shorelines of Breckenridge Reservoir to a depth of about 8 feet (Stamps, pers. obs.). Because of the steep-sided nature of the reservoir, hydrilla was largely restricted to a narrow band along the shoreline. This band of hydrilla has persisted with seasonal die back (winter) and regrowth (early summer).

3. Dalton Pond. Dalton Pond is a 16.4-acre man-made pond with a watershed of about 1,280 acres. It is located in TA 13 and is accessed from MCB-3. Maximum water depth in Dalton Pond is about 9 feet. The fish community of this pond includes largemouth bass, bluegill, redear sunfish, and bullhead catfish. A water control gate at this reservoir is stuck in a closed position so that drawdowns could only be accomplished by pumping. In an August 2005 survey by NREA Branch, all areas of the pond shallower than 8 feet (about 70% of the surface area) were found to contain a dense growth of hydrilla and

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

it remains well-established today.

4. R-6 Pond. It is a 6.6 acre pond near Range 6 in TA 9C. Fed by a 200 acre watershed, the pond contains largemouth bass and bluegill. Largemouth bass are generally overstocked and stunted in growth due to the limited fishing access. It has an improved gravel access road that is kept locked; anglers must hike about 1 mile to gain access to the pond.

5. Barrett Pond. This is a one-acre man-made pond located behind the parade deck at Camp Barrett. It is spring fed and has a 4-acre watershed. In 1966 the pond was drained, cleaned, treated with rotenone, relieved of rank vegetation along the banks and restocked with channel catfish. It was restocked with catfish again in 1972, but has since been unmanaged for fish. The Basic School has proposed the development of a Montford Point Marines Memorial Park near Barrett Pond and would like to establish a fishing program to enhance the park experience, if feasible.

6. Upshur Pond. Upshur Pond is a one-acre man-made impoundment with a watershed of 33 acres located in TA 17A. In 1968 it was drained, cleaned, the drain system repaired, and the banks cut and replanted with grass to retard erosion and silting. The water level often drops to less than 3 feet during summer drought periods. Because of the seasonal low water, no intensive fisheries management efforts are undertaken at this pond. Nevertheless, some bluegill and largemouth bass are present and some recreational fishing does occur.

7. Nolan H. Gray Reservoir. This man-made impoundment is a 1.8 acre body of water that formerly was used as a holding pond to provide potable water to the Mainside of MCBQ. It is located approximately 1.5 miles below Breckenridge Reservoir and is fed directly by Chopawamsic Creek. Bluegill and largemouth bass are found here and snakeheads move up the Chopawamsic Creek watershed to the Gray's Reservoir dam. The reservoir capacity has become greatly reduced due to siltation/sedimentation and water depth currently only averages about 2 feet. In 2011, MCBQ Public Works Branch initiated plans to renovate the reservoir but no further action has been taken yet. A handicapped accessible fishing dock is located along the shoreline where Chopawamsic Creek feeds into the reservoir. Chopawamsic Creek above the reservoir is stocked with trout for recreational fishing. Restoration of the reservoir's depth would greatly expand the recreational fisheries opportunities at this site.

8. Buffalo Pond. Buffalo Pond is a 4.1 acre man-made pond located in TA 4. Access to the pond is permitted only from the Officer Candidate School area via Engineer Road. Largemouth bass, crappie, bluegill, and American eels (*Anguilla rostrata*) were observed here in 2011 and 2012 electrofishing samples collected by VDGIF and NREA Branch personnel.

9. Smith Lake. This 220 acre reservoir is managed by Stafford County for potable water supplies and has a capacity of two billion gallons. A portion of the reservoir is located within the boundaries of the Base. A MCBQ fishing license is required to launch boats or fish from

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

the shoreline within Base boundaries per Chapter 1 of MCBQ 11015.2B. Stafford County has no public access facilities to this reservoir; all public fishing and boating access to the reservoir is provided by MCBQ on Smith Lake Road. The reservoir supports a recreational fishery for largemouth bass, channel catfish, walleye, crappie, bluegill, and redear.

10. Trout Stream. Approximately 3.0 miles of Chopawamsic Creek is managed by MCBQ as a put-and-take fishery, with rainbow trout (*Onchorhynchus mykiss*), brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*) being stocked in the Spring. At the upper stocked portion of Middle Branch, Chopawamsic Creek, a 50 meter section of the stream, Secon Pool, is reserved for fishing by children 12 years old and younger. Restroom facilities are provided at Secon Pool.

### 11. Tidal Waters

a. Tidal waters within MCBQ include 3.9 miles of shoreline bordering the Potomac River, 2.0 miles of shoreline bordering Quantico Creek, and a 377 acre estuary at the mouth of Chopawamsic Creek. The estuary serves as a nursery area for fish and shellfish occurring in the Potomac River, including herring (*Alosa* spp.) which can be seen ascending the stream at the head of the estuary in Spring (Swihart 1980). Fish species reported for tidal Chopawamsic Creek and adjoining Potomac River include blueback herring (*A. aestivalis*), alewife (*A. pseudoharengus*), American shad (*A. sapidissima*), gizzard shad (*Dorosoma cepedianum*), white perch, yellow perch, channel catfish, carp, gar (*Atractosteus spatula*), largemouth bass, bluegill and chain pickerel.

b. SAV. Non-native hydrilla became established in the tidal Potomac River and Chopawamsic Creek in 1989. Eurasian watermilfoil (*Myriophyllum spicatum*) and wild celery (*Valisneria americana*) have also become prevalent. Though some of these species are non-native and invasive plants, the colonization of these waters by SAV has apparently resulted in great improvements in habitat quality for largemouth bass, an important gamefish.

c. Fishing Access. A boat launch ramp for tidal Chopawamsic Creek is located at the Officer Candidate School. Canoeing access to the upper tidal portion of Chopawamsic Creek is available at the Chopawamsic Creek Wildlife Viewing Area. Boating access to Quantico Creek and the Potomac River is available at the Hospital Point boat ramp, accessible via the the Town of Quantico. An accessible fishing facility, the Joe Foxx Shoreline Pier, is located along Chopawamsic Creek at the Marine Corps Air Facility (MCAF). This fishing facility is located in a secure area and appropriate U. S. government credentials are required for access.

d. Northern Snakehead. The Northern snakehead (*Channa argus*) is an invasive species that has become well-established in the Potomac River and its tidal tributaries (Odenkirk and Owens 2007). MCBQ anglers regularly catch snakeheads in tidal waters adjacent to the base, and the U.S. Fish and Wildlife Service (USFWS) began studying



## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

radio-tagged snakeheads in Chopawamsic Creek in 2009 to monitor for impacts on ecosystem processes.

6102. FISHING REGULATIONS. Military personnel and civilians meeting Base Access Control Policy requirements are allowed access to the fishing areas at MCBQ in keeping with the fishing regulations described in Chapter 8 of this INRMP ( see also Appendix B).

### 6103. FISHERIES MANAGEMENT PROGRAM

1. Technical Assistance. Both the USFWS and the VDGIF have provided technical fisheries assistance, professional advice, and fish stocking to MCBQ. The USFWS provides this assistance through its Office of Fisheries Assistance, Gloucester Point, Virginia, and VDGIF provides assistance out of its regional office at Fredericksburg, Virginia.

2. Management Practices. Fisheries management at MCBQ was initiated in 1951. Management has been concerned primarily with maintaining self-sustaining largemouth bass/bluegill fisheries and a put-and-take trout fishery through fertilization, shoreline access improvements, population sampling, stocking, road maintenance, and habitat improvement.

a. Fertilization. A fertilization program was established to increase primary productivity and enhance fish growth and carrying capacity. Ponds were treated with a 20-20-5 fishpond fertilizer at the rate of 40 pounds per acre per application, with 3 to 6 applications per year (Marine Corps Development and Education Command 1975). Pond fertilization requires attention to detail to prevent over-fertilization; the program was discontinued prior to 1983 because the benefits did not seem to justify the costs and potential adverse effects if the timing and application rates of fertilizer were not perfect.

b. Shoreline Access. At most waterbodies on MCBQ, shoreline and riparian areas are being protected as much as possible from land disturbances to control erosion and sedimentation. At Lunga Park recreation areas, shorelines are controlled to improve aesthetics and allow shoreline recreational access for campers by clearing underbrush, thinning tree stands to park-like densities, and, where possible, planting grass to the water's edge.

c. Population Sampling. Sampling of MCBQ-managed waters is scheduled intermittently to provide water quality and fish production data. Sampling has been accomplished in most years using one or more of the following: seines, gill nets, trap nets, and electroshocking (figure 6-1). Sampling results are often expressed in standardized terms, such as relative stocking density of preferred sized fish (RSD-P) and catch per unit effort of preferred sized fish (CPE-P).

d. Stocking. Initial stocking of ponds and reservoirs on MCBQ was considered necessary to obtain the proper species and populations. Additional stocking has been conducted based on sampling data and upon

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the availability of fish at the hatcheries. All stocking has been done per recommendations provided by either the USFWS or the VDGIF.

e. Road Maintenance. All weather paved or gravel access roads have been constructed at all of the MCBQ fishing areas with the exception of Upshur Pond and R-6 Pond. Gravel boat launch ramps are located at Breckenridge Reservoir, Dalton Pond, and the Beaverdam Run access to Smith Lake. The Breckenridge Reservoir boat ramp becomes dry during summer drought periods and boat launching becomes difficult or impossible. The Dalton pond and Breckenridge Reservoir launch sites need improvement. At Dalton Pond, there is no hardened boat launch so weather conditions can make the launch of a trailered boat difficult. At Breckenridge, the launch access channel is too shallow and the outlet into Chopawamsic Creek fills with sediment and leaves.

f. Habitat Improvement. Habitat improvement/manipulations may include regulating water levels, sedimentation control, introduction or control of aquatic plants, and placement of fish structures. Numerous fish structures have been built and placed in Lunga and Breckenridge Reservoirs, and Dalton Pond, by the Conservation Volunteer Program (CVP).

3. Water Quality Protection. MCBQ protects water quality necessary for fisheries by the controlling and reducing of point and non-point pollution sources through a variety of soil and water conservation practices (Chapter 4).

### 6104. POPULATION MONITORING

1. Game Fish. A variety of sampling techniques are used to monitor game fish populations. Effort is focused mostly on determining the size class distributions of popular game fish such as the largemouth bass, black crappie, bluegill, white and yellow perch, and channel catfish. Electroshocking is the primary capture technique but gill nets and hoop style swim-in traps are also used to collect fish samples. Monitoring has also focused on the survival and growth rates of walleye in Lunga Reservoir. All man-made water bodies (ponds and impoundments) have been subject to monitoring but greatest emphasis has been placed on Lunga, Breckenridge, and Smith reservoirs. A brief history of game fish monitoring includes the following:

a. Walleye. Beginning in 1990, the VDGIF stocked 10,000 walleye fry in Lunga Reservoir for three consecutive years beginning in 1990 and then assessed reproductive success in the following years. MCBQ constructed a gravel spawning reef for walleye as part of the study in 1992. Also in 1992, the VDGIF conducted trap netting in Lunga Reservoir to monitor for walleye survival. Although no walleye were detected, the CPE-P for white perch was extremely high. Other species contributing substantially to the capture numbers and weights were brown bullhead and channel catfish.

b. VDGIF and the NREA Branch continued to conduct hoop net, gill net, and electroshocking from 1993 - 2012 to monitor the success of the Lunga Reservoir walleye introduction, the RSD-P and CPE-P of

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largemouth bass populations, and to record any observed changes in abundance of other primary game species. Walleye up to 20 inches were detected in both Lunga Reservoir and Smith Lake, indicating survival of at least one age class; however, no reproduction of walleye was detected. There are no records of Smith Lake being stocked with walleye; it is assumed that some walleye stocked at Lunga Reservoir went through the spillway and travelled downstream into Smith Lake. Largemouth Bass populations at Lunga Reservoir and Smith Lake are similar to populations in other Stafford County lakes, but the CPE-P and RSD-P for this fish is in the lower half of reservoirs monitored by VDGIF elsewhere in northern Virginia. It is believed that the underlying acidic and infertile soils of Stafford County contribute to waters of low conductivity and poor fish production capability. VDGIF concluded that the Lunga Reservoir largemouth bass population is stable and of moderate quality compared to other Northern Virginia district waters (Odenkirk 2001). Bluegill populations in both Lunga and Breckenridge Reservoirs exhibited many quality-sized fish. From 1992 to 2012, the following changes in fish distribution occurred: Lunga developed a good population of quality redear sunfish; white perch declined in Lunga Reservoir and yellow perch became well established; channel catfish declined in Lunga Reservoir and could not be detected in 2011.

### 2. Stream Fisheries Evaluation

a. In 1988, USFWS inventoried fish distribution, evaluated habitat quality, and sampled water chemistry parameters in MCBQ streams. A total of 23 species were captured from 18 stations located in Beaverdam Run, Chopawamsic Creek, and tributaries of Cedar Run. No rare or endangered fish species were detected. Habitat conditions among the stations varied. In most cases riparian vegetation was not disturbed and stream banks were stable. Most sedimentation present in the streams appeared to have originated from activities away from the streams, e.g., tank crossings. Beaver dams and manmade check dams on some streams trapped sediment and appeared to enhance water quality immediately downstream of these structures (USFWS 1988).

b. In 1998 and 1999, George Mason University used U.S. Environmental Protection Agency (EPA) Rapid Bioassessment Protocol V (Plafkin et al. 1989) to evaluate the fish communities and habitat conditions in Base streams, to include Cannon Creek, Goslin Rin, Lucky Run, Mill Branch, all three forks of Chopawamsic Creek, South Fork of Quantico Creek, and the main stem of Chopawamsic Creek. Forty fish species were identified, including all 23 previously identified in the 1988 USFWS survey (Appendix C). Based on the Index of Biotic Integrity (IBI) computed from this study, the quality of almost all MCBQ streams was found to be "very good and perhaps the best found in northern Virginia." This study concluded that "together with Quantico Creek in Prince William Forest Park, MCBQ streams seem to be the best reference sites available in this area (Kelso et. al. 2000)."

3. Natural Heritage Surveys. In 1991, all MCBQ watersheds were surveyed for the presence of any rare, Virginia or federally listed threatened and endangered species (Virginia Department of Conservation and Recreation (VDCR 1992). The federally endangered dwarf

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wedgemussel (*Alismadonta heterodon*) was located in Aquia Creek near the mouth of Cannon Creek bordering TA 7A. Further discussion of this species and protective measures for it is provided in Chapter 7.

4. Invasive Species Surveys. The non-native northern snakehead fish has become established in the Potomac River and its tributaries. The USFWS and VDGIF have both been actively involved in monitoring and research involving this species. Both agencies have used electrofishing surveys in tidal waters adjacent to MCBQ, and the USFWS has tagged and installed transmitters on snakeheads in Chopawamsic Creek for analysis of movements and survival.

### 6105. MANAGEMENT RECOMMENDATIONS

1. Coordinate with VDGIF for sampling of impoundment waters to maintain a database on water quality and fish (centrarchid and ictalurid) populations. Establish database record of specific measurement parameters (i.e., RSD-P, CPE-P, etc.) that may show population trends.

2. Continue put-and-take trout fishing program in Chopawamsic Creek and try to provide organized events for kids, wounded warriors, and military families. Install information kiosks at entry points (see Chapters 8 and 9).

3. Continue to replenish fish habitat structures in Lunga (when it re-opens), Breckenridge Reservoir and Dalton Pond.

4. Maintain public access at Smith Lake, including the road right-of-way, parking areas, and docks (see Chapter 9).

5. Monitor pond water control structures and spillways for beaver blockages and take action as necessary to control beaver-related damage.

6. Install and maintain identification signs and regulatory information at fishing areas (see Chapter 9).

7. Maintain road right-of-way and access to the current launch at Breckenridge Reservoir and install an information kiosk. Clean sediment and leaves from the channel and harden the boat launch area for access by trailered boats.

8. Protect water quality by control of point source pollution and rapid response and clean-up of any hazardous material spills. Control non-point sedimentation pollution of streams by ensuring that permanent Best Management Practices (BMPs) are in place after land disturbing projects are complete, where appropriate. Restore and revegetate damaged training lands and improve stream crossings where erosion is a problem (Chapter 4).

9. Enforce all Virginia and MCBQ fishing regulations and issue citations and/or suspensions for violations of those regulations. Control off-road vehicle traffic in the Chopawamsic Creek fishing area

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and adjacent TAs 6B and 6C.

10. Maintain year-round MCBQ fishing license sales program, including the 5-day trip license and the annual license. License fees will be established per current MCBQ directive in the 11015 series.

11. Maintain dams and spillways by brush cutting and mowing.

12. Maintain trails and walkways to provide pedestrian access at Dalton Pond.

13. Remove or repair weir structures on Chopawamsic Creek below Breckenridge Reservoir. In the meantime, make annual inspections and install/remove flashboards to control water levels during trout stocking season.

14. Renovate Gray's Reservoir to re-establish fisheries recreation opportunities. Grade and rock the parking area and install kiosk to post fishing information. Rock the access trail along Chopawamsic Creek upstream from Gray's Reservoir to provide handicapped access to the trout fishing area.

15. Continuously update fishing and boating regulations for Lunga Reservoir when it re-opens and ensure compliance with those regulations.

16. Conduct SAV surveys in all water bodies and determine the need for controls. Control measures will require environmental review prior to implementation.

17. Maintain surveillance program for non-native invasive plant and animal species, to include snakeheads, in MCBQ surface waters.

18. Improve/harden the boat launch at Dalton Pond with pavers or articulated concrete matting to stabilize the shoreline.

19. Coordinate with VDGIF on fish stocking efforts to restore channel catfish population in Lunga Reservoir.

20. Consider Barrett Pond for development of a Community Lake Improvement Program pond; this would require heavy stocking and more intense management to allow for high fishing pressure in a site with easy access.

21. Provide access and support to USFWS and VDGIF to monitor/study snakeheads in MCBQ waterways. Coordinate with regulatory agencies for authorization to stock oxytetracycline-marked juvenile snakeheads into Buffalo Pond to support VDGIF and USFWS research needs to verify age and growth patterns of northern snakeheads.

22. The recommendations above include biological, regulatory, human dimension and facilities considerations related to managing fisheries resources. Some of these topics are also addressed in Chapters 8 and 9.

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### 6106. REFERENCES

- Kelso, D. P., R. Jones, K. Brittingham, A. Maher, D. Morgan, and E. Tuszynska. 2001. Quantico Marine Corps Base stream monitoring final report. Dept. of Biology, George Mason Univ., Fairfax, Va. 31pp.
- Lotspeich, R.R. 2007. Quality of water and bottom material in Lunga Reservoir, Virginia, September 2004 through August 2005: U.S. Geological Survey Open-File Report 2007-1053, 52p.
- Lotspeich, R.R. 2012. Quality of water and bottom material in Breckenridge Reservoir, Virginia, September 2008 through August 2009: U.S. Geological Survey Open-File Report 2011-1305, 19p., plus appendixes.
- MCDEC. 1975. Fish and Wildlife Management Plan. Natural Resources Management Division, Facilities Department, Marine Corps Development and Education Command, Quantico, Va.
- Odenkirk, J. 2001. Lunga Reservoir Management Report. Va. Dept. of Game and Inl. Fisheries, Fredericksburg, Va. 5pp.
- Odenkirk, J. and S. Owens. 2007. Expansion of a northern snakehead population in the Potomac River system. Transactions of the American Fisheries Society 136:1633-1639.
- Plafkin, J. L., M. Barbour, K. Porter, S. Gross and R. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates and fish. EPA/44/4-89-001. U.S. Environmental Protection Agency, Office of Water.
- Swihart, G. L. 1980. Fishery Management plan for Marine Corps Base, Quantico, Virginia. U.S. Fish and Wildl. Serv., Gloucester Point, VA. 15pp.
- USFWS. 1981. Evaluation of put-and-take trout stocking programs, 1981. U.S. Fish and Wildl. Serv., Fisheries Assistance, Gloucester Point, VA. 38 pp.
- \_\_\_\_\_. 1985. Fisheries survey, Marine Corps Base Quantico, Quantico, Virginia. U.S. Fish and Wildl. Serv., Office of Fisheries Resources, Gloucester Point, VA. 17 pp.
- \_\_\_\_\_. 1987. Fisheries survey, Marine Corps Base Quantico, Quantico, Virginia. U.S. Fish and Wildl. Serv., Office of Fisheries and Wildl. Assistance, Gloucester Point, VA. 25 pp.
- \_\_\_\_\_. 1988. Fish distribution/stream habitat evaluation report, Marine Corps Base Quantico, Virginia - June 1988. U.S. Fish and Wildl. Serv., Office of Fishery Assistance, White Marsh, VA. 12 pp.
- VDCR. 1992. A Natural Heritage Inventory, Marine Corps Combat Development Command, Stafford, Prince William, and Fauquier Counties, Virginia. Natural Heritage Technical Report 92-25, Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, 41 pp.



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a.



b.



c.



d.



e.



f.

Figure 6-1.—Fisheries management activities: a. Creel survey; b. Buoy marker for fish structure; c. Buffalo Pond spillway repair; d. Volunteers deploy weighted trees for fish structures; e. Electrofishing sample; f. Hoop net sample.



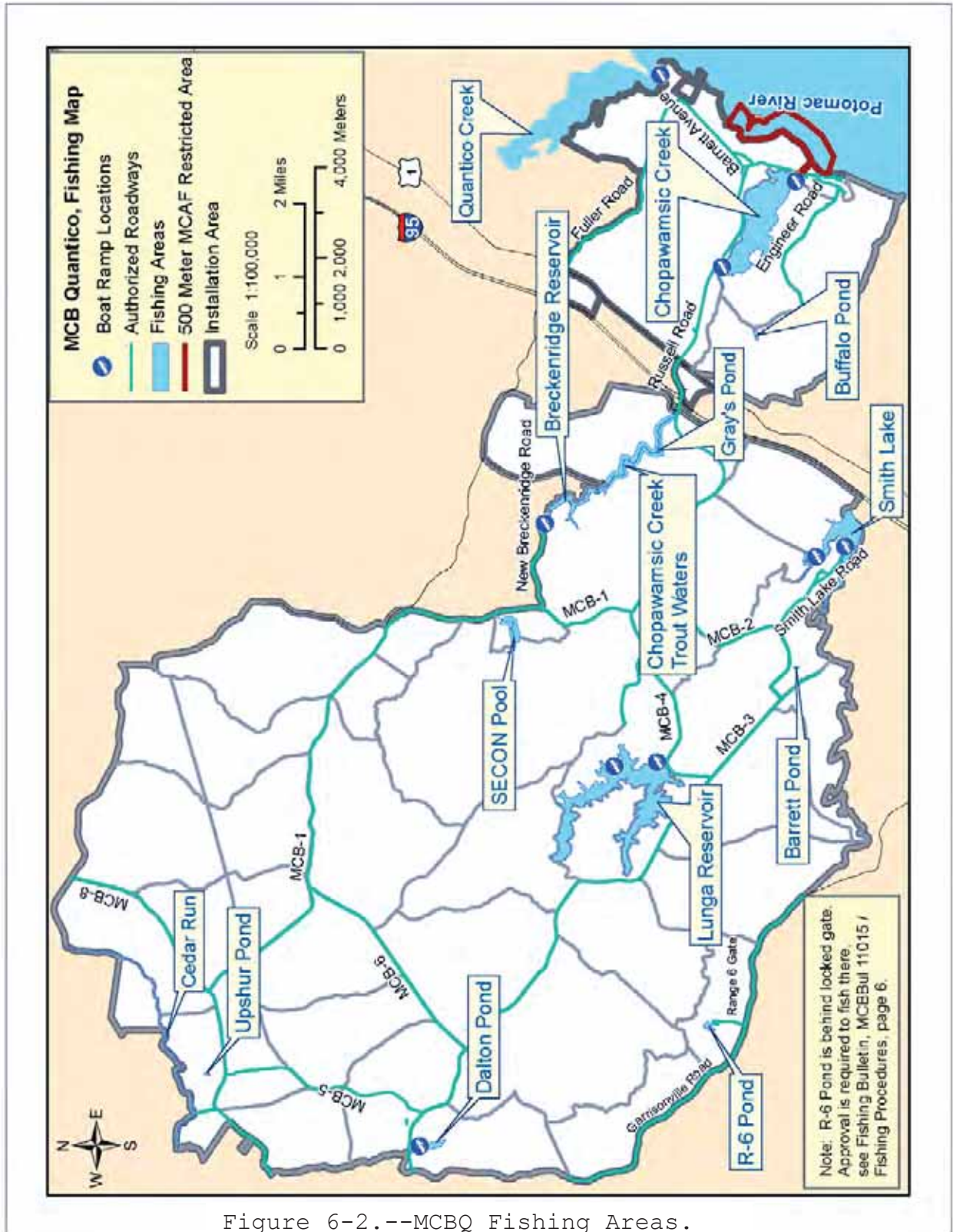


Figure 6-2.--MCBQ Fishing Areas.

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## CHAPTER 6

### SECTION 2

#### TERRESTRIAL HABITAT MANAGEMENT

6200. GOALS AND OBJECTIVES. The management objective is to support and enhance the perpetuation of the animal and plant species native to the MCBQ environs within the mid-Atlantic region. This section focuses on vegetation management within forest and grassland habitats at MCBQ. Chapter 6, Sections 4-8, and Chapter 7, provide descriptions of the habitat requirements for some of the game, furbearer, nongame, threatened and endangered species found at MCBQ. It is not feasible to expect to create optimum conditions for every species within each management unit, i.e., TAs or forest compartment. Some species in this region are adapted to a variety of habitat conditions that are produced within a landscape of scattered patch disturbances while other species are specialized. This plan identifies land management zones based on land usage that can be managed as fire-maintained grasslands, managed forestland with patch disturbances, and mature forestland. It is believed that these management regimes will provide the early, mixed and late successional habitat necessary to support regional biodiversity.

#### 6201. HISTORICAL PERSPECTIVE

1. Virginia is located along an ecological transition zone between the fire-maintained pine ecosystems to the south and the hardwood forests to the north. It is reasonable to believe that fire historically played a significant role in the ecology of the MCBQ land area and the diversity of species that occupy the land. Accounts of early naturalists suggest that Native Americans in the Mid-Atlantic states used fire to maintain grasslands and open forest understories. It is only in the last century that fire suppression resources became available and the influence of fire in the landscape diminished. Fleming et. al. (2000) noted that it is only on military lands in Virginia where "frequent incendiary fires approximate pre-settlement fire regimes and maintain specialized habitat condition and vegetation assemblages."

2. Diseases and invasive species have also altered the MCBQ landscape. A few remaining stems of American chestnut (*Castanea dentata*) continue to grow on Base as a reminder that this species was once part of the forest community. Non-native plants such as tall fescue (*Festuca sp.*) and autumn olive (*Eleagnus unbellata*) were introduced for conservation purposes during the latter half of the twentieth century, but are now unwelcome. The gypsy moth

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(*Lymantria dispar dispar*) caused significant forest defoliation at MCBQ in the past, and will probably continue to have an effect on forest age and composition.

### 6202. TERRESTRIAL HABITAT RESOURCES

1. As described in Chapter 2, terrestrial habitat resources comprise about 94% of MCBQ lands, and forests comprise about 90% of the terrestrial habitat. The suitability of these upland habitats to support different wildlife species is related to the biological requirements of each species for water, space, vegetation structure, and nutrition. TAs, forests, urban areas, and grasslands all contribute to the habitat resources (Figure 6-3). Forested lands are grouped into four primary habitat types: hard mast producing hardwoods (HMHD), mixed pine-hardwoods (PHWD), non-mast producing hardwoods (NMHD), and conifers (CONI). Grasslands are categorized as: fire-maintained grasslands; native grass, scrub and seedlings; cultivated legume/tall grass pastures; cultivated small grain fields; and managed turfgrasses (Table 2-1).

2. Abandoned fields and cutover forestland normally revegetate rapidly in a predictable sequence known as secondary plant succession. Initially, various annual grasses and forbs flourish on the site. By the third year, native perennial grasses such as little bluestem (*Schizachyrium scoparium*) and broomsedge (*Andropogon virginicus*) will be the dominant ground cover. Within two more years, a forest cover will begin to develop with Virginia pine (*Pinus virginiana*) seedlings dominating in most old-field situations. This "old field" pine will gradually thin itself by natural mortality and by 50 years of age, oaks (*Quercus spp.*), hickories (*Carya spp.*) and American beech (*Fagus grandifolia*) will have become established. As the Virginia pines thin further due to wind throw and heart rot diseases, an eastern deciduous hardwood forest will replace the pine. American beech (*Fagus grandifolia*) is believed to be the climax species that will eventually replace oak as the dominant species.

3. Some species, such as bobwhite quail (*Colinus virginianus*), cottontail rabbits (*Sylvilagus floridanus*), blue grosbeaks (*Passerina caerulea*), and common yellowthroats (*Geothlypis trichas*) thrive during the early successional stage dominated by grasses, tree seedlings, and brushy thickets. The pileated woodpecker (*Dryocopus pileatus*) and barred owl (*Strix varia*), on the other hand, prefer dense mature forests with numerous large trees and snags. Generalist species, such as the white-tailed deer (*Odocoileus virginianus*), appear capable of surviving in almost any mixture of vegetation types, but achieve larger body and antler size when large quantities of high quality forage are available (e.g., agricultural crops, acorns and nuts). All of these seral habitat stages from grassland to mature forest provide essential life requisites for maintaining biodiversity.

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4. Management Units. TA boundaries delineate basic land management units at MCBQ. Military exercises, hunting recreation, and other activities are assigned to these specific areas as a means to control the safe and coordinated use of the land area. TAs are further subdivided into forest management compartments used for forest management planning (see Chapter 5 Forest Resources). Forest compartments are subdivided into forest stands of similar age and species composition that represent individual management units. The timber stand coverage in the MCBQ Geographic Information System (GIS) includes the basic cover type map for the installation and identifies the habitat acreage data at Table 2-1.

5. Forest Age Distribution. Forest age has a significant effect on habitat quality. Older forest stands contain large trees that provide nesting cavities for a large group of cavity dwelling species. Scattered dead trees (snags) and decaying logs are normal parts of forest ecosystems, and provide habitat for various invertebrate and vertebrate species. Older trees produce mast crops (e.g., acorns and nuts) that are an important energy source for wildlife, especially during winter. Young stands have important habitat values for species such as woodcock (*Scolopax minor*) and ruffed grouse (*Bonasa umbellus*) that prefer young forest stands with a high density of seedling and sapling stems. Young forests produce a large quantity of forage (Banker and Stauffer 1994) and provide important escape cover for certain wildlife.

6203. HABITAT REQUIREMENTS. During the development of the MCBQ Integrated Natural Resources Management Plan completed in 1997, the U.S. Army Corps of Engineers conducted a literature review of life histories and habitat requirements for some species native to the MCBQ environment. Those findings are summarized in Chapter 6, Sections 4-8, and drive the management action recommendations summarized at Table 6-1 for specific terrestrial species and groups of species (guilds). Basic habitat requirements can usually be related to specific vegetation successional stages (i.e., early successional grasslands and scrub-shrub woodlands, mid-successional woodlands, and late successional woodlands of mast-producing hardwoods). The ecological perspective of this revised INRMP is to match habitat management actions to land use zones in a way that supports military training mission, fire management, watershed protection, outdoor recreation, and other multiple-use land management programs.

### 6204. HABITAT MANAGEMENT ACTIONS

1. Where military use of incendiary devices is high (such as range impact areas), a prescribed burning program is needed to reduce fuel levels to control the severity of wildfires set by

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military training (see Chapter 5, paragraph 5602). Fire management also serves as an important tool for maintaining unique ecological communities (Fleming 2000). In urban areas and protected watersheds, where disturbances such as fire and logging may be neither practical nor permissible, the maintenance of mature forest stands to provide optimum habitat for cavity nesting species can be emphasized.

2. Figures 5-1 and 6-4 identify land-use zones that affect wildlife habitat:

a. The Fully Manageable Zone (1) is where access and management actions are not limited by live munitions, unexploded ordnance (duds), and populated buildings. A broad range of silvicultural and wildlife management actions can be considered for use in this zone.

b. The Limited Access Management Zone (2) is comprised of land areas where access is limited due to factors such as live fire surface danger zones (SDZ), traffic congestion, recreation areas, and developed areas. Areas impinged upon by SDZ are off-limits when the ranges are "hot" (i.e., in use), but are accessible during periods when the ranges are "cold" (i.e., not in use). A broad range of natural resource management and recreation programs are feasible as long as they can be scheduled and completed during cold range time (i.e., hunting, mowing, planting, and firewood gathering). Actions taking weeks or months, such as commercial forest harvest contracts, are possible, but are more difficult to implement due to the time and access constraints.

c. The Special Conditions/Restricted Zones (3-6) are comprised of Unexploded Ordnance (UXO) range impact areas, tenant lands, developed lands and fenced lands, where natural resources management actions are highly by explosive hazards, the proximity of occupied buildings, or restricted access. Practices to control forest pests, protect watersheds and water quality, reduce animal damage, and provide public natural history education programs are emphasized in these areas vice programs to harvest natural resources.

3. Forest Management

a. The habitat management program takes interest in the long-term development of the forest community as measured by habitat indicators such as the age distribution of forest stands and interspersions of different forest types. Some of the primary forest management actions planned to occur in the management zones are summarized below, and correlate with the silvicultural systems discussed in Chapter 5, paragraph 5404.

b. Zone 1. Forests will generally be managed on a commercial even-aged rotation of 50 years for pine and 100 years



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for hardwood forests. Some uneven-aged management in hardwood compartments will be practiced along riparian zones and within some timber stands, depending upon forest age distribution, wildlife habitat needs, and military training requirements. Current and future predicted forest habitat age-class distribution in Zone 1 would result in a forest comprised of various aged conifer and mast-producing hardwood stands. This mosaic would create many high-contrast edges per unit area and would be supportive of a wide diversity of forest birds and small mammals (Penhollow and Stauffer 2000; Williams and Stauffer 2000).

c. Zone 2. Forest stands on the perimeter of this zone may be harvested opportunistically using standard silvicultural guidelines during periods that the land is accessible. Since access is unpredictable, it is not likely that a sustained yield management plan can be executed. Some timber stands within the interior of the zone will likely never be accessible for harvest and can be expected to grow into mature hardwood stands, unless disrupted by catastrophic events. These timber stands should provide excellent habitat for forest interior species. Fire, storms, insect damage and logging are expected to create some early successional habitat along the zone's perimeter.

d. Zones 3-4. In these zones, commercial timber harvests are expected to take place only to clear land for construction purposes, to salvage timber following natural disasters (e.g., storm and insect damage), and to remove hazardous trees. In the absence of either commercial logging or natural disturbances in this zone, the forest age structure will continually increase until the majority of the forest exceeds 100 years of age.

e. Oak Mast Production. The silvicultural systems described above and in Chapter 5 should provide for an adequate component of mature mast-producing oak trees to remain on the landscape. That is important because acorns provide a significant energy supplement to the diet of many wildlife species in the eastern deciduous forest.

(1) Acorn production varies from year to year, which affects populations of many wildlife species. An annual oak mast production survey was initiated at MCBQ in 1973 to serve as an index of acorn production by red/black and white oak species (Figure 6-5). Production for both red/black and white oaks is highly variable from year to year, reinforcing the need to monitor and address oak mast production to improve the chances that an adequate supply of food is available in all years. Because of the yearly deviations of acorn abundance, the presence of other hard mast-producing tree species such as Hickories (*Carya* spp.), black walnut (*Juglans nigra*), American beech, black cherry (*Prunus serotina*), and dogwood (*Cornus florida*) become increasingly important when oak mast is deficient. Therefore, a comprehensive approach to hard mast species management is



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required to account for the needs of wildlife.

(2) An estimate of the acorn production capability of MCBQ forests is shown at Figure 6-6. Many oak species in this region begin acorn production when they reach 10 inches or greater diameter breast height (dbh), with production increasing as the trees continue to grow. The specific acorn production for white oaks, chestnut oaks, northern red oaks, and southern red oaks (Shaw 1971) was applied to MCBQ forest inventory data on the number of oak trees per acre, and the average diameter of acorn-producing trees by habitat type for each 10-year age class. The resulting estimates are represented in a production value in pounds per acre.

f. Cavity Trees. Cavity trees are important to numerous wildlife species on both upland and riparian sites (Balda 1975, Dickson et al. 1983). Although standing dead trees are generally removed in traditional timber harvest programs, some snags should be left standing unless the snags present a hazard to human life or property.

#### 4. Non-forested Habitat Management

a. Over 5,500 acres of open, non-forested habitat exists at MCBQ. Nearly half of this area (2,609 acres) is associated with improved grounds such as housing areas, administrative buildings and grounds, parade decks, rifle ranges, and recreation areas. Some improved grounds, such as parade fields, athletic fields, golf course, and rifle ranges provide considerable wildlife forage incidental to their primary purpose. The remaining permanently managed open acreage includes semi-developed grounds that are maintained as landing and drop zones for military training, utility right-of-ways, and wildlife openings. The landscape in the high explosive impact area remains open due to frequent burning caused by military munitions. The majority of the military training site open areas either incidentally, or through active management, also provide wildlife habitat. All non-forested areas require active disturbance to prevent forest regrowth; agronomic practices, mowing, and fires, both wildland fires and prescribed burning, are the actions that sustain these grassland habitats.

b. Managed Openings. Wildlife management goals for managing permanent openings are: to maintain a high-protein forage cover for white-tailed deer; to maintain early successional fields of native grasses and forbs to provide food, cover, and brood habitat for small game (quail, dove, rabbits); to provide brood and year-round foraging habitat for wild turkeys (*Meleagris gallopavo*); and to provide old field/edge habitat preferred by numerous non-game species. Early successional fields also provide habitat for insectivorous birds and bats that feed on insects attracted to the flowering plants. Tables and maps identifying managed openings are provided at Appendix C.

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### c. Conservation Plantings

(1) Currently, about 130-150 acres of MCBQ are cultivated annually for warm season (Spring) and cool season (Fall) plantings. Warm season plantings normally consist of millet, corn, buckwheat, sunflower, and milo. Plantings of native warm season grasses along road shoulders and selected fields may enhance bobwhite quail habitat. Cool season species include ladino clover, wheat, rye and alfalfa. Conservation plantings are normally done by conventional tillage where the seed bed is prepared by primary and secondary tillage to incorporate all residual plant material into the soil. Occasionally, the no-till method is used to drill seeds into a sod layer that has been killed by herbicide applications. Soils at MCBQ typically have a low pH, low natural fertility and require the application of lime and fertilizer to promote plant growth. Hence, under both methods, soil tests are run on the area prior to planting to determine the appropriate quantities of lime and fertilizer required for plant growth.

(2) Conservation planting of selected fields is generally done on a 3-5 year rotation. In year 1, warm season annuals are planted and left unharvested in the field through the winter and into the subsequent Fall. This fallow period encourages the growth of highly nutritious forbs to provide foraging habitat and overhead cover during the following summer. In the Fall of year 2, the field will be planted with a cool season mixture of cereal grain and perennial legumes. Legumes have the unique ability of nitrogen fixation in the soil, which improves soil fertility by retaining nitrogen for the accompanying cereal grain and for future plantings. After fall planting, the fields are typically mowed intermittently for 2-3 years to maintain the legume/grass pasture.

(3) Deer ecology researchers have indicated that deer habitat quality could be enhanced by managing forage crops in distributed openings over at least 2 percent of a management unit (Kroll 1995). Only TAs 14, 15, and 17 have enough cultivated openings to meet the minimum recommendation for deer. An additional 604 acres in the TAs areas would be needed as follows: TA 5, 56 acres; TA 6, 70 acres; TA 7, 36 acres; TA 8, 5 acres; TA 9, 108 acres; TA 10, 72 acres; TA 11, 108 acres; TA 12, 7 acres; TA 13, 19 acres; and TA 16, 123 acres.

(4) Planted conservation plots also enhance the nutritional value of the plants foraged by wildlife. For example, a cool season planting normally produces at least ten tons of highly nutritious browse per acre (Koerth and Kroll 1994). In particular, legumes, such as ladino clover, provide high protein forage (approximately 14-17% crude protein) that is also highly digestible and rich in calcium. The high protein/nutrient content of the cool season plantings counters the natural drop in native forage to 10-12% crude protein content

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by mid-July (Koerth and Kroll 1994). The higher calcium content also is important for bone and antler formation, and influences birth weights. Moreover, cereal grains (e.g., wheat, rye, barley) provide forage early in the Spring and are good sources of phosphorus, which is important in milk production (Kroll 1995).

d. Erosion Control Plantings. Unmaintained stream crossings, abandoned tracked vehicle routes, and road rights-of-way are subject to deterioration, erosion, and development of gullies. Hence, stabilization and replanting of disturbed sites is often done as a joint watershed protection/wildlife management project. Replanted areas can provide cover and forage for wildlife species, as well as, erosion buffers to protect aquatic species downstream. Erosion control plantings often require the application of specialized erosion control materials and engineering practices to control water runoff, such as erosion control blankets, straw mulch, turn-outs, retention ponds, and rock weirs.

e. Agricultural Equipment. The Fish, Wildlife and Agronomy Section operates and maintains farm tractors and a variety of mowers, disc harrows, plows, planters, and spreaders to accomplish vegetation management tasks.

f. Mowing. Managed openings that are not cultivated or prescribed burned during a year may be mowed to control the encroachment of woody vegetation and to release previous plantings of ladino clover. Military training operations may require mowing to ensure clear sight lanes. However, even when this is the case, some strips will be left unmowed in larger fields to produce forage, seed and cover for game and non-game animals. In these instances, mowing is delayed until after the primary breeding season for ground nesting birds and mammals, unless military training needs require otherwise. Mowing, however, does have negative repercussions that must be considered when deciding to use it as a management tool. For example, mowing promotes grass monocultures and encourages the spread of fescue. Thus, mowing should be minimized and used in conjunction with early growing season prescribed fires. Much of the range mowing is done by the Facilities Management Section (FMS) but the Natural Resources and Environmental Affairs (NREA) Branch mows portions of the Landing and Drop Zones listed at Table 6-2.

g. Prescribed Burning. While grasslands near range impact areas are the most susceptible areas to wildfire, virtually all woodlands throughout the Base are subject to wildfires caused by military incendiary devices. To control the threat of severe wildfires, the Fire Management Program, Chapter 5, addresses the firebreak system and prescribed burning program. For example, primary range areas are annually burned to alleviate the most direct threat of wildfire (see Figure 6-4 depicting a fire management area for the corridor from Range 3 in TA 7 to the

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Anti-Armor Tracking Range (R-9) in TA 15). In a wildlife habitat management context, such prescribed burns connect frequently burned range areas to create a corridor of continuous grassland habitat for species such as bobwhite quail. In other areas, patchy burns are implemented to benefit wildlife such as quail, which need some patches of unburned grasses to provide nesting sites during the next breeding season. In all instances, military training requirements and fire danger ratings take priority in influencing the exact timing of burning. Generally speaking, however, the majority of burning will be accomplished during the early Spring months just prior to green-up. Additionally, the U.S. Forest service recommends that loblolly pine stands be prescribe burned every 3 to 5 years to enhance habitat quality for white-tailed deer and turkey (U.S. Forest Service 1980), however, there are too many scattered stands and not enough favorable weather days to implement that recommendation at MCBQ.

h. Invasive Species Control. Executive Order 13112 directs federal agencies to prevent the introduction of invasive species, and to control, monitor, and restore native species. To accomplish this, the Base Exterior Architectural Plan (BEAP) requires the use of native and/or non-invasive species for Base landscape plantings. Some highly invasive plant species at MCBQ are tall fescue (*Festuca arundinacea*), autumn olive (*Elaeagnus umbellata*), sericea (*Lespedeza cuneata*), Chinese silvergrass (*Miscanthus sinensis*), tree of heaven (*Ailanthus altissima*), bamboo (unkown species), kudzu (*Pueraria lobata*), and Japanese knotweed (*Fallopia japonica*). Some control efforts have been made on Base against tall fescue, autumn olive, bamboo, and kudzu as described below.

### (1) Tall fescue

(a) Tall fescue is a non-native dense, sod-forming grass that is found in many of the managed openings and improved grounds on MCBQ. For many years tall fescue was the grass of choice for landowners and farmers in Virginia. However, tall fescue is an extremely aggressive grass species that quickly displaces native grasses and spreads to areas not originally seeded. It forms a dense matted sod that inhibits travel and foraging of quail and other small animals. Compounding the problem, tall fescue often contains the toxic, fungi-produced compounds ergotamine and ergovaline. These compounds have been linked to sickness and reproduction problems in ruminants and rabbits.

(b) In the Falls of both 1993 and 1994, approximately twenty acres of tall fescue were treated with glyphosate herbicide. Short-term reduction of tall fescue was noted; but within two growing seasons tall fescue was again the dominant ground cover. Corn crops planted over fescue sod at MCBQ were effective in shading out tall fescue and provided some short-term

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reduction in fescue cover. From experience gained on Base, repeated combinations of mechanical, chemical, and agronomic practices appear to be more effective in reducing tall fescue abundance than any single practice.

(2) Autumn Olive. Autumn olive was once widely used for wildlife and erosion control plantings in the Eastern United States. Extensive hedgerows of autumn olive were planted in TAs from the late 1960s - 1984 and readily formed naturalized thickets. It is now considered a pest species, particularly where it has encroached into open training lands. Mechanical treatment (bulldozing) followed in the next year by either mowing or tillage has been successful to remove autumn olive and reclaim woodland openings.

(3) Bamboo and Kudzu. Bamboo is not prevalent on Base but occurs in TA 8 and it is speculated that it was planted to simulate Southeast Asian forest understory conditions. NREA Branch had success killing kudzu and bamboo using glyphosate herbicide applied to fresh cut stems but did not achieve 100 percent mortality for either species. Multiple sprayings of the herbicide will be required for long-term control.

i. Integrated Vegetation Management (IVM). IVM is a facet of integrated pest management that utilizes a combination of chemical and mechanical controls to produce a sustainable vegetation community. This practice is most appropriate for utility rights-of-way, target ranges, and landing zones where minimizing cost for long-term sustainment of plant height and composition is important. For example, Dominion Power started an IVM program on their powerline rights-of-way on Base in 2013 to control woody plants and promote a grassland habitat that rarely requires mowing. Herbicides used are reported to the MCBQ Pest Management Program.

j. Fruit and Nut Trees. Over 300 old homesites occur at MCBQ, with diverse landscapes utilized by a variety of wildlife. Many of the sites have foundation rubble, naturalized daffodils, and remnant orchards of pear (*Pyrus sp.*), apple (*Malus domestica*), and black walnut (*Juglans nigra*) trees. Pruning, releasing competitive species, and replanting can help maintain the fruit and nut production in these areas.

### 5. Riparian Zones

a. Riparian habitats occur throughout the Base in association with streams and tributaries. Riparian habitats are considered to be among the most productive and valuable of all natural systems. These ecosystems play a critical role in maintaining regional biodiversity and are generally characterized by a combination of high species diversity, high population densities, and high productivity. Riparian vegetation also helps control erosion and functions as a buffer to protect streams from

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the potential impacts of adjacent land uses.

b. Chesapeake Bay Act Riparian Protection Area (RPA) and Streamside Management Zones (SMZ) are established on perennial and intermittent streams, as described in Chapter 4. In addition to their function of controlling non-point sources of pollution, these zones can serve a wildlife management function by providing large live and dead trees for nesting and escape cavities. For example, tall trees along the edges of reservoirs, ponds, and rivers can provide nesting habitat for bald eagles (*Haliaeetus leucocephalus*) and ospreys (*Pandion haliaetus*). Herbaceous vegetation along wetland edges also provides shelter for frogs, snakes, turtles, and small mammals. As such, VDGIF recommends that RPA and SMZ zones be increased from 100 feet to 100 meters, where feasible.

6205. HABITAT MANAGEMENT PROJECTS. Table 6-1 provides a summary of the recommended habitat management actions for the terrestrial wildlife that will be addressed in further detail in sections 4-8 of this chapter. Terrestrial habitat management projects based on these actions are summarized as follows:

a. Forest Habitat Management. Evaluate management proposals in 3-5 forest compartments annually (about 3,000 acres) on the 10-year entry cycle described in Chapter 5, using members of the NREA forestry, wildlife biology, and agronomy programs. The evaluation will result in ecosystem management prescriptions to integrate forest operations with military training, sustainable wildlife habitat development, threatened and endangered species protection, and water quality protection. Habitat management recommendations resulting from this coordination may include:

(1) Intersperse small (average 20 acres) regeneration harvests through areas of mature timber.

(2) Maintain species diversity within forest compartments by retaining cavity and snag trees.

(3) Retain 50% or more of compartment acreage in timber 40 years or older to promote hard mast production. Monitor oak mast production.

(4) In riparian corridors, leave large snags for cavity and den trees and selectively harvest small pockets of short-rotation soft hardwoods (NMHD) so that forest regrowth will provide early successional habitat for American woodcock.

b. Old Homesites. Maintain and release the approximately 500 fruit/nut trees in orchards and homesites to sustain these sources of hard and soft mast for wildlife food.



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c. Conservation Plantings. Maintain as many acres as possible in scattered managed openings. TAs 5, 6, 7, 8, 9, 10, 11, 12, 13, and 16 have a combined deficiency of 604 acres of cultivated openings. In conjunction with other land management programs (e.g., military range development, erosion control plantings, and logging) additional acres should be returned to a herbaceous cover type through conservation planting to the extent practicable.

d. Prescribed Burning. Use prescribed burning as frequently as possible to stimulate herbaceous growth in grasslands and in forest understories. Develop fire management corridors near primary impact/range areas to promote grassland dependent species.

e. Control Invasive Plants. Implement an Invasive Plant Control Plan to: restrict the use of non-native plants in landscape plantings; establish methodology and logistics for the judicious use of chemical controls for non-native/invasive species; and selectively apply control measures to non-native/invasive species encountered. Any species impacting the quality of military training space shall be managed first. Species potentially encroaching into threatened or endangered species protection zones shall be managed second. All other controls shall be implemented based where treatment is practical (i.e., kudzu, where a localized infestation can be readily treated).

### 6206. REFERENCES

- Anderson, S. H. 1979. Habitat structure, succession and bird communities. Pages 9-21 In Workshop Proceedings: Management of North Central and Northeastern Forests for
- Balda, R. P. 1975. Vegetation structure and breeding bird diversity. Pages 59-80 In Proceedings: A Symposium on the Management of Forest and Range Habitats for Nongame birds. USDA For. Serv. Gen. Tech. Rep. WO-1.
- Banker, M. E. and D. F. Stauffer. 1994. Modelling white-tailed deer habitat quality and vegetation response to succession and management. Dept. of Fisheries and Wildl. Science, VPI&SU, Blacksburg, Va. 148 pp.
- Dickson, J. G., R. N. Conner, and J. H. Williamson. 1983. Snag retention increases bird use of clear-cut. J. Wildl. Manage. 47:799-804.



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- Fleming, G. P., K. M. McCoy, and N. E. Van Alstine. 2000. An inventory of the fire-maintained grasslands and woodlands at Marine Corps Base, Quantico, Virginia. Natural Heritage Tech. Rep. 00-04. Va. Dept. of Cons. and Rec., Div of Nat. Heritage, Richmond. 17 pp. plus appendices.
- Giles, R. H., Jr. 1978. Wildlife Management. W. H. Freeman and Co., San Francisco, Calif. 416 pp.
- Koerth, B. H. and J. C. Kroll. 1994. The southern food plot manual, 1<sup>st</sup> Edit. Center for Applied Studies in Forestry, Nacogdoches, Tx. 132 pp.
- Kroll, J. C. 1995. Better nutrition means better deer. North American Whitetail, Game and Fish Publications, Marietta, Ga.
- Penhollow, M. E. and D. F. Stauffer. 2000. Large-scale habitat relationships of neotropical migratory birds in Virginia. J. Wildl. Manage. 64(2): 362-373.
- Shaw, S. P. 1971. Wildlife and oak management. Pages 84-89 In Proc. Oak Symp., Northeast For. Exp. Sta., USDA For. Serv., Upper Darby, Pa.
- Williams, J. M., and D. F. Stauffer. 2000. Small mammal demography and habitat associations in 4 forest cover types on Quantico Marine Corps Base, Virginia. M.S. Thesis, VA Tech. 208pp.

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Figure 6-3.--Habitat Resources (clockwise from upper left): cultivated openings, landing zones, forests, grasslands and fruit/nut producing tree plantings.

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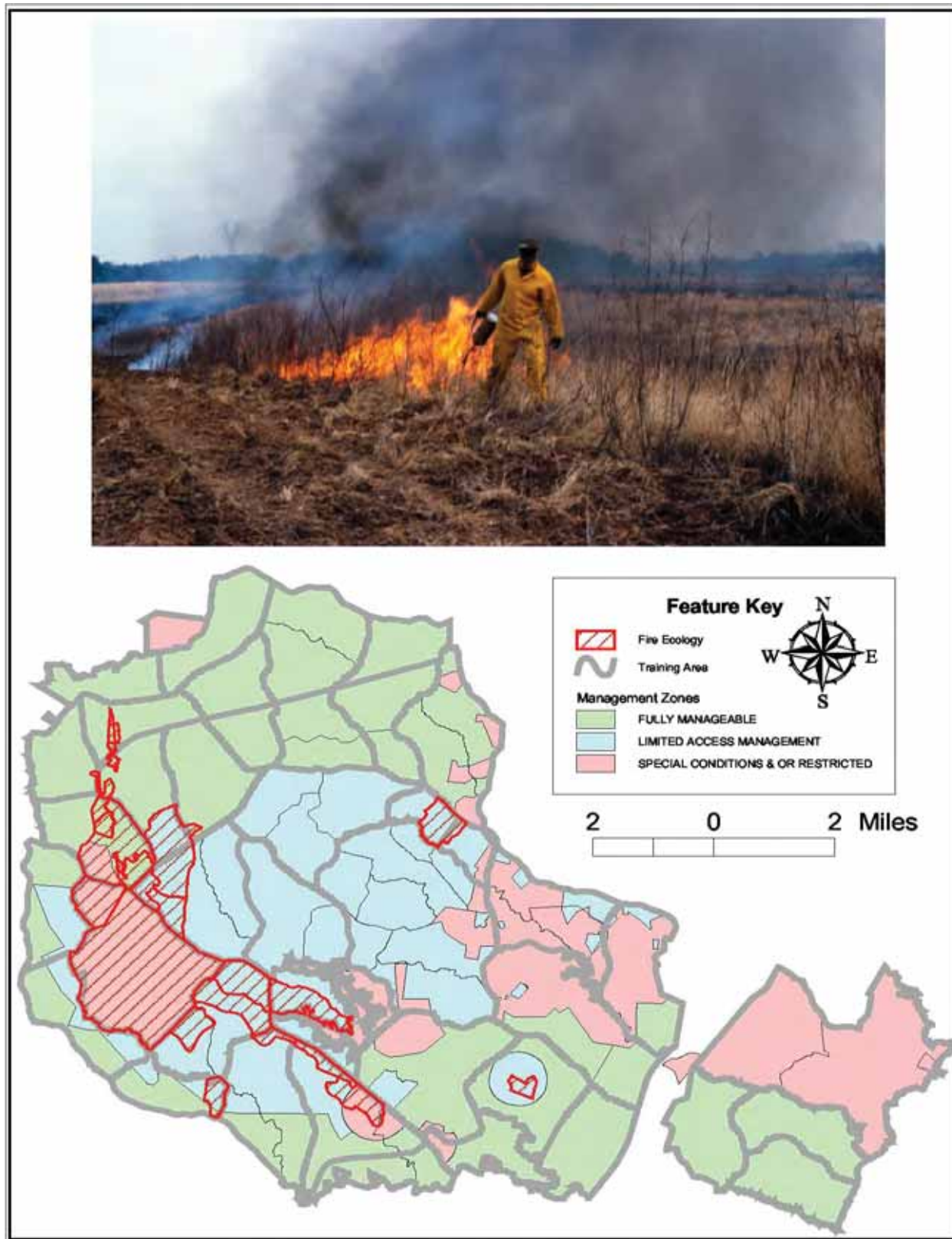
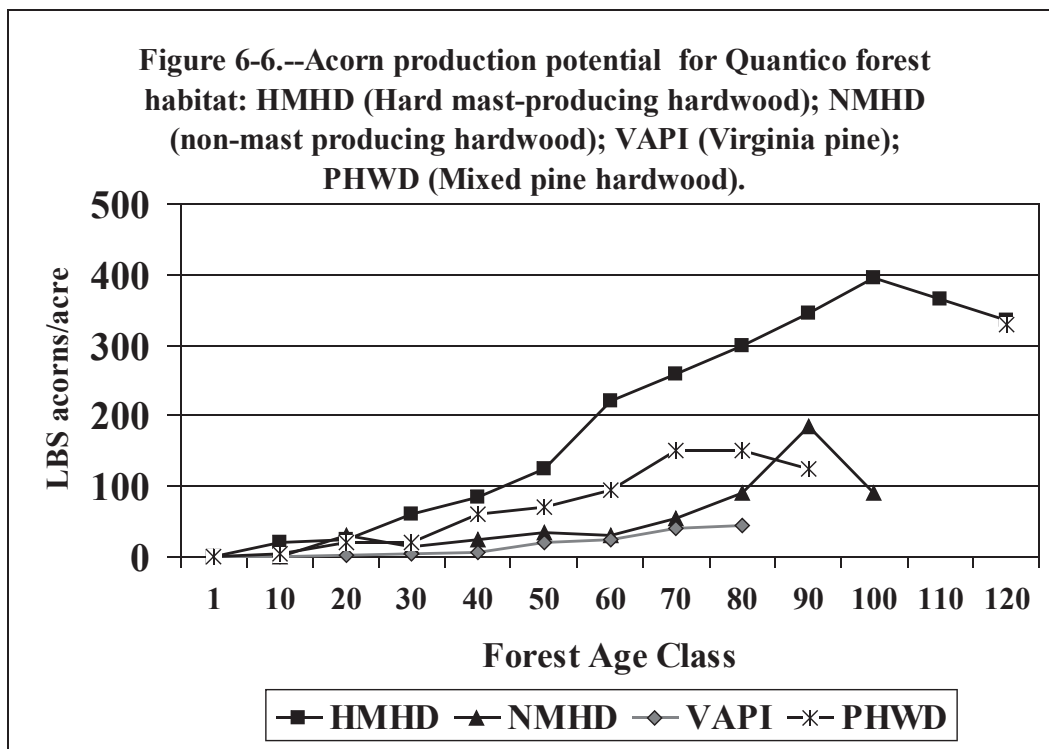
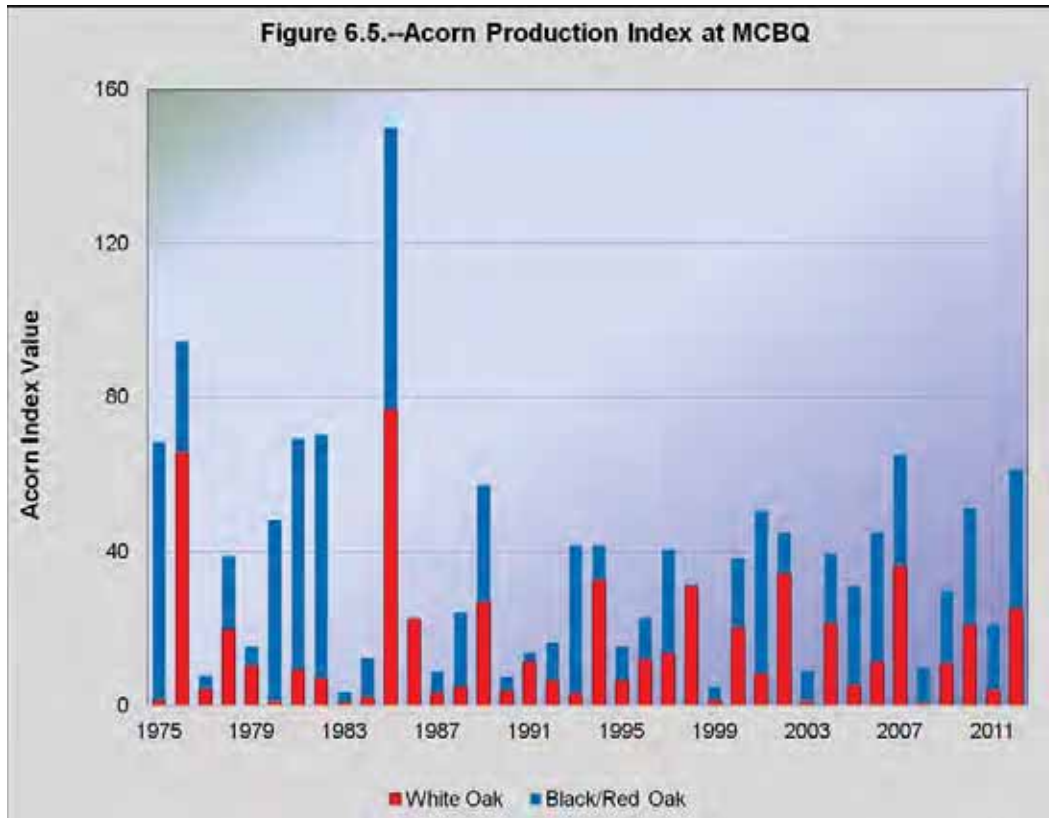


Figure 6-4.--Land management zones and fire management area.



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Table 6-1. Summary of recommended terrestrial habitat management actions.		
<u>Species</u>	<u>Management Actions</u>	
	<u>Forestland</u>	<u>Open Land</u>
Wild Turkey	<p>Interspersion of small cutover units (&lt;25 acres) with mature forest units recommended.</p> <p>Maintain mature riparian habitat stringers adjacent to cutovers.</p> <p>Selective harvesting, uneven aged management, recommended for hardwood stands.</p> <p>Release orchards and homesteads.</p> <p>Prescribed burn 1-3 year interval in pines and open fields.</p> <p>Maintain 60% of forest in mast producing stands.</p> <p>Rotations 100 years or greater in hardwood and 50 years or greater in pine.</p>	<p>Exclude mowing late April-late June.</p> <p>Maintain 3% of habitat or 3-8 openings per mi<sup>2</sup>.</p> <p>Brood habitat of grassy openings or young cutover critical.</p>
Quail & Rabbit	<p>Fire-maintained open canopy pine silviculture. Thin basal area to 50ft<sup>2</sup>/acre.</p> <p>Prescribed burn at 1-3 year rotation. Late spring &amp; growing season burns desirable for hardwood control.</p> <p>Leave slash piles during site preparation.</p>	<p>Develop fire management corridor connecting fields (&gt;10 acres) of warm season and cultivated grasslands. Concentrate in TA's 7, 9, 10A, 14, and 15.</p> <p>Eliminate tall fescue.</p> <p>Use disking or planting rotations to maintain brood habitat of overhead grass that is sparse at ground level. One 1/10 acre plot per 20 acres of quail habitat.</p>



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Table 6-1 (continued). Summary of recommended terrestrial habitat management actions.		
<u>Species</u>	<u>Management Actions</u>	
	<u>Forestland</u>	<u>Open Land</u>
Woodcock, Ruffed Grouse	<p>Small scattered clearcuts and log decks for courtship arenas (woodcock).</p> <p>Leave large logs on ground after logging for drumming logs (grouse).</p> <p>40 year timber rotation in soft hardwoods.</p> <p>Small strip clearcuts in riparian zones.</p> <p>Propagate fruit orchards (grouse).</p> <p>Control deer herd to help retain low vine cover.</p>	
Dove		<p>Include warm seasons grains in planting rotations for fields &gt;4 acres.</p>
Gray Squirrel	<p>120-140 year timber rotation.</p> <p>Maintain 40-60% of timber within management compartment in mast producing habitat.</p> <p>Maintain species diversity: dogwood, blackgum, pine, hickory, all are important food sources.</p> <p>Maintain at least 6 den trees per acre.</p> <p>Small selection cuts &amp; uneven aged timber management preferred.</p> <p>Keep clearcuts &lt; 20 acres.</p>	

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Table 6-1 (continued). Summary of recommended terrestrial habitat management actions.		
<u>Species</u>	<u>Management Actions</u>	
	<u>Forestland</u>	<u>Open Land</u>
White-tailed deer	<p>Scattered timber harvests, each 20 acres or less.</p> <p>Prescribe burn at 3-5 year intervals in pines.</p> <p>Maintain 50% of forest <math>\geq 40</math> years of age to enhance hard mast production. Perpetuate oaks.</p>	<p>2% or more of deer management areas cultivated to enhance protein forage production.</p>
Terrestrial Furbearers	<p>Intersperse small irregularly shaped clearcuts through forestland to enhance rodent production.</p> <p>Retain snag and den trees.</p> <p>Maintain diversity of forestland species; promote fruit, soft, and hard mast species.</p>	
Songbirds	<p>50% forest reserved from cutting and other 50% cut even-aged on 80 year rotation.</p> <p>Retain at least 8 dead trees (snags) per acre for nest cavities.</p> <p>Leave mature, big trees <math>&gt; 20</math>" dbh in riparian zones.</p> <p>Allow fallen logs to remain on forest floor.</p> <p>Use pesticides judiciously to avoid elimination of food supply for insectivores.</p>	<p>Eliminate tall fescue from semi-improved grounds. Emphasize use of native bunchgrasses and forbs.</p> <p>Develop backyard habitat programs for edge management at schools and public areas.</p>
Pileated Woodpecker	<p>Maintain <math>&gt; 0.17</math> snag (<math>&gt; 15</math>" dbh) per acre.</p>	<p>Note: benefits barred owls and other cavity nesters.</p>



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Table 6-2. Landing and Drop Zones under cultivation program.		
LANDING ZONE NAME (Alternate Name/Location per Appendix C Maps)	TRAINING AREA	ACRES
Albatross (Bunker Agout A&B)	17A	17.4
Buzzard	15A	24.5
Canary	16B	2.8
Chickadee (Bishop's A-E)	15A	5.8
Chicken (Confederate Springs)	10A	0.5
Condor (Stung Fields)	10C	6.9
Cuckoo (R-9 Burn Area)	15A	14.1
Dove (Shortleaf Pine 4)	7B	2.2
Eagle (Tops Secret A&B)	16B	1.1
Falcon (Wysteria)	6B	2.4
Goose (Dumpster)	15A	3.0
Goshawk (R-9 Burn Area)	14A	26.0
Hawk (Paulownia)	5B	0.6
Hen (Sawmill)	7B	6.9
Hummingbird (R-9 Burn Area)	15A	3.6
Mallard	11B	2.6
Martin (Hamilton's Trail Fields)	16G	1.6
Parrot (R-9 Burn Area)	14B	6.9
Pelican	15B	18.0
Penguin	15C	3.0
Pigeon (Hayfield Farm)	16G	4.7
Pheasant	16A	3.8
Quail	11A	1.9
Starling	5A	5.8
Stork (R-9 Burn Area)	15A	51.2
Toucan (Oak)	17A	13.3
Turkey	14B	8.0
Woodpecker	11A	0.8
Wren (Orchard)	11A	1.5
DROP ZONE NAME		
Cockatoo	8A	42.0
Raven	8B	21.0
NREA maintains part of these areas with annual plantings; uncultivated portions are typically kept mowed by either NREA Branch or Facilities Management Section.		

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## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 3: WATERFOWL/WETLAND HABITAT MANAGEMENT

##### 6300. INTRODUCTION

1. Waterfowl are highly prized by the American public for hunting, wildlife viewing, and their natural beauty. In 1988 the Department of Defense (DoD) entered into the Atlantic Coast Joint Venture (ACJV) to implement the North American Waterfowl Management Plan (NAWMP) on military lands for the benefit of waterfowl and other associated wetland species. Subsequently, in 1989, the USFWS worked with MCBQ to complete a cooperative plan to manage waterfowl resources in accordance with the NAWMP. (USFWS and MCCDC 1990).

2. The primary objective of waterfowl management at MCBQ under the cooperative plan is to support the NAWMP by increasing and/or enhancing the availability of wetland habitat needed to support both brood rearing and wintering habitat for waterfowl. The wood duck (*A. sponsa*), mallard (*Anas platyrhynchos*) and black duck (*A. rubripes*) are three important year-round resident species at MCBQ that are covered by the NAWMP. The Canada goose (*Branta canadensis*) and tundra swan (*Cygnus columbianus*) are other species found at MCBQ that are highly visible due to their size and to their habitat overlapping with areas frequented by humans. Table 6-3 provides a listing of the waterfowl species that have been observed at MCBQ and documents that the Quantico region attracts numbers of migratory waterfowl.

3. In addition to cooperating with the USFWS, the MCBQ waterfowl management program is also coordinated with the VDGIF. The VDGIF is a member of the ACJV to conduct management actions in support of the NAWMP; VDGIF also sends a representative to the Atlantic Flyway Council, which contains representatives from all the agencies that have management responsibility for migratory bird resources in the Flyway.

6301. WETLAND HABITAT RESOURCES. The USFWS National Wetlands Inventory identifies approximately 3,905 acres of palustrine, riverine, and lacustrine wetlands at MCBQ (See Chapter 2). These habitats, particularly the open water, emergent and scrub/shrub types are the most often used by waterfowl for feeding, loafing, and nesting habitats. The most important wetlands for waterfowl located on MCBQ property are found in the lower Chopawamsic Creek drainage where a complex of over 400 acres of open water, tidal emergent, and intertidal emergent wetlands attract hundreds of migratory and resident birds. Plants of these wetlands are listed at Table 6-4.

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### 6302. WATERFOWL SPECIES OCCURRENCE AND HABITAT REQUIREMENTS

#### 1. Wood Duck

a. The wood duck is a common breeding resident of MCBQ. From late February through April, the wood duck is commonly seen singly, or in small groups, throughout the Base's palustrine emergent and open water habitats when they establish breeding territory and mate. After broods hatch in May and new vegetation becomes thick, wood ducks are rarely seen on MCBQ until late summer when a wood duck roost of up to 500 birds may form in the Chopawamsic Creek tidal area. After the roosting period, wood ducks migrate and become scarce during the colder winter months of December and January, until they start returning in February for the mating season. Beaver ponds and the flooded woodlands of the lower Chopawamsic Creek wetlands are the best areas to observe wood ducks at MCBQ.

b. Wood ducks nest in tree cavities, and the mature timber at MCBQ generally provides numerous natural cavities suitable for wood duck nesting. Wood duck nests are most likely to occur in palustrine forested wetlands along riparian corridors.

c. Wood duck brood-rearing habitat consists of areas that have an interspersed of open water with overhead saplings and shrub hiding cover. The palustrine shrub/scrub wetland in the lower Chopawamsic Creek basin east of U.S. Route 1 is the best wood duck brood habitat at MCBQ.

#### 2. Mallard

a. Mallards typically nest in upland vegetation near water or along the periphery of marshes, lakes, ponds, and sloughs. Mallards will frequently nest on suitable islands, where they may occur in dense concentrations. Mallard nests have been found nesting at many MCBQ beaver ponds and reservoirs, but little data has been collected to indicate the success of these nesting attempts.

b. In the winter, mallards can usually be found in large numbers in the wetlands of lower Chopawamsic Creek. During migration, mallards may number in the hundreds in the lower Chopawamsic Creek and Potomac River wetlands where hydrilla has become abundant. During prolonged freezing spells, mallards are driven out of tidal creeks by the ice but may remain in the main body of the Potomac River or near the unfrozen outfalls of power plants.

#### 3. Black Duck

a. The black duck breeds in forested habitats more often than other dabblers, but also use estuaries, tidal marshes, freshwater streams, inland lakes and reservoirs, and small woodland pools on occasion (Wright 1954, Kirby 1988). For water-based black duck breeding, beaver pond complexes provide excellent nesting and brood-rearing habitats in the Northeastern U.S. (Renouf 1972, Whitman 1987). Despite the abundance of beaver pond complexes at MCBQ, no black duck

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nests have been reported in recent years. However, the presence of black ducks in late summer flocks suggests that the black duck is a year-round resident.

b. Black ducks are frequently observed in small flocks in the lower Chopawamsic Creek wetlands, and are occasionally seen at Lunga Reservoir. The black duck is considered a Tier II species (very high conservation need) in the VDGIF Virginia Wildlife Action Plan.

### 4. Canada Goose

a. Both migratory and resident Canada geese can be found at MCBQ. A resident flock of giant Canada geese was established in 1987 with the release of 42 wing-clipped geese at Lunga Reservoir. Since then these birds have successfully nested in most wetland habitats aboard the base using mats of vegetation, beaver lodges, shorelines, or artificial nesting platforms.

b. Brood-rearing habitat for Canada geese is primarily shallow emergent marshes with nearby meadows or pastures (Bellrose 1980). As such, Canada geese have been successful in rearing broods at Lunga Reservoir, where the presence of grass fields in recreation areas has provided excellent foraging habitat for the young geese.

5. Tundra Swan. Tundra swans are a common resident of MCBQ from the first week of November through early March in lower Chopawamsic Creek, as long as ice does not form. While tundra swans found at MCBQ often number less than 100 throughout their winter residency, numbers often peak to approximately 1,000 swans during late February near the Chopawamsic Creek Wildlife Viewing Area.

## 6303. MANAGEMENT PRACTICES AND HISTORY

1. No-Net Loss. In keeping with Executive Order 11990 and Department of Navy policy to prevent loss of wetlands, i.e., "no net loss," the primary emphasis of waterfowl management at MCBQ is to sustain existing wetland resources, thereby ensuring the availability of a diversity of interconnected wetland complexes throughout the installation.

2. Riparian Corridors. In addition to wetland resources, forested streamside zones provide particularly valuable waterfowl habitats (i.e., travel lanes to/from brood-rearing habitats) that warrant special protection from development. In fact, these habitats are designated as RPAs under Virginia's Chesapeake Bay Preservation Act regulations. Riparian corridor set asides and maintenance are effective tools for water quality and waterfowl management, and MCBQ generally uses Virginia RPA regulations as guidelines for riparian corridors on Base. The beaver (*Castor canadensis*) is a master dam builder and creates flooded wetlands attractive to waterfowl in many riparian corridors at MCBQ (see Chapter 6, Section 7).

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3. Greentree Reservoirs. Greentree reservoirs (GTRs) are impounded tracts of bottomland forests that are flooded during the dormant season to attract waterfowl. Potential sites at MCBQ where this practice could be used include the Cedar Run floodplain in TAs 17A and 17B and the Chopawamsic Creek floodplain east of Route 1. The intent is to use earthen berms and water control structures to flood areas up to about 7 inches in depth to provide waterfowl foraging habitat. No GTR's have been constructed at MCBQ.

### 4. Shallow Impoundments

a. Shallow impoundments can be constructed and managed to provide an abundance of desirable waterfowl foods (e.g., SAV) and open water for resting and brood rearing. As part of the NAWMP at MCBQ, six sites were identified to study the feasibility for constructing shallow impoundments and two impoundments were subsequently constructed, one at South Branch and one at Middle Branch on Chopawamsic Creek.

b. The primary management practice associated with shallow impoundments is managing the growth of SAV food sources. Doing this requires maintaining permanent water levels during the growing season at depths of 4 to 10 inches (10 to 25 cm). During drought, water levels may be maintained by pumping. If necessary, these impoundments may be drawn down during the growing season every 1 to 3 years to allow the reestablishment of emergent plants.

### 5. Goose Management.

a. Canada geese forage in fields of winter wheat, barley, and rye extensively throughout the Maryland-Virginia-North Carolina region (Hindman and Stotts 1989). Wheat, rye, and barley are sometimes cultivated as winter crops in the landing zones at MCBQ; however, these areas are not generally large enough to attract flocks of geese. Most often, geese at MCBQ fly to large agricultural operations off of the installation to feed but also will use some grassland fields near Lunga Reservoir as well as large parade fields like the lawns in front of Lejeune Hall.

b. Beginning in 1996 the Base began instituting measures to help prevent the further growth of the resident flock based on mounting adverse impacts associated with the flock (e.g., unmanageable goose droppings in recreation areas and around administrative buildings). In 2000, MCBQ initiated consultations with the U.S. Department of Agriculture (USDA) Animal Damage Control Division which led to MCBQ obtaining a USFWS Depredation Permit to take unwanted geese near airfields and to addle eggs to reduce reproductive success. The Depredation Permit also was conditional on the use of non-lethal methods, such as harassment by herding dogs, to deter geese from lingering in undesirable places.

6. Wood Duck Nest Boxes. Nest boxes are a useful management tool when used in areas where the lack of suitable nest sites has limited

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breeding capabilities of wood ducks (Bellrose 1990, Wilkins et al. 1990). In 1990, 106 plastic wood duck nesting boxes were installed in shallow beaver ponds and along creeks across MCBQ. These were provided through a cooperative effort between Ducks Unlimited and the VDGIF. The boxes were mounted on galvanized poles and were placed over shallow water in beaver ponds and along creeks. The CVP monitored the use of these boxes but no successful nests were recorded from 1990 through 1992. In February 1993, the CVP replaced 50 of these boxes with wooden boxes equipped with tunnel-type predator guards to potentially improve the chances of successful nesting but, again, there was no documented nesting success. The wood duck nest box program began anew in 2006 and care was taken to place wooden boxes lined with cypress wood chips within good brood habitat in the lower Chopawamsic Creek basin. Roughly 30% of these nest boxes were used for wood duck nesting attempts.

7. SAV. SAV is among the more important waterfowl foods in the Chesapeake Bay region and is responsible for attracting large numbers of ducks and geese to MCBQ. The Virginia Division of Natural Heritage, Department of Conservation and Recreation (VDCR), established baseline data on Chopawamsic Creek and Quantico Creek SAV in 1991-1992 (Table 6-4), and annual SAV surveys were implemented for those waters in 2009.

8. Invasive Plant Control. MCBQ natural resources managers are watching for two species of wetland plants that are considered nuisance species when they become heavily established. These are the common reed, *Phragmites communis*, and purple loosestrife (*Lythrum salicaria*). Common reed is not abundant in MCBQ wetlands but is found in small patches both east and west of Interstate 95. In 2004, patches of reed found along the shoreline at Lunga Reservoir were treated with a formulation of glyphosate herbicide approved for wetland use, in an experimental effort to eradicate the plant at Lunga. Efforts were largely successful in the short-term, although a water-level draw-down due to drought also contributed to the *Phragmites* die-off.

9. Hunting. Waterfowl harvest data from 1962 through 2011 are displayed at Figure 6-9. Fewer than 150 ducks per year were harvested from 1972 through 1989, limited primarily by the lack of suitable food sources and the small number of hunting blinds (4) available on Base at the time. In 1990, the harvest began to increase due to an increase in numbers of wintering waterfowl brought about by the resurgence of SAVs in the Potomac River. Also, the Base significantly increased the number of hunting blinds to 24 to increase hunting opportunities.

### 10. Surveys and Banding

a. Winter Count. For a 10-year period beginning in 1992, a weekly waterfowl survey was conducted from late September through March each year. Waterfowl numbers were recorded from observation sites at Lunga Reservoir, Chopawamsic Creek, and the Potomac River. The results, shown in figures 6-7 and 6-8, provide an index of the

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relative abundance of waterfowl during the migratory and overwintering periods. The numbers do not reflect overall numbers of waterfowl visiting the Quantico area.

b. Leg Banding. MCBQ provides access for VDGIF to capture and band Canada geese, wood ducks, and other waterfowl. One of the primary late summer banding activities is to use spotlights from an air boat to locate and capture wood ducks in tidal Chopawamsic Creek.

c. Avian Influenza Surveillance. In accordance with a nationwide strategy in 2006 to monitor for the H5N1 influenza virus, the MCBQ Game Checking Station (GCS) was used by VDGIF biologists as a location to collect tracheal and cloacal swabs for H5N1 detection in harvested waterfowl.

6304. MANAGEMENT RECOMMENDATIONS. The following management programs are supportive of waterfowl management.

### 1. Maintain Wetlands

a. No-Net Loss of Wetlands. Compliance with the Department of Navy (DON) policy to accomplish no-net loss of wetlands is probably the most important objective of the MCBQ waterfowl management program. The NREA Branch, NEPA program, maintains records of wetlands gains and losses and ensures that mitigation is accomplished for wetland losses.

b. Beaver Management. The beaver population should be managed at a level that balances the tremendous benefits for waterfowl habitat attributed to beaver flowages, but provides control of unwanted damage due to flooding of drainage systems, roadways, or training facilities. A judicious animal damage control program is required to maintain the population at a desirable level. In some instances, beaver drains may be inserted into culverts to allow partial draw-downs when road flooding becomes a risk. Expenses for beaver control include traps, special culvert materials, and heavy equipment support to unclog culverts.

c. Greentree Management. Make plans and necessary modifications to allow for winter flooding of the marshy area west of the old Route 1 roadbed through TA 4. The roadbed functions primarily as a dike, but has three channels for drainage. Temporary control of drainage through the southernmost channel could create flooded marsh habitat for wintering waterfowl. The blockage would need to be removed in late winter to restore normal drainage and wetland function during the growing season.

d. Shallow Ponds. Two shallow ponds, South Branch Pond (2 acres) and Middle Branch Pond (5 acres) were constructed in 1998 in support of the NAWMP. The spillways and dams for these ponds require annual maintenance in the form of woody debris removal and vegetation controls.



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2. Resident Goose and Mute Swan Management. It is advised that the resident Canada goose population continue to be controlled on an as required basis using both lethal and non-lethal methods as authorized under the MCBQ Depredation Permit. Any nests of mute swans detected on MCBQ should be destroyed per regional flyway policies.
3. Wood Duck Nest Box Program. Nest box programs are very popular with the public and are an ideal means to recruit volunteer and youth participation in MCBQ natural resources management programs. The wood duck nest box program may be continued with cautious enthusiasm as a means to involve the public in wildlife service projects. Even if wood ducks do not use the boxes, the boxes are often found by gray squirrels (*Sciurus carolinensis*), screech owls (*Megascops asio*), and other wildlife.
4. SAV. An annual inventory of SAV should be conducted in MCBQ impounded and tidal wetlands to monitor the extent and distribution of SAV species over time.
5. Invasive Plants. The location and area covered by Phragmites should be inventoried and mapped, and a control plan should be implemented.
6. Hunting Blinds. Maximize the use of available MCBQ hunting blinds, within safety considerations, and license them in accordance with Virginia regulations during scheduled hunting seasons.
7. Surveys and Banding
  - a. Reinstitute weekly wintering waterfowl ground surveys from mid-September to mid-March to update census data.
  - b. Continue to provide manpower and logistical support to VDGIF efforts to capture and band resident waterfowl.
  - c. Disease Surveillance. At the request of the VDGIF, specimens from hunter-harvested waterfowl will be collected in support of the Atlantic Flyway Council surveillance plans for disease vectors.

### 6305. REFERENCES

- Bellrose, F. C. 1980. Ducks, Geese, and Swans of North America. Third edit. Stackpole Books, Harrisburg, Pa. 543 pp.
- Fredrickson, L. H., and D. L. Batema. 1992. Greentree reservoir management handbook. Gaylord Memorial Lab. Wetland Manage.
- Hindman, L. J., and V. D. Stotts. 1989. Chesapeake Bay and North Carolina Sounds. Pages 27-55 In L. M. Smith, R. L. Pederson, and R. M. Kaminski, ed. Habitat Management for Wintering Waterfowl in North America. Tex. Tech. Univ. Press, Lubbock. 560 pp.

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- Kirby, R. E. 1988. American black duck breeding habitat enhancement in the northeastern United States: a review and synthesis. US Fish and Wildl. Serv., Biol. Rep. 88(4). 50 pp.
- Renouf, R. N. 1972. Waterfowl utilization of beaver ponds in New Brunswick. J. Wildl. Manage. 36:740-751.
- USFWS and MCCDC. 1990. Waterfowl/wetlands management plan. U.S. Fish and Wildl. Serv. and Fish and Wildl. Unit, Marine Corps Combat Development Command. 25 pp.
- Whitman, W. R. 1987. Estimating black duck production on beaver ponds in the Maritimes. Pages 32-34 In A. J. Erskine, ed. Waterfowl breeding population surveys, Atlantic Provinces. Can. Wildl. Serv. Occas. Pap. 60.
- Wilkins, T. M., A. L. Bowman, and J. T. Fulton. 1990. Management of wood ducks at Yazoo National Wildlife Refuge. Pages 269-273 In L. H. Fredrickson, G. V. Burger, S. P. Havera, D. A. Graber, R. E. Kirby, and T. S. Taylor, eds. Proc. 1988 North Am. Wood Duck Symp., St. Louis, Mo. 390 pp.
- Wright, B. S. 1954. High tide and an east wind - the story of the black duck. The Stackpole Co., Harrisburg, Pa., and Wildl. Manage. Inst., Wash., DC. 162 pp.

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Figure 6-7. Waterfowl Observations West of I-95

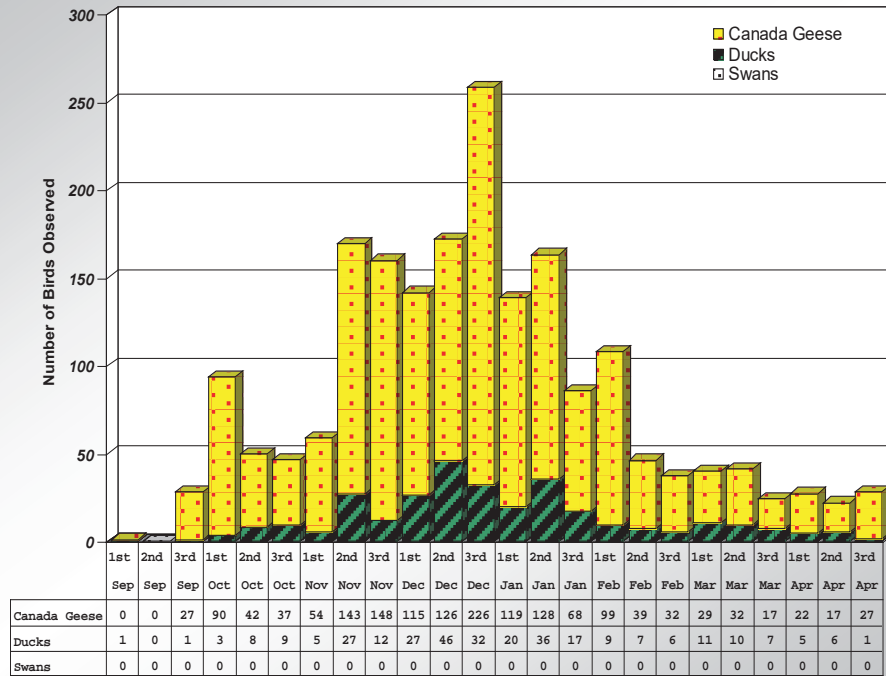
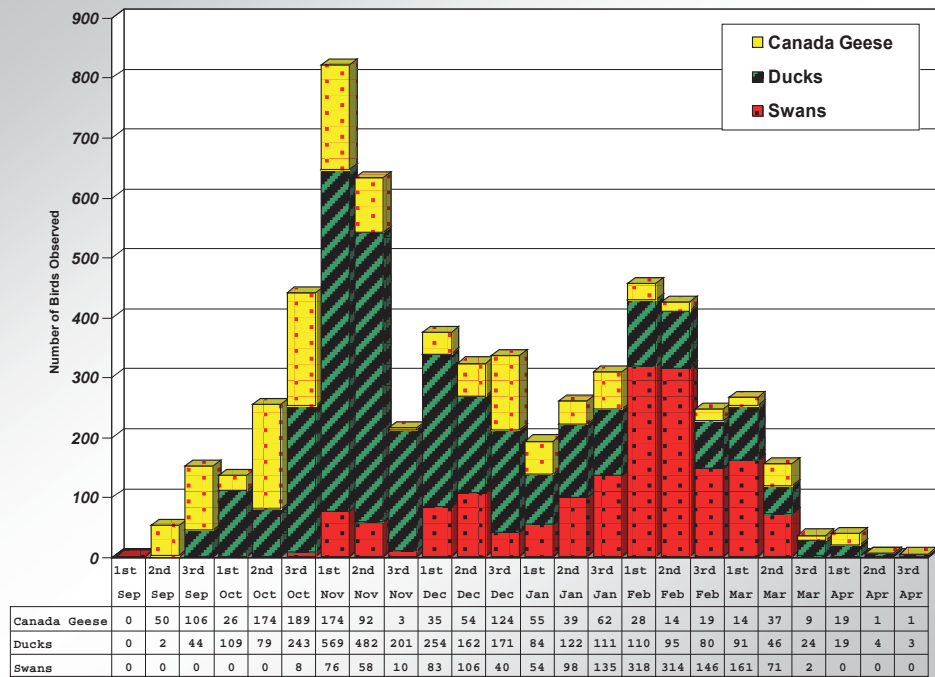
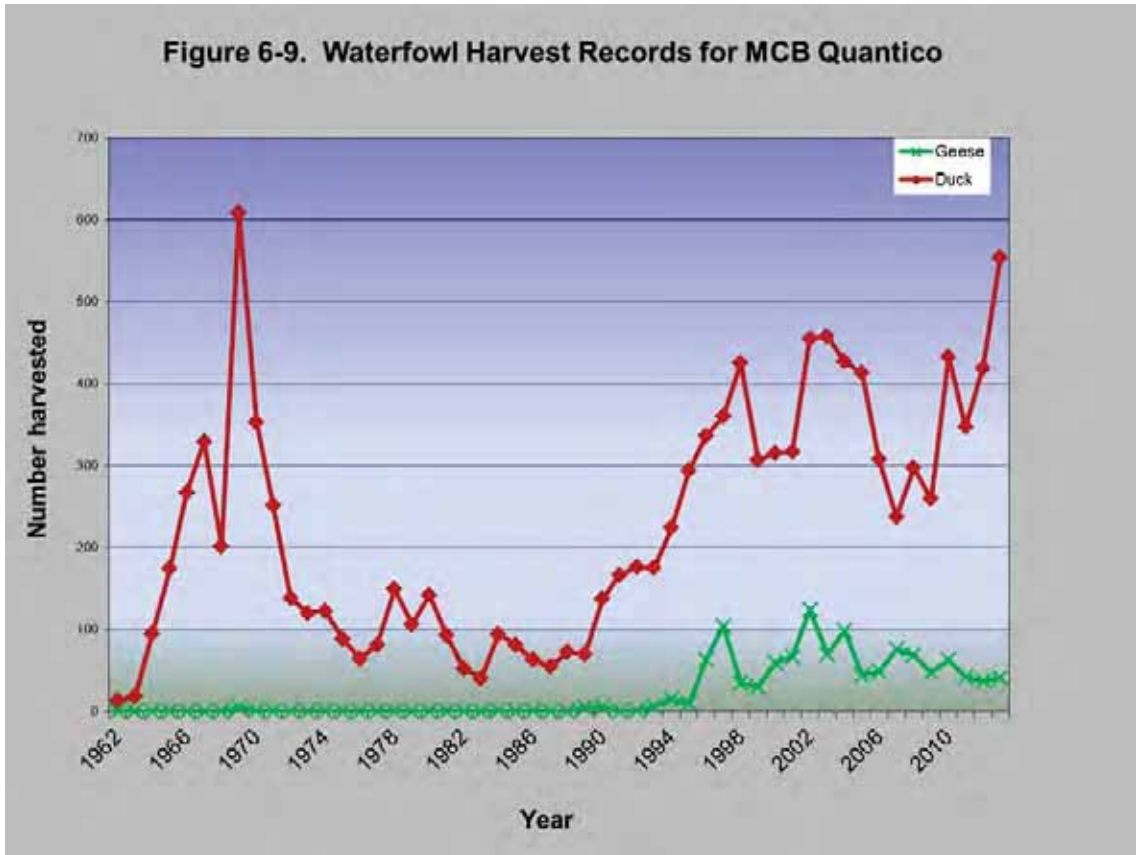


Figure 6-8. Waterfowl Observations East of I-95





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Table 6-3. Waterfowl Species Reported for MCBQ.

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Tundra swan ( <i>Cygnus columbianus</i> )
Mute swan ( <i>C. olor</i> )
Canada goose ( <i>Branta canadensis</i> )
Wood duck ( <i>Aix sponsa</i> )
Mallard ( <i>Anas platyrhynchos</i> )
American black duck ( <i>A. rubripes</i> )
Green-winged teal ( <i>A. crecca</i> )
Blue-winged teal ( <i>A. discors</i> )
American wigeon ( <i>A. americana</i> )
Northern pintail ( <i>A. acuta</i> )
Ring-necked duck ( <i>Aythya collaris</i> )
Greater scaup ( <i>A. marila</i> )
Lesser scaup ( <i>A. affinis</i> )
Ruddy duck ( <i>Oxyura jamaicensis</i> )
Common goldeneye ( <i>Bucephala clangula</i> )
Bufflehead ( <i>B. albeola</i> )
Long-tailed duck ( <i>Clangula hyemalis</i> )
Hooded merganser ( <i>Lophodytes cucullatus</i> )
Red-breasted merganser ( <i>Mergus serrator</i> )
Common merganser ( <i>Mergus merganser</i> )
Redhead ( <i>Aythya Americana</i> )
Gadwall ( <i>A. strepera</i> )
Canvasback ( <i>Aythya valisineria</i> )
Shoveler ( <i>Spatula clypeata</i> )
American coot ( <i>Fulica americana</i> )
Common loon ( <i>Gavia immer</i> )
Horned grebe ( <i>Colymbus auritus</i> )
Pied-billed grebe ( <i>Podilymbus podiceps</i> )

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Table 6-4. Plant species noted for Chopawamsic Creek and Quantico Creek (VDCR 1992).

Scientific Name	Common Name	Chopawamsic Creek	Quantico Creek
<u>RIVERINE AQUATIC BEDS</u>			
<i>Cabomba caroliniana</i>	Carolina fanwort	X	
<i>Ceratophyllum demersum</i>	Common hornwort	X	X
<i>Heteranthera dubia</i>	Water star-grass		X
<i>Hydrilla verticillata</i>	Hydrilla	X	X
<i>Myriophyllum spicatum</i>	Eurasian water-milfoil	X	X
<i>Potamogeton foliosus</i>	Leafy pondweed	X	
<i>Sparganium americanum</i>	American bureed	X	
<i>Spirodela polyrhiza</i>	Greater duckweed	X	X
<i>Vallisneria americana</i>	Wild celery	X	X

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Table 6-4 (continued). Plant species noted for Chopawamsic Creek and Quantico Creek (VDCR 1992).

Scientific Name	Common Name	Chopawamsic Creek	Quantico Creek
<u>PALUSTRINE EMERGENT WETLANDS</u>			
<i>Acer rubrum</i>	Red maple	X	X
<i>Acorus calamus</i>	Sweetflag	X	X
<i>Alnus serrulata</i>	Smooth alder	X	
<i>Amaranthus cannabinus</i>	Tidmarsh amaranth	X	
<i>Amorpha fruticosa</i>	Indigobush	X	X
<i>Asclepias incarnata</i>	Swamp milkweek	X	X
<i>Bidens coronata</i>	Tickseed sunflower		X
<i>Cephalanthus occidentalis</i>	Buttonbush		X
<i>Cinna arundinaceae</i>	Wood reedgrass		X
<i>Clematis terniflora</i>	Japanese virgin's bower		X
<i>Commelina virginica</i>	Virginia dayflower		X
<i>Conoclinium coelestinum</i>	Mistflower		X
<i>Decodon verticillatus</i>	Water willow	X	X
<i>Eleocharis quadrangulata</i>	Square-stem spikerush	X	X
<i>Helenium autumnale</i>	Common sneezeweed		X
<i>Hibiscus laevis</i>	Halberd-leaf rosemallow		X
<i>Hibiscus moscheutos</i>	Swamp rosemallow	X	X
<i>Justicia americana</i>	Water willow		X
<i>Lobelia cardinalis</i>	Cardinal flower	X	X
<i>Ludwigia palustris</i>	Water purslane		X
<i>Mikania scandens</i>	Climbing hempweed		X
<i>Murdannia keisak</i>	Marsh dewflower	X	X
<i>Nelumbo lutea</i>	American lotus	X	X
<i>Nuphar leuteum</i>	Spatterdock	X	X
<i>Panicum virgatum</i>	switchgrass	X	X
<i>Peltandra virginica</i>	Arrow arum	X	X
<i>Phragmites australis</i>	Common reed	X	
<i>Polygonum arifolium</i>	Halberd-leaf tearthumb	X	X
<i>Polygonum hydropiperoides</i>	Mild water pepper		X
<i>Pontedaria cordata</i>	Pickerelweed	X	X
<i>Rosa palustris</i>	Swamp rose	X	
<i>Rumex verticillatus</i>	Swamp dock		X
<i>Sagittaria latifolia</i>	Common arrowhead		X
<i>Scirpus validus</i>	Soft-stem bulrush	X	X
<i>Scirpus americanus</i>	American three-square	X	X
<i>Spartina cynosuroides</i>	Big cordgrass	X	X
<i>Typha angustifolia</i>	Narrow-leaf cattail	X	X
<i>Vernonia noveboracensis</i>	New York ironweed	X	X
<i>Zizania aquatica</i>	Wild rice	X	

CHAPTER 6

FISH AND WILDLIFE RESOURCES

SECTION 4: WILD TURKEY

6400. MANAGEMENT GOALS AND OBJECTIVES. The wild turkey is an important game bird and its widespread distribution throughout the installation provides significant recreational opportunities during both fall and spring hunting seasons. The public takes great interest in the well-being of this species - particularly the effects of timber management on turkey populations. This Section will describe in detail the forest management practices used to ensure a balance between wild turkey habitat and other Base interests. Generally speaking, these management practices fall into two categories: (1) manage vegetative communities in a manner that maintains or improves existing wild turkey habitat, and (2) implement census procedures to monitor the turkey population.

6401. GENERAL ECOLOGY AND LIFE HISTORY. The annual life cycle of wild turkeys can be divided into three seasons: breeding season, nesting and brood-rearing season, and a Fall-Winter season.

1. Breeding. In Virginia, breeding generally begins in late March, and mating peaks about mid-April (Bailey and Rinell, 1976a). A second peak of gobbling activity occurs about 2-4 weeks later when most hens have been serviced and are no longer attracted to males.

2. Nesting and Brooding. Nesting takes place immediately after hens are fertilized; at MCBQ most hens will have nested and be incubating during April and the first half of May. Peak hatch dates typically occur from mid-May through mid-June when Spring vegetation green-up is well advanced and food and cover are plentiful. Females that lose a nest early during the breeding season may nest again and late hatches of turkeys at MCBQ have been reported at the end of July. After hatching, poults remain and forage with their mothers until at least September, at which time the majority of poults have completed their post-juvenile molt. During the brood-rearing season, turkey flocks generally consist of 1 or 2 hens with their respective broods. Unmated hens occasionally join brood flocks, or alternatively, form flocks composed entirely of barren hens.

3. Fall-Winter. Early Fall flocks consist almost entirely of hens and juveniles. In years of high poult production, juvenile males (jakes) leave their natal flocks by mid-November and form flocks composed entirely of jakes. Segregation by age-class is often very pronounced within the male cohort of the population during Winter. Not only do jakes form discrete flocks, but 2-year-old, 3-year-old, and more mature gobblers form their own flocks as well. Flocking behavior begins to wane with the approach of the breeding season, and



older gobblers eventually leave flocks to establish breeding territories in March. Jakes and hens may maintain loose flock affiliation throughout their first breeding season, but generally flocks are entirely disintegrated by April when nesting and incubation are at their annual peaks.

6402. HABITAT REQUIREMENTS. Wild turkeys are very adaptable and can tolerate a variety of habitat types and conditions. At MCBQ, over 52,000 acres of forestland and about 2,900 acres of semi-improved open land are wild turkey habitat. Turkeys utilize all MCBQ forest habitat types listed in Chapter 2, i.e., HMHD, PHWD, NMHD and CONI, to meet year-round requirements for shelter and food. Herbaceous cover types important for turkeys include burned grasslands and cultivated woodland openings. Ideal turkey habitat is typified by the interspersed of forested and grassland vegetation types (Schaffer and Gwynn 1967). The values of different plant communities for wild turkeys are described below.

1. Woody Vegetation. Trees and shrubs are important producers of hard and soft mast food and also provide cover for turkeys. Large, mature trees generally provide horizontal cover, while understory trees, shrubs, and vines provide screening cover at the ground-level and potential food sources. The presence of large trees is considered an essential habitat feature for roosting turkeys (Schaffer and Gwynn 1967). Plant species such as, blueberry (*Vaccinium spp.*), blackberry (*Rubus spp.*), wild grape (*Vitis spp.*) (Korschgen 1967), and Eastern serviceberry (*Amelanchier canadensis*) (Luckett 1980) are of dual value because they provide turkeys with both Summer food and low screening cover. Turkey populations can be maintained in managed hardwood forests (Wunz 1990), commercial pine plantations (Burk et al. 1990), or combinations of both (Holbrook et al. 1987), so long as the bird's food, cover, and water requirements are sustained on the area throughout the year.

2. Grass Cover. Herbaceous communities serve as brooding and nesting cover. Hens often nest in grassy openings with grass stem densities low enough to provide some bare space at ground level to enable movement corridors for newly hatched poults. After hatching, broods spend a significant amount of time in pastures or forest openings based on the low cover and food they provide. Grasses are also of indirect importance in that the plants provide habitat for insects that serve as critical food items throughout the year and for poults.

3. Forb Cover. Like grasses, forbs are integral components of brood-rearing cover. Broods often favor tall perennial forb communities, because poults mobility is generally unrestricted within the understory, yet the canopy formed by the interlacing network of aerial leaves and stems furnishes excellent horizontal cover. Ferns, for example, provide young broods with secure hiding and loafing cover. (Hayden 1961)

4. Bare Ground. Although wild turkeys frequently obtain food directly from a plant by stripping grass seedheads or pulling fruit from the stems of shrubs and vines (Korschgen 1967), the birds also locate significant amounts of food on the soil surface underneath the plants. Insects, hard mast, and small forbs are much easier to locate on soil surfaces that are free of litter. Bare ground also furnishes turkeys with dusting sites (Bailey and Rinell 1967b) and facilitates movement through ground vegetation.

5. The only areas at MCBQ that do not provide habitat for wild turkeys are the open water wetlands and developed areas. Over 52,000 acres of forestland, and about 2,900 acres of semi-improved open land, are potential wild turkey habitat. Turkeys utilize all MCBQ forest habitat types listed in Chapter 2, i.e., HMHD, PHWD, NMHD and CONI, to meet year-round requirements for shelter and food. Herbaceous cover types important for turkeys include burned grasslands and cultivated woodland openings.

6403. MANAGEMENT PRACTICES AND POPULATION SURVEYS. Habitat management, harvest management, and population surveys are important aspects of wild turkey management conducted at MCBQ.

1. Habitat Management - General. As noted earlier in this Section, wild turkeys in the Southeastern U.S. prefer mature upland forest as their primary habitat type, but are adaptable to several habitat types. Productive turkey populations frequently occupy landscapes that are composed of various combinations of woodland, cropland, fallow field, idle area, and pasture habitats. As such, maintaining extensive, undisturbed tracts of forest is not a fundamental requirement of wild turkey management; adequate interspersions of several land-use types is equally beneficial.

2. Timber Management. Since forests play a significant role in wild turkey habitat selection, there are potential conflicts with timber production at MCBQ where silvicultural practices may have greater effects on turkey habitat than any other land use program. As a result, the forest management practices listed in Chapter 5 and Chapter 6, Section 2, inherently account for turkey management needs through the stand treatment planning and implementation processes. Turkey populations can be maintained in managed hardwood forests (Wunz 1990), commercial pine plantations (Burk et al. 1990), or combinations of both (Holbrook et al. 1987), so long as the bird's food, cover, and water requirements are sustained on the area throughout the year.

a. Even-aged Management. Bailey and Rinell (1967b) noted that even-aged, sustained yield timber management processes can be beneficial to wild turkey populations, as long as cutting is limited to small stands, stand age classes are balanced, stands of the same age class are evenly dispersed, and woody species diversity is maintained. Clearcuts and shelterwood silvicultural systems are common even-aged harvesting methods employed in the Southeast and at

MCBQ that can achieve these goals for turkey habitat protection. Additionally, harvest rotation planning can further account for wild turkey habitat during timber management activities using these method.

(1) Clearcuts. Many researchers consider small, evenly distributed clearcuts a better wild turkey habitat management alternative than large clearcuts. Luckett (1980) recommends limiting the size of clearcuts to less than 40 acres where wild turkey production is an important management consideration. Donohoe (1990) adds that wild turkey populations derive considerably more benefit from a harvesting regime that results in an even distribution of clearcuts characterized by a size limitation of 25 acres.

(2) Shelterwood Cuts. Shelterwood systems effectively promote oak transitions because oak seedling respond well to the shade provided by the mature trees left unharvested and the resulting lower soil temperatures that encourage acorn germination and oak seedling development (Society of American Foresters 1981). While there are some impacts to wild turkey populations through this transition (i.e., forced reliance on other mast-producing species when acorns are scarce), shelterwood cutting can effectively minimize the negative impacts through proper implementation. In particular, limiting shelterwood cuts to areas 20 to 30 acres in size with adequate distribution of other mast-producing species reduces the impacts to wild turkey populations.

(3) Harvest Rotations

(a) Studies conducted in eastern hardwood forests indicate that mid- to long harvest rotations produce habitat conditions most conducive to wild turkey management. Optimally, Wunz (1990) stated that 100-year harvest rotations are best for hardwood forests in which wild turkey production is an important management objective. Chapter 5 of this Plan recommends 100-year rotations for HMHD management at MCBQ, which should be protective of wild turkey habitat.

(b) For pine plantations, however, wild turkeys appear to tolerate shorter harvest rotations. For example, Smith et al. (1990) noted that turkeys made significant use of short-rotation pine plantations in Mississippi, and Gehrken (1975) reported that a harvestable turkey population was maintained in a South Carolina forest that was dominated by shorter duration? even-aged pine plantation harvests. While shorter harvest rotations can remain protective of wild turkey populations, additional considerations may need to accompany pine forest management to do so.

(1) Hardwood Corridors. In both studies on pine harvest rotations, a network of hardwood travel corridors connecting pine plantations with mature hardwood stands were retained and were thought to be the primary reason wild turkeys remained in these intensively managed pine forest areas. Therefore, MCBQ's recommended 50-year rotation for pine management should support wild turkey

populations as long as 100-year rotation hardwood forest stands are appropriately managed near, and in conjunction, with pine stands. For further discussion on MCBQ's planned interplay between hardwood and pine forest area, see Chapter 5.

(2) Thinning. Thinning of loblolly pine stands as recommended in Chapter 5 should further enhance pine habitat for turkeys. Smith et al. (1990) found that one commercial thinning operation made the pine plantations in the Mississippi study more attractive to turkeys. More specifically, complete removal of every fourth row of pine trees created travel lanes and opened the canopy sufficiently to increase the abundance of herbaceous foods and soft-mast producing vines to support wild turkeys. Thus, MCBQ's thinning procedures for pine forests would also be a particularly appropriate mechanism to ensure wild turkey populations are not impacted through timber harvesting operations.

b. Uneven-aged Management. Selective harvesting discussed in Chapter 5 also can effectively account for wild turkey habitat by creating habitat interspersions - discussed above as an equally beneficial factor for wild turkey population success. For example, Luckett (1980) observed that round-wood and firewood thinning reduced competition within a stand and stimulated mast production among remaining trees. Similarly, Bailey and Rinnel (1967b) stated that modest pulp-cutting and saw-wood removal operations enhance turkey habitat quality by promoting crown development and stimulating seed production. Beech and oaks are valuable mast-producing trees that should be retained during thinning operations.

### 3. Management of Openings

a. The management of woodland openings is described in more detail in Section 2 of this Chapter. Recent clearcuts, cultivated fields, old homesites, old fields maintained by fire, military landing zones, and rights-of-way all provide habitat and food support for turkey populations. Opinions vary as to what percentage of turkey habitat should be devoted to openings, ranging widely from 3-50%. As noted in Section 2, permanent managed openings are less than 1% of the MCBQ landscape. Recent cutover land resulting from timber harvesting creates transitional openings that help make up for the lack of permanent openings.

b. Mowing. Where open areas are maintained on MCBQ, mowing can control invasion of woody plant species into open fields and thereby prevent the transition of fields into forest cover. Mowing also helps release desirable clover from overhead grasses and forbs. Nevertheless, because herbaceous lands are important nesting and brood-rearing sites, these areas should be left unmowed when possible from April through June, as mowing may cause nest abandonment and/or high brood mortality.

4. Prescribed Burning. Prescribed burning described in Chapter 5 also is a beneficial tool for turkey habitat management. Burns conducted at 1 to 3 year intervals help maintain the park-like or open nature of woodlands by curtailing shrub invasion. Fire further prevents heavy accumulations of ground litter and decadent standing plant material. These effects of prescribed burning maintain open understory conditions for wild turkey habitat cover and stimulate herbaceous seed and soft-mast production. Ideally, a patchy burn is desirable to maintain a balance of unburned nesting cover and poult escape cover with burned patches comprised of abundant food.

5. Artificial Feeding. Providing turkeys with feeders or scattering free grain is of questionable value and has not been practiced at MCBQ. Artificial food delivery programs are considered unnecessary and undesirable.

6. Harvest Management. Dense turkey populations can endure high hunting pressure over an indefinite period of time as long as sufficient quantities of good habitat remain available. More importantly, the impacts of wild turkey harvesting are inherently limited by state regulations capping the numbers that may be taken per person per year. The following trends have been observed for Spring and Fall turkey harvests:

a. Spring Gobbler Season. Since 1970, annual spring gobbler harvests have averaged 42 birds, with a low of 21 birds in 1970 and a high of 80 gobblers in 1998. In fact, major declines or increases in the Spring harvest seem to follow the population trends seen in the Spring gobbler count (Figure 6-10). Whatever the impetus for the trends, the Spring harvest variation observed over the past 42 years is not uncharacteristic of healthy turkey populations. And like Spring gobbler counts, considerable variation in Spring harvests may arise from time to time due to weather variations and access limitations for the TAs.

b. Fall Hunting Season. Turkey harvest results are shown in Figure 6-11 and are noticeably more abnormal than Spring harvest data. Historically, good poult production years have resulted in above average Fall harvest numbers. Since 2000, however, the Summer brood production and Fall turkey harvest has been low. MCBQ wildlife managers thought that low Fall harvest numbers were more related to external considerations than turkey numbers. Shortening of the Virginia fall turkey season, expanded fall deer seasons, and fewer fall turkey hunters were believed to have had more influence on low harvests than a shortage of turkeys, because similar declines have not been observed in spring harvest numbers where these factors do not apply. However, 2013 was an extraordinary poult production year for turkeys at MCBQ and the Fall harvest did increase 500% over the previous year. This documented the resilience of the turkey population to have an exceptional breeding output after 10 years of apparent mediocre production, and the response of hunters to take advantage of the game abundance.

7. Population Surveys. In addition to general habitat considerations, severe weather conditions or disease outbreaks have the potential to drastically reduce turkey populations. In order to identify population trends and to assign potential influences on them, several population survey techniques have been conducted at MCBQ.

a. Gobbler Counts. Spring gobbler counts are a popular method used throughout the Southeast to monitor population trends over an extended period of time and/or to compare gobbler abundance between different management areas. MCBQ wildlife personnel have conducted spring gobbler counts annually since 1970. As illustrated in Figure 6-10, gobbler counts average around 82 individuals per year, with fluctuations up to 139 gobblers (2001) and down to 22 gobblers (1988). Military training schedules affect observer access to the TAs so there naturally is a degree of variation among the surveys from year to year. Weather patterns can also affect results from time to time, where inclement weather or unseasonal warm spells may affect gobbling activities on count days.

b. Brood Production. Research from Pennsylvania indicated that brood counts were reliable indices of population abundance on both a regional and statewide basis (Wunz and Ross 1990). At MCBQ, records are maintained of all turkey broods observed by NREA natural resources employees during their daily summer work assignments. Numbers of flocks and total numbers of juvenile turkeys observed also are recorded. Since 1970, the best count year was 2013 when 88 flocks and 657 juvenile birds were counted (Figure 6-11). The worst count year on record was 2002 when only 9 flocks and 29 juveniles were observed. Annual productivity appears to vary widely based upon weather conditions during the hatching peak in late May.

8. Food Habit Study. Information regarding wild turkey food habits on MCBQ was obtained via examination of 30 turkey crops collected between 1983 and 1987. The crop is an expanded, muscular pouch near the gullet or throat where turkeys can store ingested food items. Invertebrates were the most frequent food item consumed, occurring in 21 of 30 crops (Table 6-5). A variety of hard and soft mast-producing species were also found to be important, including beech nuts, dogwood fruit, acorns, grapes, and partridge berries (*Mitchella repens*).

9. Wild Turkey Survival Investigations. In 2009, MCBQ began a study to investigate rates and causes of turkey mortality at MCBQ. Turkeys are captured by rocket nets and radio-equipped with backpack transmitters (Figure 6-12). The transmitters are programmed to send mortality signals when motion ceases. Researchers retrieve the transmitter and turkey carcass to assess cause of death. The study is currently in progress.



6404. MANAGEMENT RECOMMENDATIONS

1. Habitat Management. The MCBQ, Fish, Wildlife and Agronomy Section should evaluate each timber sale or land management activity affecting wild turkey habitat to determine opportunities for improvement of wild turkey habitat as described in this chapter. This evaluation is carried out in conjunction with the Environmental Assessment prepared specifically for a timber sale so that any conversion of cover type within a TA has been formally reviewed. Basic habitat recommendations that may apply under a given set of circumstances are:

- a. Use selective harvesting uneven-aged management for hardwood stands.
- b. Even-aged harvest rotations of 50-60 years in pines and 100-120 years in hardwoods are recommended.
- c. Maintain mature riparian habitat stringers adjacent to cutover forest.
- d. Distribute small pine clearcuts (20 acres average size) throughout a forest compartment to accentuate habitat diversity.
- e. Conduct patchy prescribed burns, implemented at 1 to 3 year intervals.
- f. Thinning operations should be conducted in even-aged timber stands to promote wide spacing of trees which allows for more plant diversity in the ground cover and understory.
- g. Maintain scattered small openings through the woodlands through burning, mowing, and cultivation practices. A density of 3-8 openings per square mile is recommended (from Table 6-1).
- h. Exclude mowing in managed openings from late April-late June, when feasible.

2. Population Surveys. Continue to conduct Spring gobbler counts, Summer hen-brood counts, and research to determine cause-specific mortality.

3. GIS. Maintain an up-to-date installation vegetation cover map within the MCBQ GIS system (Geofidelis).

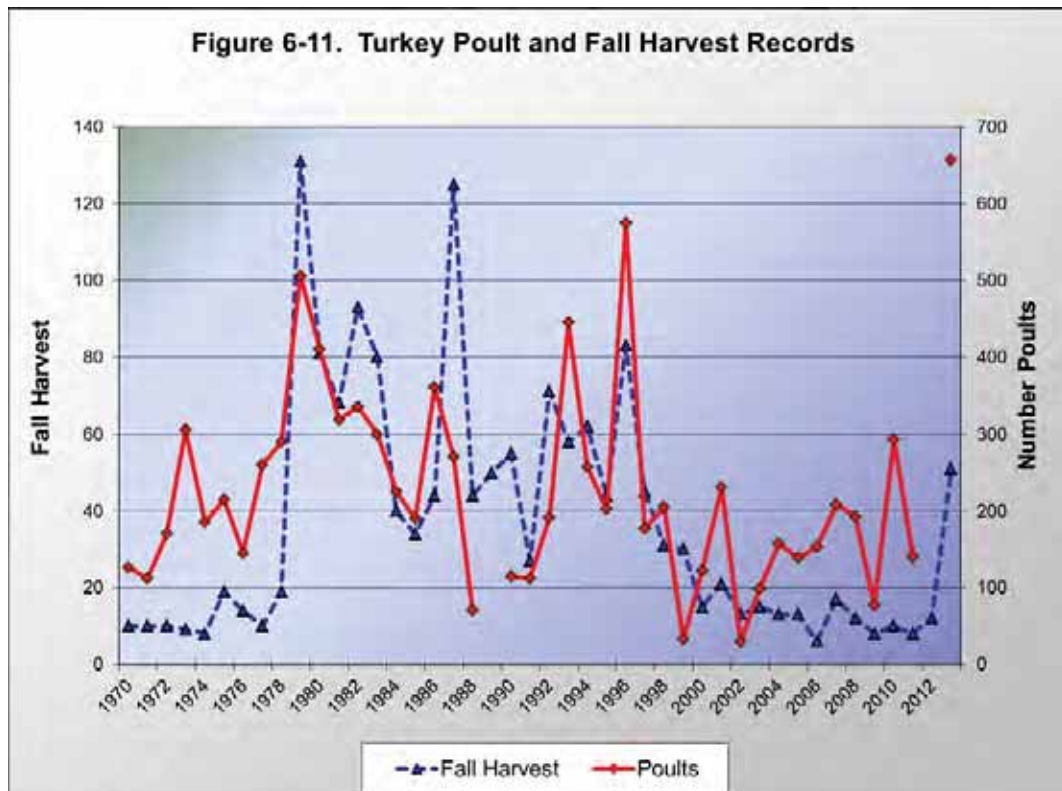
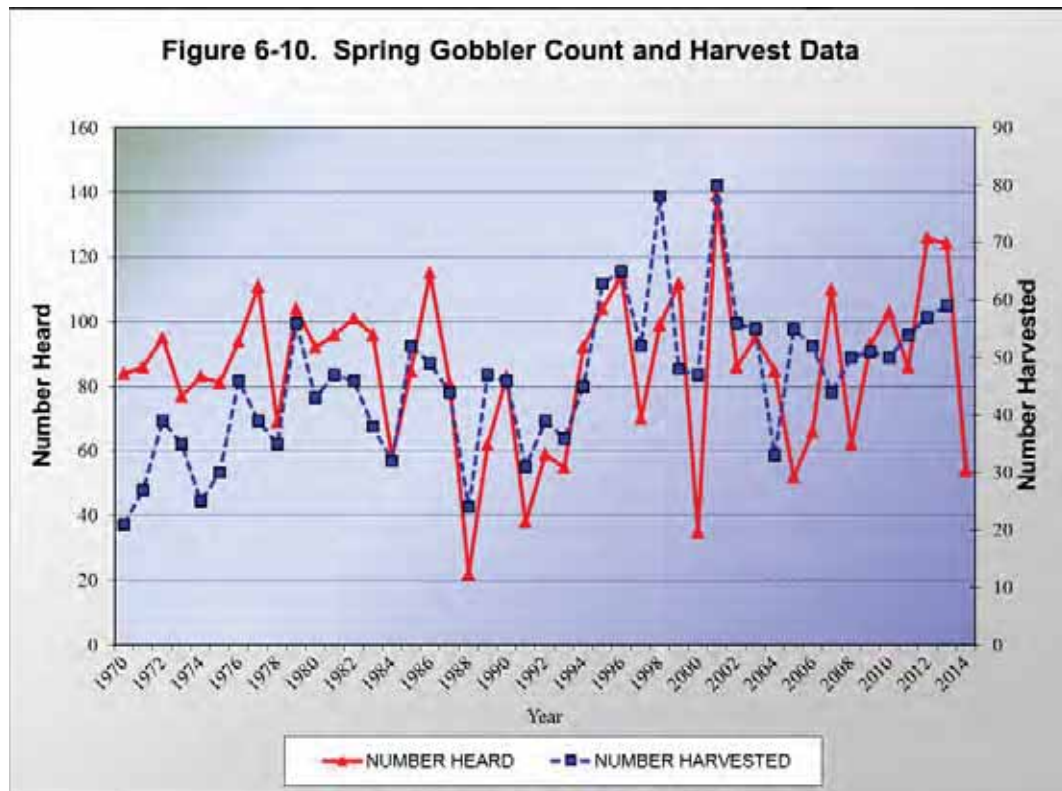
6405. REFERENCES

Bailey, R. W., and K. T. Rinnel. 1967a. Events in the turkey year. Pages 73-82. in O. H. Hewitt, ed., The wild turkey and its management. The Wildl. Soc., Washington, D.C. 589 pp.



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN [2013 Revision]

- \_\_\_\_\_, and \_\_\_\_\_. 1967b. Management of the eastern turkey in the northern hardwood forests. Pages 261-302. in O. H. Hewitt, *ed.*, The wild turkey and its management. The Wildl. Soc., Washington, D.C. 589 pp.
- Donohoe, R. W. 1990. The wild turkey: past, present and future in Ohio. Ohio Fish and Wildl. Rep., No. 11. 47 pp.
- Gehrken, G. A. 1975. Travel corridor technique of wild turkey management. Proc. Natl. Wild Turkey Symp. 3:113-117.
- Hayden, A. H. 1961. Winter range requirements of the wild turkey in Cameron County, Pennsylvania. Pa. Coop. Wildl. Res. Unit, Unpubl. Rep. 7 pp.
- Holbrook, H. T., M. R. Vaughan and P. T. Bromley. 1987. Wild turkey habitat preferences and recruitment in intensively managed Piedmont forests. J. Wildl. Manage. 51:182-187.
- Korschgen, L. J. (1967). Feeding habits and foods. Pages 137-198. in O. H. Hewitt, *ed.*, The wild turkey and its management. The Wildl. Soc., Washington, D.C. 589 pp.
- Luckett, L. M. 1980. Management of the wild turkey on national forest lands in North Carolina. Proc. Natl. Wild Turkey Symp. 4:159-167.
- Porter, W. F. 1976. Utilization of agricultural habitats by wild turkeys in southeastern Minnesota. XIIIth Int. Congr. Game Biologists. 13:319-323.
- Ross, A. S. and G. A. Wunz. 1990. Habitats used by wild turkey hens during the summer in oak forests in Pennsylvania. Proc. Natl. Wild Turkey Symp. 6:39-43.
- Shaffer, C. H. and J. W. Gwynn. 1967. Management of the eastern turkey in oak-pine and pine forests in Virginia and the Southeast. Pages 303-342. in O. H. Hewitt, *ed.*, The wild turkey and its management. The Wildl. Soc., Washington, D.C. 589 pp.
- Smith, D. R., G. A. Hurst, J. D. Burk, B. D. Leopold, M. A. Malchioris. 1990. Use of loblolly pine plantations by wild turkey hens in east-central Mississippi. Proc. Natl. Wild Turkey Symp. 6:61-66.
- Society of American Foresters. 1981. Choices in silviculture for American forests. Soc. Am. Foresters, Washington, D.C. 80 pp.
- Wunz, G. A. 1990. Relationships of wild turkey populations to clearings created for brood habitat in oak forests in Pennsylvania. Proc. Natl. Wild Turkey Symp. 6:32-38.
- \_\_\_\_\_, and A. S. Ross. 1990. Wild turkey production, fall and spring harvest interactions, and responses to harvest management in Pennsylvania. Proc. Natl. Wild Turkey Symp. 6:205-207.





a. Turkeys in field.



b. Turkeys in net.



c. Radio equipped gobbler.



d. Successful youth hunt!

Figure 6-12. Wild turkey research and management.

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Table 6-5. Crop contents of 30 wild turkeys harvested during the fall, 1983-1987, at MCBQ.

Food Item	Quantity (g)	Number of Crops
Beech nuts	273	8
Acorns	125	9
Dogwood berries	281	12
Autumn olive	557	2
Honeysuckle berries	51	4
Holly berries	81	2
Black Gum berries	11	1
Grapes	174	6
Partridgeberry	132	12
Poison Ivy	78	8
Beech drops	137	4
Spring Beauty tubers	90	2
Mushrooms	122	6
Grass seeds	72	9
Grass leaves	54	7
Shrub and Forb leaves	70	8
Invertebrates	115	21

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## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 5: WHITE-TAILED DEER

##### 6500. MANAGEMENT GOALS AND OBJECTIVES

1. White-tailed deer (WTD) are found in all TAs at MCBQ. As the primary game species in Virginia, deer are highly treasured for the hunting opportunities they provide. Many citizens also take pleasure in opportunities to observe WTD in natural habitats. With the arrival of coyotes (*Canis latrans*) in Virginia, and increasing abundance of bobcats and black bears, some hunters are concerned that these predators will cause WTD numbers to plummet.

2. Large numbers of deer can impact the ecosystem. Some scientists suggest that deer browsing may affect understory plant abundance and related habitat for migratory birds and small mammals. Deer consumption of acorns can reduce the availability of this important energy supply for other animals.

3. Not all deer-human interactions are positive. Deer are adaptable to a wide range of habitat conditions and can be a nuisance in urban environments. Deer serve as hosts for tick species that are responsible for the transmission of Lyme disease to humans. Some citizens are concerned about deer vehicle collisions on busy roads and the damage deer inflict on gardens and flowerbeds. Other citizens are becoming increasingly vocal to protect deer from hunting activities. It is evident that society has many different values concerning the management of deer.

4. Deer management objectives are to sustain a quality deer hunting program, keep the deer population density within the tolerance limits of Base residents and staff, and to keep the deer herd in balance with other land use and resource management objectives. Monitoring the deer herd through a variety of research and survey practices is a key part of this management plan.

6501. LIFE HISTORY. Detailed information about WTD life history is available in a number of references, including Halls (1984). One of the most important life-cycle events, breeding, appears to peak about the third week in November at MCBQ based on fetal measurements. Adult females produce an average of 1.56 fawns per year, based on data collected from MCBQ road-kills.

6502. HABITAT REQUIREMENTS. WTD have adapted to a wide range of habitat conditions. In general, habitat quality for WTD may be affected by the following factors: availability of food and water,



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nature and extent of cover, interspersions of food and cover, and inherent soil fertility.

### 1. Food and Water Resources

a. Food. A primary habitat requirement for WTD is the availability of nutritious forage that will satisfy their seasonal energy requirements. WTD are foraging generalists and readily consume many types of vegetation. Short (1986) developed a WTD Habitat Suitability Index (HSI) model intended for use in the South Atlantic coastal plain. The model used the quantity of forages, the quality of forages and available metabolizable energy in Fall-Winter to predict habitat quality for deer - 1.0 being the highest. Banker and Stauffer (1994) applied this HSI model at MCBQ and identified the following eight classes of forage as suitable for deer (at least 41% digestibility):

- (1) Current year's twig growth and needles from pines.
- (2) Current year's fallen leaves from perennial woody species.
- (3) Leafy browse composed of evergreen or tardily deciduous leaves *in situ* on perennial woody species.
- (4) Mast from all vegetative layers including acorns, fleshy fruits, and seeds from many agricultural crops.
- (5) Leguminous seeds.
- (6) Cool season grasses and forbs (succulent) including growing herbaceous agricultural crops.
- (7) Mushrooms.
- (8) Ground pine (*Lycopodium clavatum*) and running pine (*L. digitatum*).

If all available plant material from these forage classes is utilized at MCBQ, then the WTD HSI value was found to approach the maximum value (1.0) (Banker and Stauffer 1994). As such, Banker and Stauffer (1994) suggested modifying the HSI model to identify real world variability by incorporating utilization rates (expected percent of available forage consumed by deer) based on the quality of forage. The utilization rates by forage type are: current year twigs and needles, 5%; dried, fallen leaves, 0.5%; leafy browse, 20%; mast, 50%; cool season grasses and forbs, 20%; and mushrooms, 50%. The utilization rates represent the inverse of their relative abundance at MCBQ (i.e., leafy browse, mast, grasses/forbs, and mushrooms, are generally less abundant than the poor quality forages of twigs, needles and fallen dried leaves). By assigning utilization rates in this manner, a range of HSI values less than 1.0 can be identified to develop deer management units based on the abundance of high quality

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forage, which has been posited as the better indicator of habitat suitability over quantity of forage (Banker and Stauffer 1994). Based on this model, the quantity of food is not a limiting factor at MCBQ, but high quality forage can be inadequate.

b. Water. Man-made reservoirs, beaver ponds, perennial streams, and springs provide a year-round supply of water within deer home ranges at MCBQ. Therefore, water is not a limiting resource.

### 2. Cover

a. The type and amount of cover required by WTD depends to a great extent upon regional conditions, particularly weather and predation. In the northern parts of WTD range, conifer stands provide essential thermal cover during severe winter weather. Winter cover is less critical for WTD in more southern latitudes. In the MCBQ environs, intermediate between northern and southern latitudes, snow is intermittent or almost entirely absent for much of the year; hardwood brush, mountain laurel thickets, and young pine stands are readily available to provide protective cover.

b. Dense escape cover may also help WTD survive the hunting season. The impact of predation on the MCBQ WTD population is unknown as coyotes have become established at MCBQ, and fawns may be important in the summer diet of territorial pairs. Coyotes and bobcats (*Lynx rufus*) occasionally take adult WTD but it is believed that their predation is limited primarily to diseased or crippled animals.

3. Habitat Interspersion. WTD populations appear to thrive in areas of high habitat diversity (McCaffery and Creed 1969). Any given habitat type in isolation usually provides optimal food resources during only one or two seasons; therefore, the interspersion of habitat types throughout a home range affords a wider range of year-round food and cover resources than do large uniform habitats. Important habitat types include mature forests (40 + years of age), early successional forests (15 years of age or younger), open grassland areas, wetlands, and agricultural lands. With the juxtaposition of several of these habitat types, WTD also receive benefits from the intervening ecotones, or transition zones between cover types. WTD tend to use diurnal habitats that offer adequate cover and nocturnal habitats that have the best foraging areas.

### 4. Soil Fertility

a. Inherent soil fertility affects the nutrient quality of plant materials eaten by WTD, which ultimately affects the physiology of the animals. For example, mineral deficiencies in forages grown on soils of low fertility may affect population characteristics such as density, productivity, average weights, and antler development. Also, soil fertility affects a practice known as geophagy, whereby WTD directly ingest soil material to take in salts and minerals. Deer will visit both artificial and natural "licks" to consume these



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dietary supplements. This practice occurs mainly in the spring and summer.

b. MCBQ soils are generally acidic and infertile. The best agricultural soils at MCBQ are generally the Triassic soils found in the northwest training areas of the Base. Studies have therefore found that average buck weights from areas of Triassic soils (training areas 14, 15 and 17) were larger (but not statistically significant) than weights from the other WTD management areas on Base (Banker and Stauffer 1994).

### 6503. DEER HABITAT RESOURCES AT MCBQ

1. The area west of Interstate 95, known as Guadalcanal, has been managed for WTD hunting since at least 1962. The Guadalcanal area is further subdivided into deer management units based on TA boundaries. The management units east of Interstate 95 have been hunted on a limited basis since 1992, and are Mainside, north of Chopawamsic Creek, and Officer Candidates School (OCS), south of Chopawamsic Creek. Mainside is the only area with a significant amount of development, supporting most of the administrative buildings and all of the housing facilities on the Base. Despite the development, there are still large undeveloped tracts of woodlands that provide deer habitat and escape cover.

2. While virtually all vegetated habitats (e.g., forests, rights-of-way, utility corridors, golf courses, lawns, and forested wetlands) provide food and shelter for WTD, the density of animals they support tends to vary. A 40-10-20 "rule-of-thumb" for predicting the winter capability of eastern deciduous forest types to support WTD populations is as follows:

a. Forests 15 years old or younger (seedling-sapling) generally can support 40 deer per square mile through the winter.

b. Forests 16-39 years of age (pole-timber) can support only 10 deer per square mile through the winter.

c. Forests 40 years of age and older (sawtimber) can support 20 deer per square mile through the winter.

These rule of thumb estimates are based on herds that are presumably maintained in good condition (i.e., accounting for both density AND range/habitat considerations). It is possible that herds may survive at higher forest densities, but these estimates represent thresholds above which over consumption of the vegetative growth could damage the quality of the range. That is, as range quality deteriorates it is accepted that herd characteristics (e.g., average weight, antler growth, and reproductive rate) will decline. Thus, the 40-10-20 rule aims to prevent unnecessary loss or scarcity of the highest nutritional quality, and resulting impacts to herd characteristics,

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that could occur at higher densities. Deviations from this "rule" for forest areas may be appropriate under certain circumstances, such as high acorn production years for 40 + year old hard mast producing forests (HDWD) and mixed pine-hardwood (PHWD) forests that provide higher nutritional energy acorns capable of supporting greater numbers of WTD. Grasslands, especially when mowed and fertilized, can produce large quantities of highly nutritious forage. Thus, lawns, golf courses, parade fields, landing zones, and managed openings may produce enough energy to support 80 or more WTD per square mile.

3. A WTD habitat study of MCBQ woodlands identified a measurable relationship between metabolizable energy and forest age on Base that justifies the application of the 40-10-20 rule (Banker and Stauffer 1994). The study results suggest that younger forests (0-15 years old) provide about 4 times the energy of pole-timber stands (16-39 years old), and twice the energy of stands over 40 years of age. This result lends some credence to the ratio of 40-10-20 being used to describe the relative WTD carrying capacity (in deer per square mile) of seedling-sapling, pole-timber, and sawtimber forest stands on MCBQ. Also, since the study was done in a year of mast failure (i.e., no acorns), it preserves the notion that acorn mast production may increase the energy value in HDWD and PHWD habitats over 40 years of age, thereby allowing for higher herd densities.

4. The habitat resources available at MCBQ are summarized at Table 6-6. Based on the available acreages, and applying the 40-10-20 rule to respective forest habitats, the estimated overall winter carrying capacities for the three primary WTD management areas are: Guadalcanal, 23 deer/square mile; Mainside, 36 deer/square mile; and OCS, 24 deer/square mile. Forested wetlands and old field habitats were assigned a value of 40 deer/square mile, and managed grasslands were assigned a habitat value of 80 deer/square mile. It is emphasized that these values are estimates and that they may vary considerably based on acorn production, weather, and other land management practices.

6504. MANAGEMENT PRACTICES. Habitat management, population monitoring, and harvest management are primary WTD management practices used at MCBQ. Habitat management consists of practices of forestland and grassland management that enhance food quality for deer. Population monitoring primarily involves the collection of data that reflect herd numbers and/or physical condition and can be used to evaluate requirements to control or expand deer numbers. Knowledge of habitat and deer herd conditions contribute to informed decisions concerning annual deer hunting regulations and desired harvest results.

1. Habitat Management. The discussion in Chapter 6, Section 2, describes vegetation management practices and recommended strategies for quality deer habitat (Table 6-1). Per the discussion in 6503 above, the vegetation types that contribute most to quality deer

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habitat appear to be young forests (<15 years of age), mature forests (>40 years of age), old fields, managed grasslands, and vegetated wetlands. The vegetation type that contributes the least to deer habitat appears to be pole size forests, 16-39 years of age.

2. WTD Population Monitoring. Both direct and indirect census methods are available for estimating WTD density as function of population management. Direct techniques involve counting actual animals and using the data to estimate the total population. At MCBQ, spotlight counts and harvest data are the primary direct count methods that have been used. Experimentation with camera trapping is also being done to create an index of animals captured per unit time. Indirect techniques rely upon counting signs of WTD presence (i.e., track counts or pellet group counts) and converting the data to an index that is relative to the total number of animals in a particular population. Both direct and indirect methods have inherent shortcomings and constraints. Thus, census techniques are often used in tandem with one or more other techniques. Whatever the technique(s) the results obtained are not intended to determine actual animal numbers present, but rather to produce estimates that can be used to monitor trends in population density. Three methods of direct and indirect techniques used consistently at MCBQ over a number of years to monitor the WTD population are spotlight counts, snow track counts, and deer harvest (hunting) data.

a. Spotlight Counts. The spotlight count is a direct census technique used to inventory a variety of species, such as WTD, that have a tendency to "freeze" when blinded by high power spotlights. Spotlight counts are a reliable, cost effective method used to census WTD on relatively large open range habitats using minimum manpower and equipment expenditures. Conversely, they have limited use while deciduous trees are leafed out. Thus, since MCBQ is mostly forested, spotlight counts have the most utility after leaf fall when there is some visibility into hardwood stands.

b. Track Counts. Track counts are usually conducted within 24 hours of snowfall at MCBQ. Track counts are generally practiced on or near improved gravel roads and forest trails of known lengths that are used as permanent transects by WTD. Two-member sampling crews drive the transects and count the number of deer crossings observed. Density is estimated by using simple equations that relate the total number of track crossings counted to the mileage censured and the average daily home range diameter of WTD (Tyson 1959).

c. Harvest Data. Measuring the deer sex-age composition of the WTD harvest brought to game checking stations can be useful for reconstructing population structure (Creed et al. 1984). Average weights of deer, antler beam diameter of yearling bucks, and overall condition are useful indicators of range condition and the presence of disease conditions.

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3. Harvest Management. Information about population trends and habitat evaluation must be integrated to determine a baseline WTD population size compatible with available resources. That baseline may also be impacted by human social factors that also may influence management decisions, such as the demand by the public to reduce deer/vehicle collisions, observe deer, or preferences of hunters to bag trophy bucks. Major WTD harvest management strategies include:

a. Buck-only Harvest. Restricting hunting seasons to antlered bucks only is a strategy used to allow newly established populations to grow rapidly. If used continuously, buck-only hunting results in the following: (a) high residual population of predominantly females; (b) low recruitment rates; and (c) mature antlered bucks comprising 10% or less of the population (McCullough 1984). MCBQ has not used buck-only hunting seasons since the 1960's. Some regions that are experiencing severe predation of fawns may consider this strategy to sustain more breeding-aged females, increase fawning potential, and stop WTD population declines.

b. Maximum Sustainable Yield. This strategy, sometimes referred to as "either-sex hunting," attempts to prevent overpopulation of deer by harvesting both sexes in equal numbers. The resulting equality between doe and buck populations should maintain a lower population of deer, higher quality forage, and produce greater fawn recruitment due to enhanced physical condition of the does. This strategy has been practiced at MCBQ since 1968.

c. Quality Deer Management. Quality Deer Management (QDM) is the process of delaying harvest on young bucks combined with an aggressive doe harvest. Similar to either-sex hunting, the goals of this management practice are to approach a 1:1 buck/doe ratio and to maintain a healthy deer herd that is in balance with its habitat. However, by not harvesting younger bucks, the buck harvest is focused on the older age classes of bucks (2 ½ years and older) that have larger body weights and antler size.

### 6505. HISTORICAL DATA

1. Spotlight Counts. Winter spotlight counts were begun in 1992 to initiate population surveys for WTD in the Mainside deer management unit east of Interstate 95. Increasing complaints about the number of vehicle/deer collisions at Mainside made it necessary to begin a more active deer management program. Concurrent counts were also made at Guadalcanal deer management areas to provide comparable data. Counts from night surveys can be highly variable, but the results shown at Figures 6-13 and 6-14 suggest that there are more deer per square mile east of I-95 than west of I-95. This trend is supported by harvest data, which documents that Mainside archers harvest up to three times more deer per square mile than their counterparts west of I-95.

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2. Track Counts. Since 1977, post-hunting season deer track counts have been conducted within about 24 hours after snowfall. Proper conditions for a track count only occur sporadically for the following reasons: snowfall events of an appropriate depth are rare (heavy snows result in impassable roads; light snows melt too rapidly to provide a good track count); the day following snowfall must be relatively free from military live-firing activities in order to permit access to training area roads; and personnel and 4-wheel drive vehicles must be available at short notice. Track count results are shown in Figure 6-13 along with night count results west of Interstate 95.

3. Harvest Data. Basic annual WTD harvest data has been collected at MCBQ since 1962. A graph of annual harvest numbers over that time is provided in Figure 6-15. Collection of additional harvest data (weight and antler points) began at MCBQ in 1965 to assess herd health and range conditions based on yearling buck weights, the percent of yearlings with branched antlers, and to allow computation of population densities using the sex-age-kill method. Yearling antler beam diameter is a good indicator of the range condition and productivity of deer herd (Severinghaus and Moen 1983) and has been measured since 1984.

### a. Yearling Antler Beam Diameter (YABD)

(1) Average weights were determined for MCBQ WTD yearling bucks and then grouped into YABD size classes. Data shows that the average weights of MCBQ WTD increase as YABD increases (MCBQ 1997). Studies also indicate that larger average YABD (greater than 20mm) indicates excellent range conditions, whereas smaller YABD (less than 15.5mm) indicates poor range condition (Moen et al. 1986). Combining these two concepts, MCBQ correlates average yearling buck weights to range conditions such that yearling bucks averaging less than 79 pounds generally indicate poor range conditions and yearling bucks averaging greater than 85 pounds generally indicate excellent range conditions.

(2) This correlation can be cross-checked with the correlation between average YABD for MCBQ WTD and the MCBQ acorn production index from the previous year (MCBQ 1997). Data shows that range conditions for MCBQ deer improve when there is a good acorn crop, because WTD that have an abundant acorn supply may survive the winter at a heavier weight than a browse diet would allow. The larger weight may also allow them to grow larger antlers the next spring due to their improved nutritional condition. Because the improved nutrition also affects the female segment of the population, Severinghaus and Moen (1983) have used YABD as an independent variable to predict the reproductive rates of female deer giving birth the following spring.

b. Range Condition/Weight of Yearling Bucks. Average hog-dressed weights of MCBQ yearling bucks from 1965-2012 are shown at Figure 6-16. Also shown are lines predicting range condition based on YABD. From 1965 through 1968 annual yearling buck weights averaged 90-96

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pounds, indicating excellent range conditions. From 1969 to 1979 annual yearling buck weights averaged at least 80 pounds. During the 33 years from 1980 to 2012, annual average yearling buck weights exceeded 80 pounds on only 2 occasions, suggesting declining range conditions.

### 4. Hunting

a. Since 1966, an either-sex (maximum sustained yield) shotgun hunting program in the Guadalcanal area has resulted in sustained annual harvests comprised of about 55% bucks and 45% does (Figure 6-17). Antlerless deer (either-sex) hunting has been legal during the annual archery season (4-5 weeks) and for 10 or more days during the annual firearms season since 1968. The Commonwealth of Virginia allows for a special muzzleloading rifle season during early November. To date, MCBQ has not implemented this early firearms season.

b. Deer hunting was not conducted in the Mainside and OCS management areas east of Interstate 95 until the late 1980s. The OCS area was opened to archery hunting in 1987 and firearms hunting in 1990. In response to concerns about deer/vehicle collisions in the Mainside area, a limited archery program was initiated there in 1992. The Mainside area was also enrolled in the Virginia Deer Management Assistance Program (DMAP) so that participating hunters could harvest additional antlerless deer that would not count against their daily or season bag limits.

c. The percent of yearling bucks (1 ½ years of age) in the total antlered buck harvest throughout MCBQ has shown a decline since the early 1980s (Figure 6-18). A greater portion of the antlered buck harvest has come from WTD bucks in older age classes, i.e., 2 ½, 3 ½, 4 ½, and 5 ½+ year age classes. The decreased harvest of younger bucks may be due to public support and practice of QDM along with delaying the firearms harvest until late November.

5. Archery Survey. Starting in 2002, an annual archery hunting season survey was initiated to record hunter observations of animals, type of archery tackle used, and the amount of time spent hunting across MCBQ. The survey is based on a similar survey conducted by the VDGIF and is conducted throughout the entire first week of the WTD archery season. All hunters returning to the MCBQ check station after their hunt are asked to complete a survey. Data collected throughout the survey help supplement other population estimation techniques and provide an additional means for estimating WTD population characteristics. Hunter observations of WTD during the survey period are shown at Figure 6-19. Over the life of the survey the number of WTD observed has fluctuated, but in recent years observations are at the highest they have been since the survey was initiated.



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### 6. Lyme Disease

a. During the past two decades, Lyme disease has become the most commonly diagnosed arthropod-borne illness in North America. The causative agent is a bacterial spirochete (*Borrelia burgdorferi*) transmitted by the deer tick (*Ixodes scapularis*). WTD are not good spirochete reservoirs and play no role in the natural enzootic maintenance of *B. Burgdorferi* transmission, which involves larval and nymphal ticks that feed on small mammals, principally white-footed mice (*Peromyscus leucopus*). However, WTD are the single most important vertebrate host for feeding by adult deer ticks, thereby strongly influencing the tick's reproduction, abundance, and distribution.

b. In 1991, the U.S. Army Environmental Hygiene Activity, Fort Meade, Maryland, conducted a Lyme disease risk assessment at MCBQ. They examined 113 WTD at the MCBQ GCS for the presence of deer ticks and collected blood samples to test for Lyme disease antibodies. The Lyme disease spirochete was not found in 47 tested deer ticks, but was found in Lone Star ticks, *Amblyomma americanum*, and in winter deer ticks, *Dermacentor albipictus* found on the animals. Accordingly, two blood serum samples from MCBQ WTD tested positive for Lyme disease antibodies, leading to the conclusion that the tick vector and the causative agent of Lyme disease were present at MCBQ. The report also concluded that the risk for contracting the disease was high for persons who spend much time in the Base woodlands.

### 7. Hemorrhagic Disease

a. In the early fall of 1996 the MCBQ WTD herd suffered a severe outbreak of epizootic hemorrhagic disease (EHD). EHD is common throughout the Southeast United States and is the most important infectious disease of WTD. EHD is a virus that is transmitted by tiny biting flies in the genus *Culicoides*. Symptoms of the disease in animals are a high fever, swollen head, neck, or tongue and difficulty in breathing. In acute cases WTD die within 1 to 3 days of infection (SCWDS 1990). However, it is more common for WTD to become lame, lose their appetite, and become emaciated.

b. Harvest records documented that 86 deer harvested in the 1996-1997 MCBQ hunting season had sloughed hooves (Figure 6-20), which is a sign of deer that have survived EHD. Additionally, the 1996 deer harvest at MCBQ dropped over 20% from 1995 and continued to decline to over 36% animals by 1998. Based on these trends and observations, blood samples were collected from MCBQ WTD and were found to be positive for EHD viral type 2 in 30% of the animals. While the risk factors are not well documented, white-tailed deer population density is not believed to be a major factor in the severity of the disease. Harvest records show that in most years few WTD contain sloughed hooves (Figure 6-20) and that significant EHD outbreaks at MCBQ are infrequent.



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### 8. Predation

a. In recent years coyotes have migrated into the Northern Virginia Piedmont. Signs and sightings of coyotes have become common and the coyote is now well established at MCBQ. Coyotes will opportunistically prey on WTD, especially young fawns in the summer. Recent research has documented southeastern WTD populations experiencing negative impacts from coyote predatory attacks (Kilgo et al. 2012).

b. MCBQ biologists initiated an ongoing study in 2008 to examine the impact of coyote predation on WTD survivorship. The basic technique is to attach radio-transmitters (equipped with mortality indicators) to WTD and monitor them to detect when they die and what caused the mortality to occur. The site of death is investigated to recover carcass remains, recover the transmitter and to look for evidence of cause of death (e.g., predation, disease, abandonment, etc.). Multiple methods have been used to attach radio transmitters to WTD. Adult females are sedated by shooting them with a dart loaded with anesthetizing drugs. Then they can then be equipped with standard neck collars and also with vaginal implant transmitters (VITs) that will mark a fawning site upon parturition. Newborn fawns are thus located at the site of expelled VITs; fawns are also often located using ground searches and thermal imagers to detect them by their body heat. Fawns have also been located when persons finding them in yards, parking lots, and firearms ranges report them to NREA. Newborn fawns are easily captured by hand, pertinent biological data (e.g., sex, weight, age, etc.) is recorded, and then the animals are fitted with a radio tracking collar and numbered ear tag.

c. Preliminary results show that predation has been a source of mortality along with abandonment by the dam, entanglement in fences, diseases, and vehicle collisions. Based on data collected thus far, it appears fewer than 50% of fawns survive into the fall population. This can affect population growth rates and may require future modifications to harvest management strategies.

9. Chronic Wasting Disease (CWD). CWD is a progressive neurological disease found in WTD and elk (*Cervus Canadensis*). CWD belongs to the family of diseases known as transmissible spongiform encephalopathies, and is ultimately fatal. There is no evidence that CWD can be transmitted to domestic livestock or humans, but there are still concerns that somehow the agent causing CWD in deer will become pathogenic to humans. CWD was found near Winchester, Virginia, in 2009. The VDGIF is maintaining surveillance to monitor any sickly WTD for CWD. MCBQ biologists will maintain communication with military trainers, hunters, and VDGIF biologists and will rapidly respond to any reports of sick WTD to collect tissues for disease testing. In the event that CWD positive deer are found in northern Virginia, MCBQ will implement a response plan in coordination with VDGIF biologists. The response plan will at a minimum include disease surveillance and public information releases.

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### 10. Mineral Supplementation

a. The provision of supplemental salt and mineral resources is commonly practiced by landowners interested in improving physiological condition and antler development in WTD. The actual benefit of the practice has been subject to a number of studies, many of which have been inconclusive. However, some studies suggest that mineral supplementation (especially calcium, phosphorus and sodium) may provide some benefit in areas with mineral deficient soils (Howard and Murphy 2003). Due to the generally acidic and impoverished soils at MCBQ, mineral licks were established around 1980 at the rate of about 1 per 750 acres and were replenished annually in February and July until 2006.

b. In response to the CWD threat to the Commonwealth's WTD herd, VDGIF passed regulations in 2006 placing a seasonal ban on the distribution of food, salt and minerals to attract deer. To comply with the feeding ban, MCBQ suspended the placement of mineral supplements in the TAs.

### 6506. MANAGEMENT RECOMMENDATIONS

#### 1. Habitat Management

a. Forest management practices that are recommended to enhance WTD habitat include:

(1) Make small (10-20 acre) scattered regeneration cuts that intersperse young forest stands within a mosaic of mature forest stands and woodland openings.

(2) In loblolly pine stands, use prescribed burning on a 3-5 year rotation to reduce fuel and stimulate herbaceous and woody plant production in the understory. Also, promote pre-commercial and commercial thinning to open the canopy and stimulate understory plant growth in 16-39 year old stands.

(3) Within forest compartments, maintain 50% of management area in mast-producing forest (HMHD or PHWD) >40 years of age.

(4) Implement an Integrated Pest Management Program (see Chapter 5, Section 6) to help protect oaks and mast production capability of MCBQ forest ecosystems.

b. Use appropriate agronomic practices to plant protein rich forage crops in support of multiple land-use objectives. Open range areas, rights-of-way, landing zones, skid trails, and logging decks should be specifically targeted for plantings that provide multiple benefits: erosion control, woody vegetation control, watershed protection, and wildlife grazing fields. Opportunities should be sought to increase the amount of cultivated acreage.

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2. Population Management. Continue to collect population data through track counts, late winter spotlight counts, archery surveys, and harvest returns to provide long-term deer population information and range condition trends. Camera trapping may be added as an additional monitoring method.
3. Harvest Management. The doe harvest has been reduced intentionally since 2006 so that the desired harvest ratio is closer to 60% bucks/40% does rather than 50% bucks/50% does. Because of the possible impact of predation on fawn recruitment, the doe harvest may need to be further reduced to maintain adequate fawn production. Restrictions on buck harvest by limiting firearms seasons during early rut should continue as a means of maintaining a higher proportion of mature bucks in the herd. Antler restrictions to protect yearling bucks from the harvest can be practiced if necessary. However, under the current management regime, the majority of the mature buck harvest is in older age classes.
4. Risk Factors. Continue to support ecosystem studies involving factors such as predation, parasitism, and disease that may impact WTD populations, as well as human health.

### 6507. REFERENCES

- Banker, M. E., and D. F. Stauffer. 1994. Modeling White-tailed Deer Habitat Quality and Vegetation response to succession and management. Dept. of Fisheries and Wildl. Science, VPISU, Blacksburg, Va. 148pp.
- Creed, W. A., F. Haberland, B. E. Kohn, and K. R. McCaffery. 1984. Pages 243-260 In L. K. Halls, ed. White-tailed Deer: Ecology and Management. Stackpole Books, Harrisburg, Pa. 870 pp.
- Halls, L. K., ed. 1984. White-tailed Deer: Ecology and Management. Stackpole Books, Harrisburg, Pa. 870 pp.
- Howard, B. and B. Murphy. 2003. Mineral Supplementation-Necessity or Never Mind? Quality Deer Management Association. 4 pp.
- Kilgo, J. C., H. S. Ray, M. Vukovich, M. J. Goode, and C. Ruth. 2012. Predation by coyotes on white-tailed deer neonates in South Carolina. J. Wildl. Manage 76(7): 1420-1430
- MCBQ. 1997. Fish and wildlife management plan: section III of the integrated natural resources management plan for Marine Corps Base Quantico. Chapter 13. Quantico, Va. 24pp.
- McCaffery, K., and W. A. Creed. 1969. Significance of forest openings to deer in northern Wisconsin. Wis. Dep. Nat. Resour. Tech. Bull. 44. 104 pp.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- McCullough, D. R. 1984. Lessons from the George Reserve, Michigan. Pages 211-242 In L. K. Halls, ed. White-tailed Deer: Ecology and Management. Stackpole Books, Harrisburg, Pa. 870 pp.
- Moen, A. N , C. W. Severinghaus, and R. A. Moen. 1986. DeerCAMP: Computer-Assisted Management Program Operating Manual and Tutorial. CornerBrook Press, Lansing, NY. 170 pp.
- Severinghaus, C. W and A. N. Moen. 1983. Prediction of weight and reproductive rates of a white-tailed deer population from records of antler beam diameter among yearling males. New York Fish Game J. 30(1):30-38.
- Short, H. L. 1986. Habitat suitability index models: White-tailed deer in the Gulf of Mexico and South Atlantic coastal plains. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.123). 36 pp.
- Southeastern Cooperative Wildlife Disease Study. 1990. Hemorrhagic Disease of White-tailed Deer. University of Georgia, Athens, Ga. Brochure. 2pp.
- Tyson, E. L. 1959. A deer drive vs. track census. Trans. North Am. Wildl. and Nat. Resour. Conf. 34:457-464.

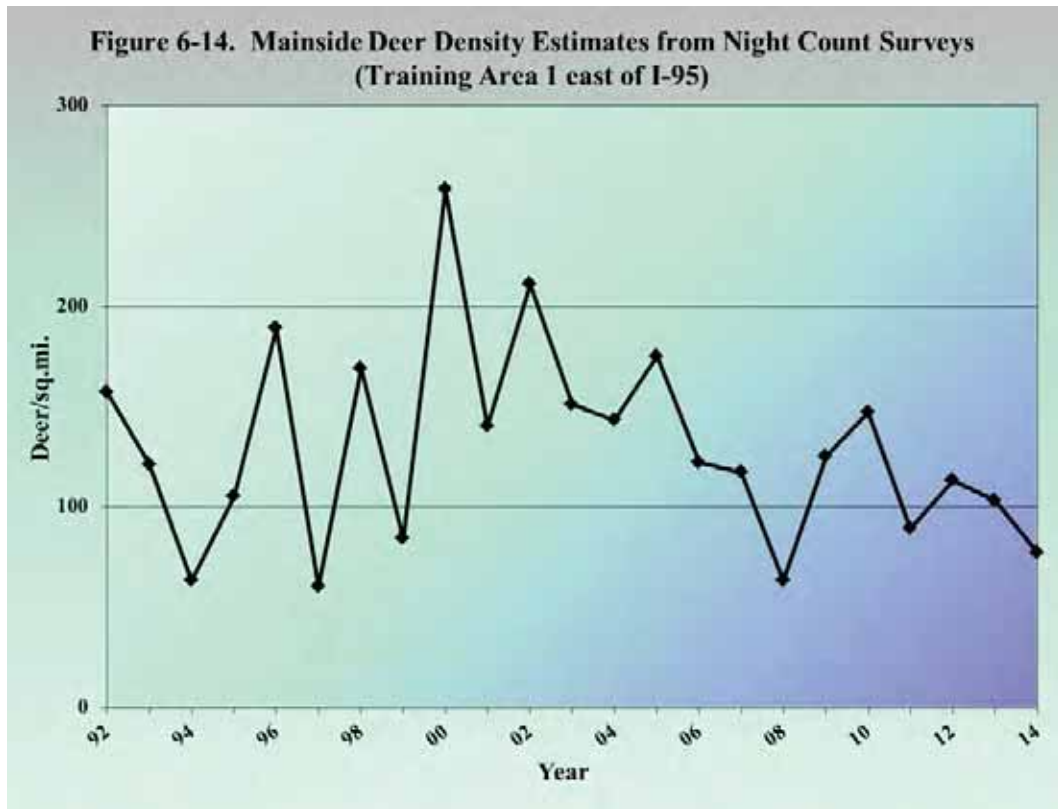
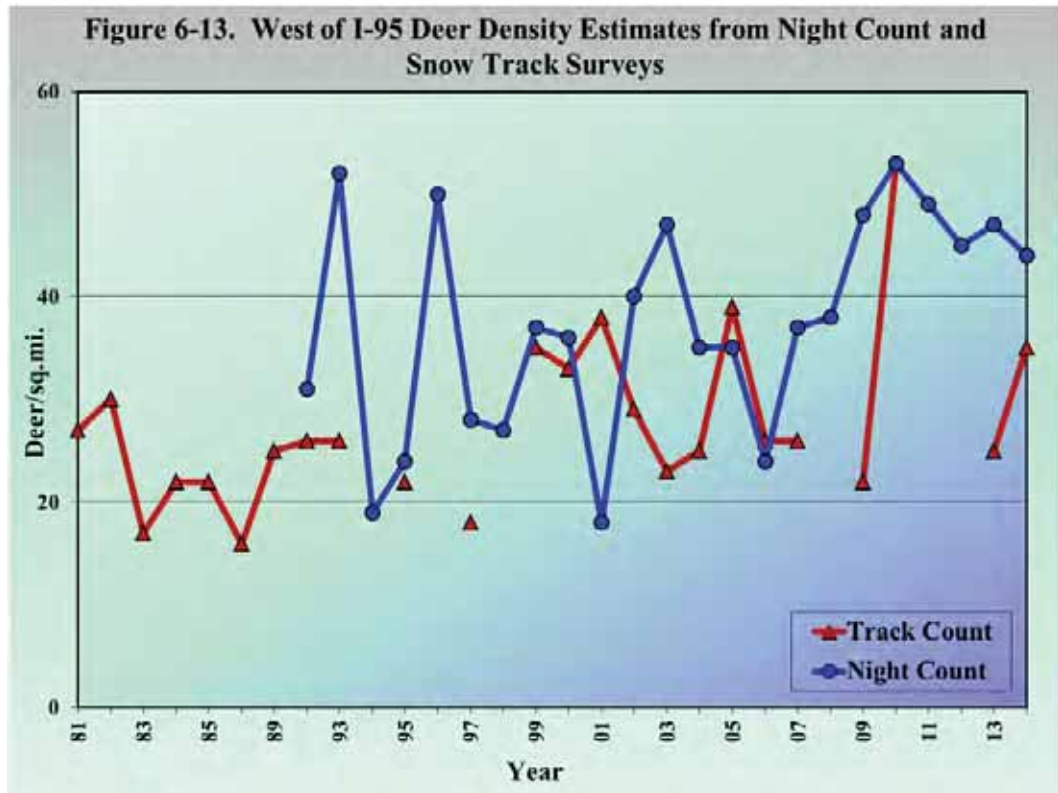


Figure 6-15. Marine Corps Base, Quantico, Deer Harvest Records

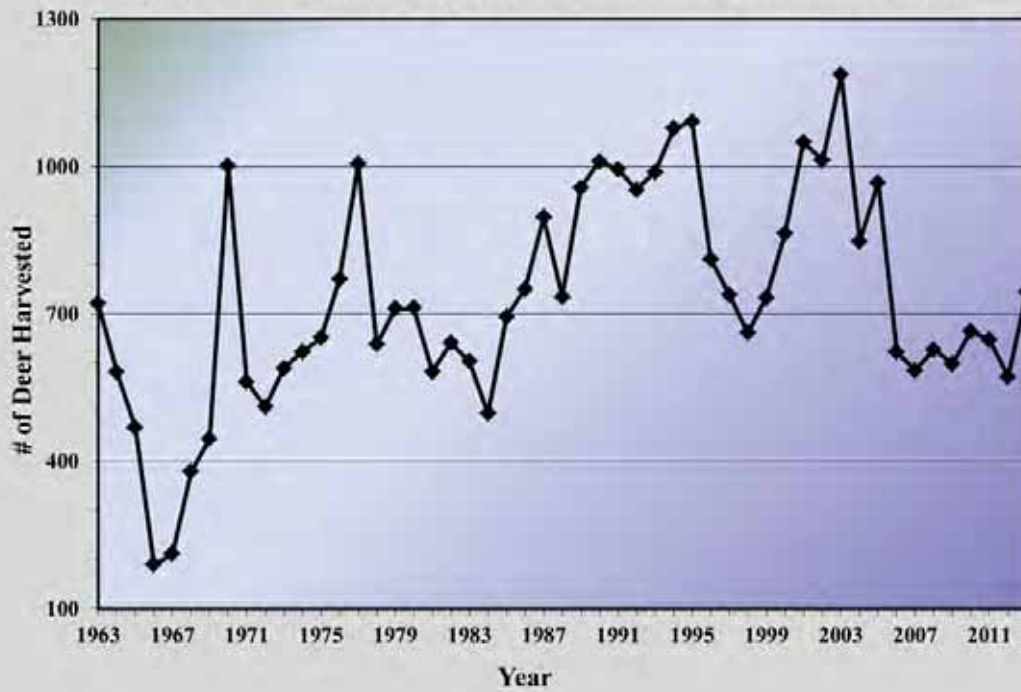
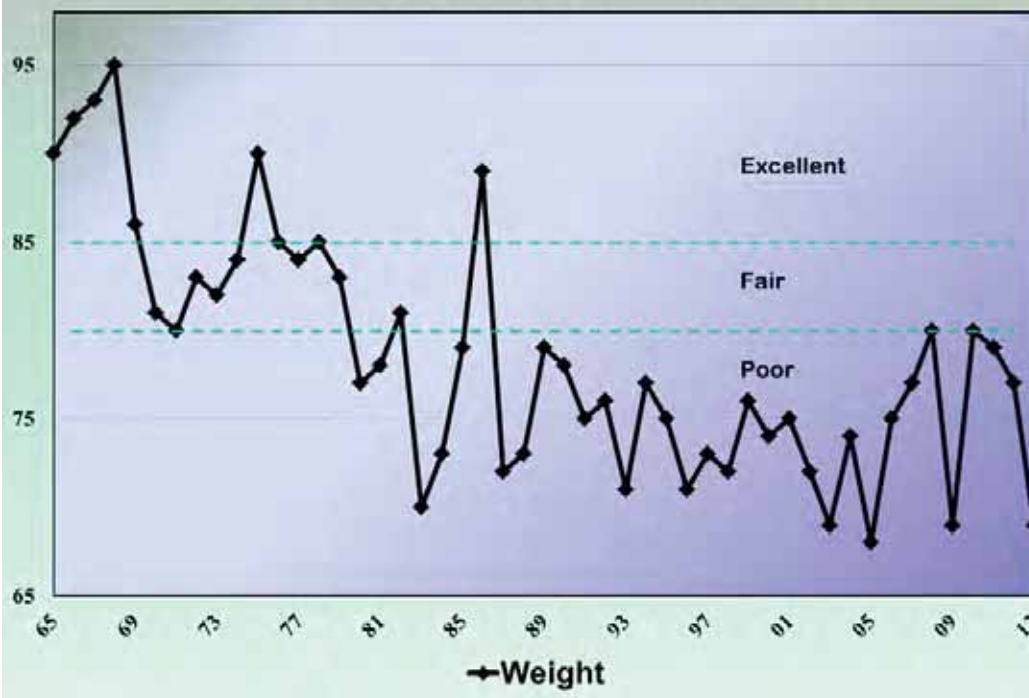
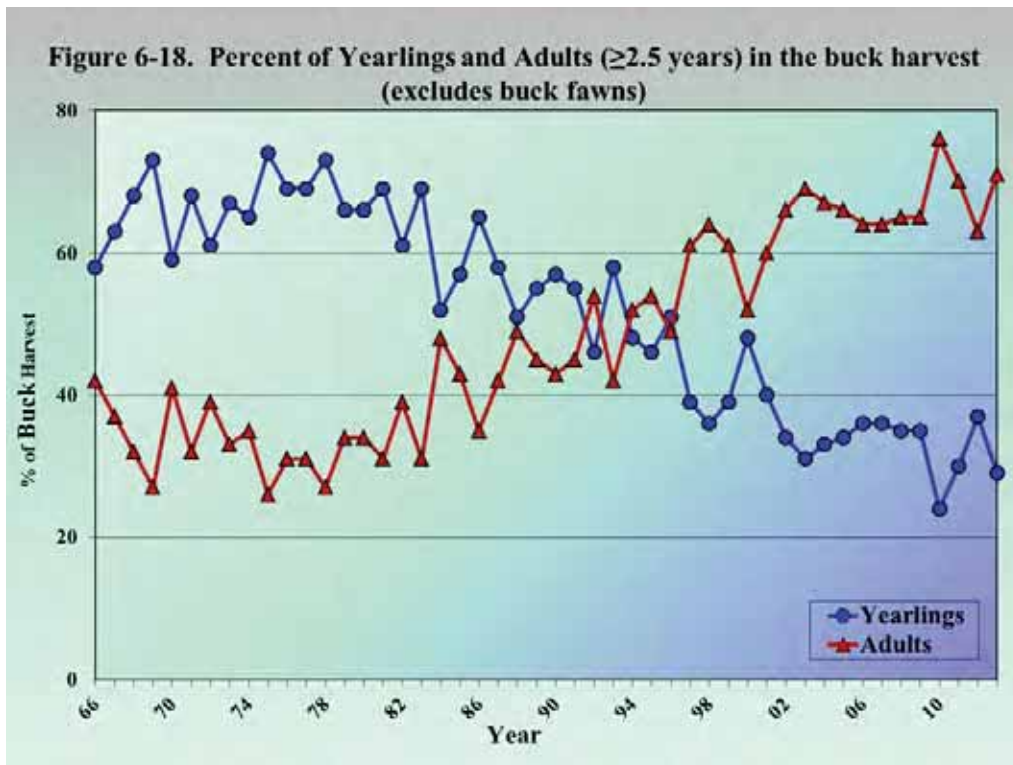
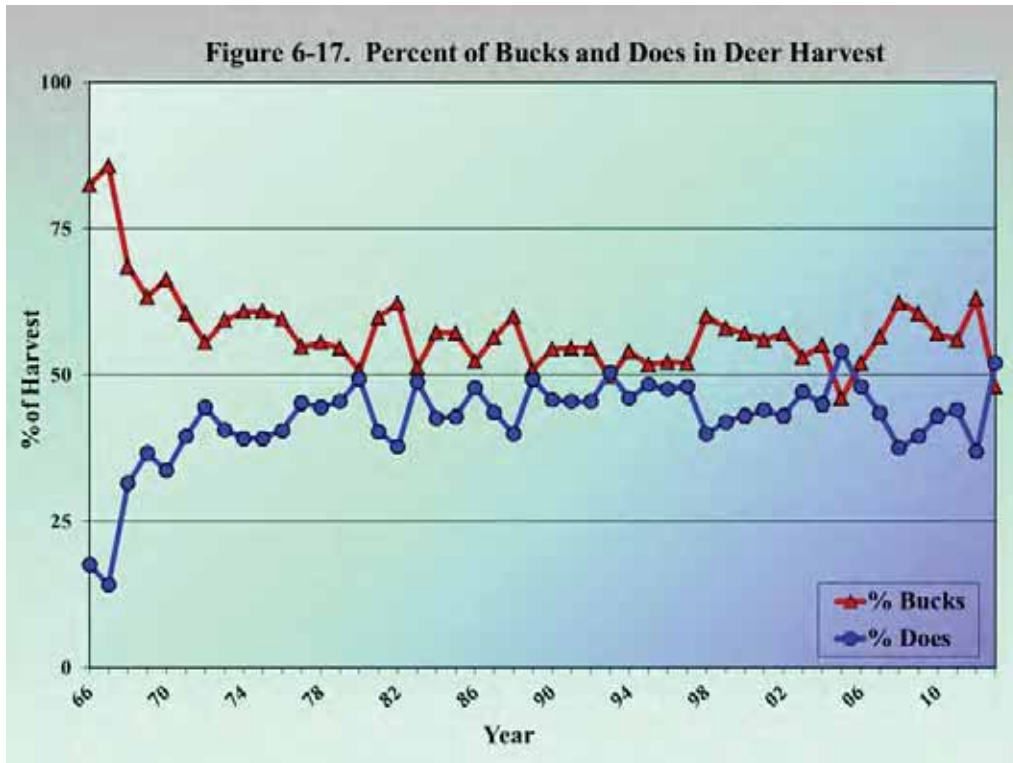


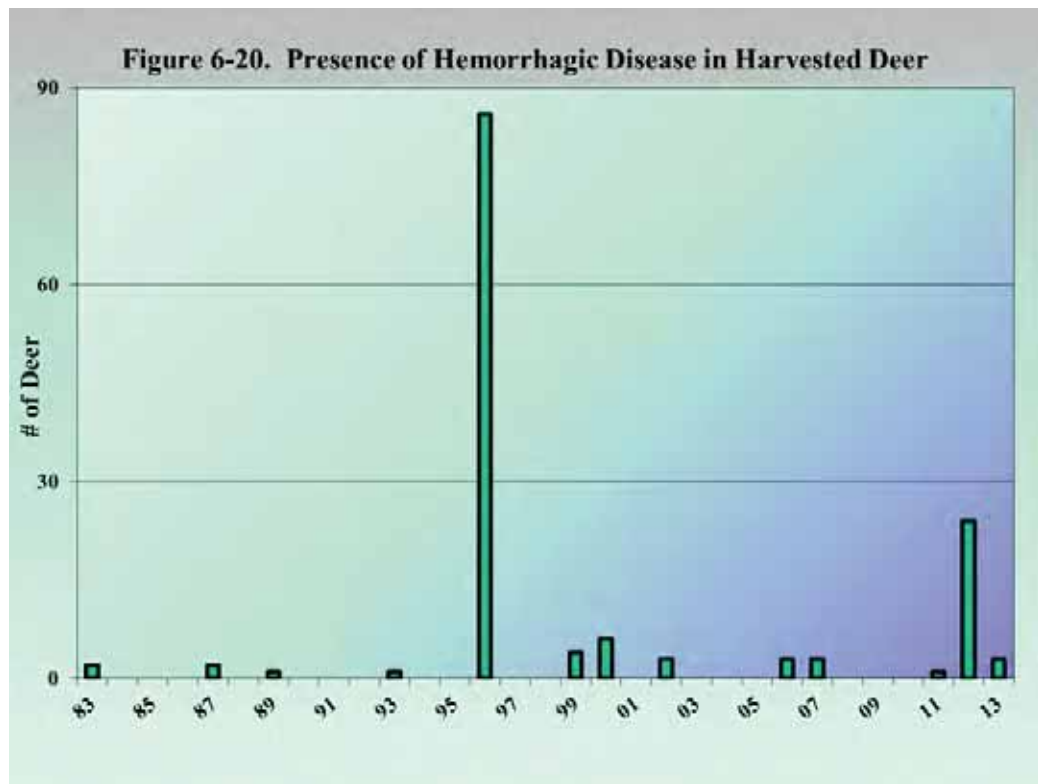
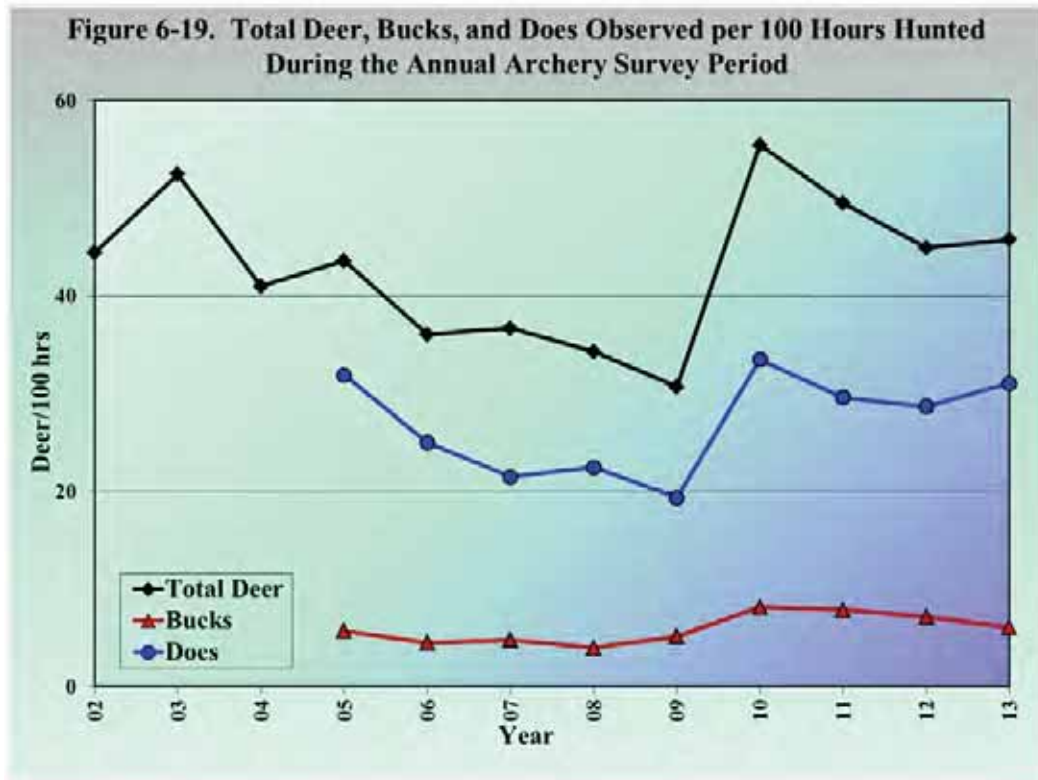
Figure 6-16. Hog-dressed Weight of Yearling Bucks and Predicted Range Condition (Excellent, Fair or Poor)











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Table 6-6. Acres of deer habitat at Marine Corps Base, Quantico, and estimate of the winter carrying capacity (WCC).								
HABITAT TYPE	MAINSIDE		OCS		GUADALCANAL		TOTAL	
	Acres	WCC: # deer	Acres	WCC: # deer	Acres	WCC: # deer	Acres	WCC: # deer
Forest <= 15 years of age	0	0	125	7.8	5,123	320	5,248	328
Forest 16-39 years of age	9	0.1	88	1.3	3,840	60	3937	62
Forest >= 40 years of age	2,551	80	2455	77	37,412	1,169	42,418	1,325
Old Fields: broomsedge grass, seedling/sapling	36	2.3	99	6	3,504	219	3,606	225
Cultivated/mowed grassland	954	119	104	13	964	121	2,022	253
Forested wetlands	75	5	31	2	38	2	144	9
TOTAL	3,625	206	2902	107	50,881	1,891	57,375	2,202
SQUARE MILES: DEER/MILE <sup>2</sup>	5.66	36.4	4.53	23.6	80.77	23.4	89.65	24.6

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## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 6: UPLAND SMALL GAME

6600. UPLAND SMALL GAME. Bobwhite quail, mourning doves (*Zenaida macroura*), cottontail rabbits, ruffed grouse, woodcock, and gray squirrels are the upland small game species that inhabit MCBQ. The primary management objective for upland small game is to maintain these species to contribute to the biological diversity of the landscape and to support recreational hunting, when feasible. Life histories of these species are described in more detail at MCBQ (1997).

6601. NORTHERN BOBWHITE QUAIL. The northern bobwhite was an important game species but has largely disappeared from many parts of its native range, including northern Virginia landscapes, over the past two decades. As a result of large scale population declines, the National Bobwhite Conservation Initiative (NBCI) was founded in 2002. NBCI consists of professional scientists, wildlife managers, and conservation specialists from 25 state wildlife agencies who are working cooperatively to restore bobwhite habitat and recover bobwhite populations. As bobwhites are still found at MCBQ in small numbers, primarily in and around the fire maintained grasslands near impact areas, MCBQ managers will continue to reference NBCI for new and important information related to improving bobwhite management aboard Base. MCBQ wildlife managers consider the bobwhite to be among the most threatened species at MCBQ although it has no formal protection status. The primary management objective for the bobwhite is to halt the downward population trend and restore the health of this species. In accordance with NBCI's strategic plan, management efforts at MCBQ will be directed towards the creation of new quail habitat and connection of existing habitat via the fire-ecosystem management effort described in Chapter 6, Section 2. More intensified population monitoring must be conducted to determine the response of the population to management efforts, and to determine whether more intensive management, such as predator control, could help restore this population.

#### 1. Population Trends

a. Harvest Data. Bobwhite quail harvest records for MCBQ are shown at Figure 6-21. Significant harvest declines occurred after 1972 as many grasslands became reforested thereby reducing habitat quality and quantity. Bobwhite quail hunting ceased at MCBQ in 2001 as numbers were considered too low to support harvest.

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### b. Call Count Survey.

(1) An annual VDGIF bobwhite quail call count was established at MCBQ in 1982. The route includes 10 listening stations (stops) at one mile intervals to listen for bobwhites. Bobwhites were most abundant during the first year of monitoring activity, as 178 bobwhite calls were heard during the census period (Figure 6-22). Bobwhite calls declined the following year (43 calls), but have remained relatively stable since 1983.

(2) From 2002 through 2005, a breeding season bobwhite call count study was conducted to understand population trends and habitat suitability of bobwhites at MCBQ. Cherepy (2006) recorded a declining population trend from 2002 through 2004, but an increasing population trend was noticed from 2004 to 2005. Habitat suitability models, which were developed by analyzing habitat features at known bobwhite locations, identified 3,814 hectares of suitable bobwhite habitat at MCBQ. Furthermore, 447 hectares were deemed as highly suitable bobwhite habitat. A large percentage of these habitats reside within TAs 9, 14, and 15. Close analysis of specific habitat features by Cherepy (2006) demonstrated that herbaceous cover, edges, and close proximity to streams were all significant components of suitable bobwhite habitat.

c. Brood Survey. From 1972 through 1974, field observations incidental to other field activities documented 60 bobwhite quail broods. Based on the age estimations of the broods and dates of observation, the peak hatching period for bobwhite quail at MCBQ was determined to be mid- to late-July with the latest brood hatching observed as late as 1 October. Due to the rarity of brood observations, no written records of bobwhite quail broods have been kept since 1974.

### 2. Habitat Resources at MCBQ

a. Fire-maintained grasslands near the range impact areas comprise the most favorable bobwhite habitat conditions currently available on the installation. Per the results of bobwhite call counts from 1982 - 2012, the highest and most stable call counts have been recorded at listening stations 6 and 7 near fire maintained grasslands at David's Crossroads, TA 9A. TAs 9, 10A, 14, and 15 have sizeable tracts of fire-maintained grasslands and may therefore be expected to function as bobwhite quail habitat in the future (Cherepy 2006). The fire ecology management plan in Section 2 of this Chapter addresses the importance of connecting these existing fire-maintained range areas in order to increase habitat availability for animals, such as the bobwhite.

b. About 2,000 acres of grass/shrub/seedling habitat are recorded on the Base (Table 2, Chapter 2) that may also provide suitable bobwhite habitat. An additional 800 acres of semi-developed land are

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maintained in open condition through combinations of mowing, agricultural planting, or prescribed burning practices.

c. Open areas maintained by agricultural practices usually support bobwhite if appropriate cover is provided by the crops. In May 1984 and 1985, one-quarter acre sorghum strips were planted in 20 scattered openings on MCBQ known to support bobwhite quail coveys. In late Summer and early Fall, bobwhite quail were found in or adjacent to all of the sorghum patches. It was believed that the sorghum patches provided ideal brood habitat because they were comprised of dense overhead cover and open ground cover. The same function has also been found to be served by disking and abandoning strips in Spring, allowing weeds to colonize the strips and create good brood habitat.

d. Based on hunters' observations, bobwhite quail have largely abandoned the small woodland openings and are only routinely located at the larger tracts of native grasslands and cultivated fields discussed above. However, some of the forested land that is less than 10 years of age may also support bobwhite quail populations. The MCBQ forest management program maintains an average of about 1,000 acres of timberland in stands less than 5 years old.

### 4. Habitat Management

a. Timber Management. Stands of timber greater than 5 years of age may provide bobwhite habitat when adequate sunlight can filter through the forest canopy to permit the growth of understory shrubs and herbaceous vegetation. Such timber management practices are supported and encouraged by NBCI. Even-aged systems such as clearcuts, seedtree, and shelterwood cuts can result in habitat conditions conducive to bobwhite production if these areas are not too extensive and are properly managed after the initial timber harvesting operation. Recommended timber management actions to enhance quail habitat involve growing pine on a widely-spaced 60 year rotation, conducting prescribed burns every other year, and thinning to maintain about 50 square feet of basal area stocking.

### b. Cropland, Plantings, and Idle Area Management

(1) Although there are no commercially farmed croplands at MCBQ, some crops are planted in managed openings by the MCBQ Wildlife Management Program. These habitats are beneficial to bobwhite populations and are encouraged by NBCI, especially when they are located adjacent to fire-maintained grasslands or woodlands.

(2) One of the benefits of Spring planting is that the site preparation often involves disking, which results in desirable brood habitat conditions later in the growing season. Disking alone may stimulate native plant growth, such as ragweed, that provides both Fall food and Summer brood foraging habitat. Food plantings made specifically for quail can be established as small blocks planted in

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long rectangular strips. The strips maximize edge and bobwhites are more likely to utilize the entire planted area because food is located in a smaller area close to escape cover.

### (3) Idle Areas

(a) Warm Season Grasses. Warm season grasses (WSGs) are perennial species that require little maintenance once established - typically in idle open lands, i.e., lands that are not subject to regular mowing or cultivation. Quail, rabbit, and songbirds thrive in patches of WSGs, and the restoration of native grasses is strongly supported by NBCI to provide better nesting and brood rearing cover for bobwhite quail and superior Winter cover. Thus, Virginia and other states promote the use of WSG for bobwhite quail pasture management (Capel 1992). One NBCI recommended species, Indiangrass (*Sorghastrum nutans*), grows naturally at MCBQ and readily colonizes burned areas, especially on moister sites. Broomsedge (*Andropogon spp.*) and little bluestem (*Schizachyrium scoparium*) also are native WSG found on MCBQ that normally colonize abandoned or idle open lands. They can be maintained by prescribed burning to avoid the establishment of shade producing woody vegetation species that is detrimental to WSG success.

(b) Tall Fescue Control. Where WSGs are beneficial to bobwhite quail, tall fescue is adverse to quail habitat. Tall fescue has been the recommended species for many maintenance and public works projects; however it has invaded many of the semi-developed open lands (landing zones and right of ways) at MCBQ because it is a very adaptable species that is easy to establish, and is drought and disease resistant. It is recommended that tall fescue in TA openings be converted to WSG or small grain plantings.

### 5. Harvest Management

a. Healthy bobwhite populations can generally withstand fairly liberal hunting pressure. Conversely, isolated quail populations can be extremely sensitive to climatic fluctuations and predation that are beyond the control of wildlife managers. The MCBQ and northern Virginia bobwhite quail population, due to limited and fragmented habitat, has declined in the last 20 years and is not healthy.

b. The historical bobwhite harvest rates at MCBQ from 1990-2000 were estimated to be less than 10% of the estimated population size. Subsequently some coveys disappeared from apparently suitable habitat even though the coveys were not hunted. While hunter harvest was not believed to have contributed to the decline, the low population levels did not provide a harvestable surplus of birds. As such, the MCBQ bobwhite quail population is vulnerable and hunting was curtailed in 2001. The intent is to reopen hunting when a more viable bobwhite quail population exists.



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### 6. Management Recommendations

a. Fire Ecology Corridor. Since bobwhite quail habitat requires an interspersed of open and fire-maintained areas, intensively used military training ranges generally provide the most suitable habitat for quail. Application of prescribed burning and selective timber harvest in and around these active ranges is the most promising means to expand bobwhite habitat aboard MCBQ. By incorporating the fire ecology management practices described in Chapter 6, Section 2, bobwhite quail habitat can be maintained incidental to the primary land use of military training.

b. Firebreaks. Firebreaks should be maintained as addressed in Chapter 5 to promote the safe management of fires aboard the installation. Abandoned tracked vehicle routes through the fire ecology corridor in TAs 7A, 7B, and 9D should be maintained annually by clearing downed timber and discing with a farm harrow to maintain them as firebreaks and brood habitat strips.

c. Forest Management. In the fire ecology corridor and adjacent to ranges where fires are expected, the management of pines per the alternative stated in 6601.4.a. may help produce savannah-like conditions preferred by quail.

d. Maintain Open Areas. Since bobwhite quail populations require early successional vegetation, it is important to maintain open habitat. Coordinate with Range Management Branch (G-3), Facilities Maintenance Section (GF), and Public Works Branch (GF), on all planting projects done in the TAs. Emphasis must be placed on establishing plantings that support training and benefit wildlife. Where appropriate, WSGs should be planted to promote bobwhite quail habitat.

e. Fescue Control. Fescue should be eliminated from managed openings in the TAs. Repeated glyphosate applications are recommended, and conversion to WSG should be promoted, where appropriate.

f. Disking. In managed fields in or near the fire ecology zone, install disk strips in Fall or early Spring to serve as summer brood habitat.

g. Population Survey. The June bobwhite call count should be conducted annually on the established VDGIF/MCBQ survey route. In addition, a base-wide call count census should be conducted on an intermittent basis in order to map which habitats at MCBQ are occupied by calling birds and to monitor any increases or declines in occupied habitat.

h. Predator Control. Consideration should be given to establishing a mammalian predator monitoring program to study long-term trends in predator-prey population relationships.

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6602. MOURNING DOVE. The mourning dove is a common resident species at MCBQ. Besides being an abundant migratory song bird, the dove is an important game bird in Virginia and provides recreational hunting opportunities.

1. Mourning doves nest in a variety of habitats, but are generally associated with forest edges and disturbed areas. Courtship activities have been observed at MCBQ from February through September. Mourning doves leave breeding habitats and begin their Fall migration around the first week of September. At MCBQ, large flocks of mourning doves form around small grain fields beginning in August. Doves use these grain fields intensively for feeding until early September, at which time dove numbers rapidly decline due to migration.

2. Management Practices. Early successional habitats are the most productive mourning dove areas; however, the influences on mourning dove habitat include improved and semi-improved areas. As such, a combined approach to managing improved areas, semi-improved areas and early successional forestland will have the strongest positive influence upon the mourning dove population.

a. Agricultural fields are important because they furnish mourning doves with a reliable source of food - particularly when sunflower and corn are present. On Base, most agricultural fields are multiple-use facilities serving as landing zones, drop zones, or mechanized training sites. For training purposes most cultivation in these fields needs to be restricted to crops that have a low growth height so that visibility for military training is not impaired. Also, the crop types are limited by MCBQ soil which is generally acidic, infertile, and highly erodible. While these conditions may not be amenable to corn and sunflower crops on MCBQ, past experience has shown that small grains (e.g., wheat and millet) rotated with soil enriching legumes (e.g., ladino clover) are appropriate crop plantings that may provide some Summer food sources for mourning doves.

b. At MCBQ, mourning dove flocks have used managed openings ranging in size from 4 to 40 acres during the late Summer. Open sites of any size are utilized for courtship and nesting purposes.

c. Woodland. Although mourning doves rely on trees for nesting and roosting habitat, forest and woodland interiors are not heavily utilized. Thus, large tracts of undisturbed forest are not attractive or particularly useful to mourning doves. Silvicultural practices that open up the forest and result in the creation of substantial amounts of edge will improve mourning dove habitat conditions significantly. Thus, habitat management zone 1 (see Section 2) and the fire-ecology management area will provide more dove habitat than other management zones.

d. Harvest Management. Since mourning doves are migratory, harvest management guidelines are developed and implemented on a flyway-wide basis. The USFWS is responsible for establishing flyway

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harvest quotas, and states are permitted to enact further specific harvest recommendations consistent with the quotas. MCBQ will plan to implement the mourning dove hunting seasons established by VDGIF when feasible; actual implementation will depend on variations in plantings, both on and off-Base and manpower availability for GCS operation.

3. Management Recommendations. Virtually all of the management practices recommended for bobwhite quail habitat will also benefit mourning doves and therefore will not be restated. The open areas listed in Appendix C that exceed four acres are large enough to support summer feeding flocks and therefore should have small grain crops included in the agricultural rotations.

6603. AMERICAN WOODCOCK. The American woodcock is a popular upland game bird found in early successional forests throughout the Base. MCBQ is located within both the wintering range and the principal breeding range of the woodcock. Although woodcock populations along the Atlantic coast have been declining during the last two decades based on USFWS estimates, woodcock are relatively abundant at MCBQ during the Fall migration. Management objectives are to maintain breeding and wintering habitat in support of regional population recovery objectives and to sustain opportunities for recreational hunting per USFWS/VDGIF guidelines.

1. Habitat Requirements. Woodcock are closely associated with young second-growth hardwoods but need a diversity of forested, shrubby, and open habitats to satisfy their life requirements. Male woodcock establish breeding territories (referred to as singing grounds) in relatively open fields containing scattered brush, small trees, or shrubs. Courtship flights have been observed in forest clearings, pastures, cultivated fields, young pine plantations, and other open sites.

### 2. MCBQ Historical Data

#### a. VDGIF Woodcock Study, 1973-76

(1) Results of fall flushing counts from 1974-1976 documented the peak of Fall woodcock migration to be from the last week of October to the first week of November, depending upon weather fronts to the North. After the hunting season opened in November of each year in this timeframe, the number of woodcock declined but continued to be fair until early December, at which time woodcock became scarce.

(2) Moist bottomland with low brush cover near streams was the habitat selected most often by Fall woodcock migrants during the 1974-1976 VDGIF study. The brush cover in these locations ranged from sparse to dense and from 8 to 15 feet tall. As in more northern states, alder (*Alnus serrulata*) appeared to be a favorite cover.

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Other species used for cover included flowering dogwood (*Cornus florida*), blackberry, small maples (*Acer spp.*), ash (*Fraxinus spp.*), willow (*Salix spp.*), spicebush (*Lindera benzoin*), other small shrubs, and thickets of Japanese honeysuckle (*Lonicera japonica*) (Taylor 1977).

(3) Breeding males were observed from early February to late May throughout the VDGIF study, with good concentrations occurring in late February of each year. The highest numbers of singing males were recorded during the last week of February and the first week of March.

(4) Woodcock nest data were gathered from all recorded sightings from 1973 to 1976. Most nests were found in small brushy patches of bicolor lespedeza (*Lespedeza bicolor*), blackberry, sumac (*Rhus spp.*), and hardwood species with stems from 1/2 inch to 3/4 inch in diameter. All nests were within 50 to 60 feet of open clearings, fields, road shoulders, or mowed rights-of-way. Estimated hatching dates varied from mid-March to late-June, with the most occurring during the first two weeks of April (Taylor 1977).

b. Harvest Data. The woodcock harvest reported to the MCBQ GCS has exhibited a downward trend from about 300 birds per season in 1977 to only a handful per season since 1986. This decline is due primarily to the regional reduction in numbers of upland game bird hunters. Urbanization, loss of habitat, and loss of other upland game hunting opportunities (i.e., bobwhite quail) has greatly reduced the number of hunters who own bird dogs and pursue upland game birds.

3. Management Recommendations. Woodcock management should provide the following habitat components: (1) openings for courtship, (2) young, second-growth hardwoods near openings for nesting and brood rearing, (3) alders or dense stands of hardwoods in low-lying, moist areas, for diurnal feeding cover, and (4) large fields for diurnal roost sites. Ideally these habitats should be closely interspersed. Following the general habitat management plan in Section 2 of this Chapter should provide these woodcock habitat requirements. A sufficient amount of forestland must be maintained in an early successional stage, ideally in riparian non-mast producing hardwood (NMHD) stands. It is recommended that selected NMHD stands be clearcut in 100 ft wide strips separated by uncut strips, or else be selectively harvested to provide seedling and sapling habitat patches for woodcock coverts.

### 6604. RUFFED GROUSE

1. The ruffed grouse is a common native game bird of the Appalachian Mountains and adjacent foothills. MCBQ is located east of the normal grouse range, but does harbor a very small population of ruffed grouse. During the late 1960s, ruffed grouse flourished at MCBQ and became an important game bird for about 10 years. Since that time the grouse population on MCBQ has declined to an almost undetectable

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level. It would be desirable to reestablish a thriving population as witnessed during the 1970s for hunting; however, at this point in time, retaining the ruffed grouse as part of the Base's natural heritage is the first priority.

2. Habitat Resources. Throughout its range, the ruffed grouse is dependent upon early- and mid-seral deciduous forest succession. Abandoned fields having seedling/shrub cover and 1-30 year old timber stands furnish some of the best habitat conditions conducive to grouse production at MCBQ. The only TAs having a significant amount of these habitat types are 9A, 14A/B, 15A/C, and 17A. The majority of drumming grouse recorded during the last 10 years were heard in these areas.

### 3. Management Practices

a. As a result of the ruffed grouse's dependency on deciduous forest succession, ruffed grouse management is virtually synonymous with active timber harvesting. Short timber rotations are beneficial to grouse, although effective management can be achieved by implementing sawtimber rotations. Clearcuts larger than 40 acres in size are not recommended, and after approximately 10 years the brood habitat value of regeneration cuts begins to decline (USDA 1971). Rather even-aged forest management on an 80 to 100 year rotation, with a 10-year cutting cycle on sites ranging from 2 to 20 acres in size, is the preferred, economically sound approach to grouse management (Stoll and Honchul 1983). This or a similar cutting scheme will also provide continual, renewed brood and other habitat types.

b. On a smaller scale, pruning, releasing, and fertilizing fruit and nut trees commonly found around former home sites is a worthwhile grouse management practice (USDA 1971). Release cuts are also useful in areas where desirable understory species such as grape or hawthorn are present.

c. The seeding of logging roads and log decks to grasses and clover following timber harvest is a beneficial practice to improve brood habitat.

4. MCBQ Historical Data. MCBQ ruffed grouse harvests are plotted at Figure 6-21. Grouse were never abundant on MCBQ; however, the population apparently dropped precipitously after 1982. Since 1984, natural resources personnel have reported no grouse broods. Occasional drumming grouse are heard in the Spring, and flushes are reported on occasion from widely scattered areas of the Base. Historically, old homesites were some of the best ruffed grouse sites on Base. These old homesteads contained relic fruit orchards, gardens, dense honeysuckle thickets, and open grassy areas. WTD browsing decimated the honeysuckle thickets by 1984 likely leading to the virtual disappearance of ruffed grouse at MCBQ. Fewer deer would probably aid in the recovery of dense vines and thickets preferred by ruffed grouse.

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### 5. Management Recommendations

a. Forest management practices recommended for woodcock also will produce desirable grouse habitat. TAs 9, 14, 15, 17, and edges along the fire-management areas are probably most suited for early successional forest management for ruffed grouse.

b. Grouse should not be hunted at MCBQ until populations recover to sustainable levels.

6605. GRAY SQUIRREL. The gray squirrel is a popular game species that can be very abundant in the oak/hickory forests found at MCBQ following years of good mast production. Bottomland hardwoods, upland hardwoods, and upland mixed pine hardwood forests provide the best habitat components for gray squirrels. Gray squirrels make heavy use of pine seeds during years of oak mast shortage; therefore, mature cone-producing pine stands may also be important to gray squirrels, particularly in years when acorn production is poor. The primary management objective is to maintain adequate acreage of mature mast producing trees, such as those listed at Table 6-7, to provide food and denning resources for gray squirrels.

1. Habitat Resources at MCBQ. Hardwood and mixed pine-hardwood forests throughout MCBQ provide quality gray squirrel habitat. Based on the MCBQ forest inventory, there are 29,193 acres of mast-producing hardwood forest, 2,607 acres of non-mast producing hardwoods (riparian zones), and 8,847 acres of mixed pine hardwoods. It is predicted that at 40 years of age these forests begin to provide enough hard mast and denning sites to support gray squirrel populations. About 31,150 acres, or 58% of the total forested acreage at MCBQ, meets this criterion. About 24,000 acres at MCBQ are either HMHD 60 years or older or PHWD 70 years or older, which is considered to be high quality gray squirrel habitat. High quality gray squirrel habitat comprises about 45% of the total MCBQ forestland.

### 2. Population Densities

a. Gray squirrel populations may exhibit significant fluctuations from year to year, but they are not considered cyclic. Fluctuations are generally correlated with the availability of hard mast food supplies during the preceding fall, which is variable. Fall-to-Fall densities of gray squirrels have been observed to double or even quadruple in response to bumper crops of mast. Conversely Fall-to-Fall gray squirrel densities have been observed to plummet to 15% to 25% of the previous fall density in response to mast crop failures (Barkalow et al. 1970). These trends of fluctuating abundance are very apparent at MCBQ as displayed by the squirrel harvest data shown at Figure 6-23.

b. Scientific literature reports gray squirrel Fall population densities ranging from approximately 0.25 to 1.3 squirrels/acre for



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extensive forested habitats (Mosby 1969, Barkalow et al. 1970). At MCBQ, there are over 53,000 forest acres, of which over 31,000 acres exceed 40 years of age and are believed to produce mast and seed crops useable by squirrels. Using population densities ranging from 0.25 to 1.3, it is estimated that the MCBQ Fall squirrel population ranges from 9,300 to 48,700 animals.

### 3. Management Practices

a. Stands of oaks and hickories may be thinned periodically to promote crown vigor, thus improving mast production potential. Small selection cuts (without cull tree removal) that create openings of 0.25 to 1.0 acre are less disruptive to gray squirrel populations than are clearcuts. During these selection cuts, a stocking rate of 15 to 20 oaks of 10+ inches dbh and 15 to 20 similarly sized hickories should each be retained per acre to provide enough mast to maintain fall densities of approximately 1 squirrel per acre. Approximately 2 to 3 trees per acre with suitable den cavities, including some large-diameter den trees (23.6+ inches dbh), should be retained for shelter (Nixon et al. 1980).

b. Clearcut stands should be kept small (less than 20 acres) and 40-60% of the management unit should be retained with trees of mast-producing age (Shaw 1971). Management units should be regenerated in a pattern where young stands (20 to 25 years old) are not contiguous to each other. Nixon et al. (1975b) suggested that 8 to 10 suppressed hickory poles per acre (3 to 6 inches dbh) be left standing in clearcuts. Although some of these trees will die, some should live and reach seed-bearing size, thus improving the habitat for gray squirrels as the stand matures. A number of healthy understory trees that produce supplementary squirrel foods should also be retained in clearcuts at a recommended minimum basal area of approximately 2 to 3 square feet per acre (Nixon et al. 1980).

### 4. Management Recommendations

a. No specific actions for gray squirrel management are required. The management actions for land management Zones 2-6, described in Section 2 of this Chapter, should produce large blocks of mature mast-producing forest supportive of healthy squirrel populations.

b. Oak Mast Count. Continue monitoring acorn production using the standardized acorn production count that is currently in use and described in Chapter 6, Section 2.

6606. COTTONTAIL RABBIT. The eastern cottontail is an important prey species for wild raptors and carnivores and is also a significant game species in Virginia. The eastern cottontail occurs throughout the eastern half of North America, where it occupies agricultural habitats and other early- to mid-successional plant communities. Management



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objectives are to manage vegetative communities to improve habitat and maintain the cottontail population.

1. Historical Data. Similar to bobwhite quail and ruffed grouse, cottontail rabbit numbers have declined at MCBQ over the past 30 years, although rabbit populations currently seem much more viable than the grouse or quail populations. Harvest data indicate an abrupt population decline during the 1970s that has remained at those low-levels to the present day (Figure 6-21). Summer roadside count surveys, winter track counts, and incidental observations by installation personnel also indicate poor rabbit populations. It should be noted that cottontail harvest trends are almost identical to those for bobwhites, possibly indicating a common decline factor among the species. Thus, habitat deterioration due to aging forests, succession of old field habitats into forested habitat, and planting of tall fescue in TAs all may have equally contributed to cottontail and bobwhite habitat decline. Other factors may include disease and increased predation.

2. Census Techniques. At MCBQ, roadside counts have been done in conjunction with annual VDGIF quail call counts since 1982. The technique consists of driving 20 miles along a predetermined route beginning 30 minutes before sunrise. The count is conducted once annually in June and the results go into a regional database. Typically, only 1-5 rabbits are seen per survey.

### 3. Management Practices

a. Because cottontail habitat requirements are so similar to those of bobwhites, active quail management will likely benefit resident cottontail populations as well. Rabbits require an interspersed of both early and mid-successional habitat. Rabbits need horizontal cover of woody vegetation and vines to help protect them from predators. Young forests may be made more attractive to cottontails by maintaining strips of dense shrubs and vines, such as blackberries, at intervals throughout the plantation. Networks of these strips may function as corridors, connecting pine plantations with more superior habitats. Prescribed burning can help to retain pockets of grass and seedlings within pine plantations.

b. Idle Area Management. Many of the same management practices used to improve idle areas for bobwhite production will also maintain or improve idle areas for cottontails. Late-winter or early-spring prescribed burns, shrub plantings, brush-pile establishment, and strategically placed disked strips will result in habitat conditions favored by both bobwhites and cottontails. Though both rabbits and quail rely heavily on dense woody vegetation for escape and thermal cover during winter, rabbits are probably more dependent on woody vegetation because shrubs and vines often make up the bulk of a cottontail's winter diet.

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c. Mowing. Extensive mowing operations, performed at the wrong time, can have deleterious effects on rabbit populations. In locations where cottontails are a central management concern, mowing should be conducted on small parcels of land after the breeding season during late Summer and early Fall. An ideal habitat management scenario would involve mowing strips of vegetation from a managed opening rather than mowing an entire area. Mowed strips should be located adjacent to dense brush so that rabbits have escape cover, foraging habitat (mowed strip), and nesting habitat (unmowed strip) all in proximity to one another.

### 4. Management Recommendations

a. Habitat Management. The fire-ecology zone described in Section 2 holds the most promise for rebuilding quality cottontail rabbit habitat.

b. Ensure that all planting done in conjunction with construction and range maintenance activities in these training areas utilize WSGs, small grains, and legumes that support cottontail rabbit habitat.

c. When compatible with other land management purposes, use strip mowing as opposed to total mowing to diversify habitat within fields.

d. Diversify forest clearcut units by breaking up large pine plantations with hedgerows. Rather than piling slash into piles for burning, the slash may be pushed into hedgerows that could remain unplanted to provide immediate escape cover and possible conversion to cottontail food species such as pokeberry, blackberry, sumac, honeysuckle, and then woody saplings. This transition would serve to maintain more diversity within the clearcut than if 100% of the space is planted to pine.

e. Eliminate or control tall fescue in these training areas through glyphosate application and cultural treatments.

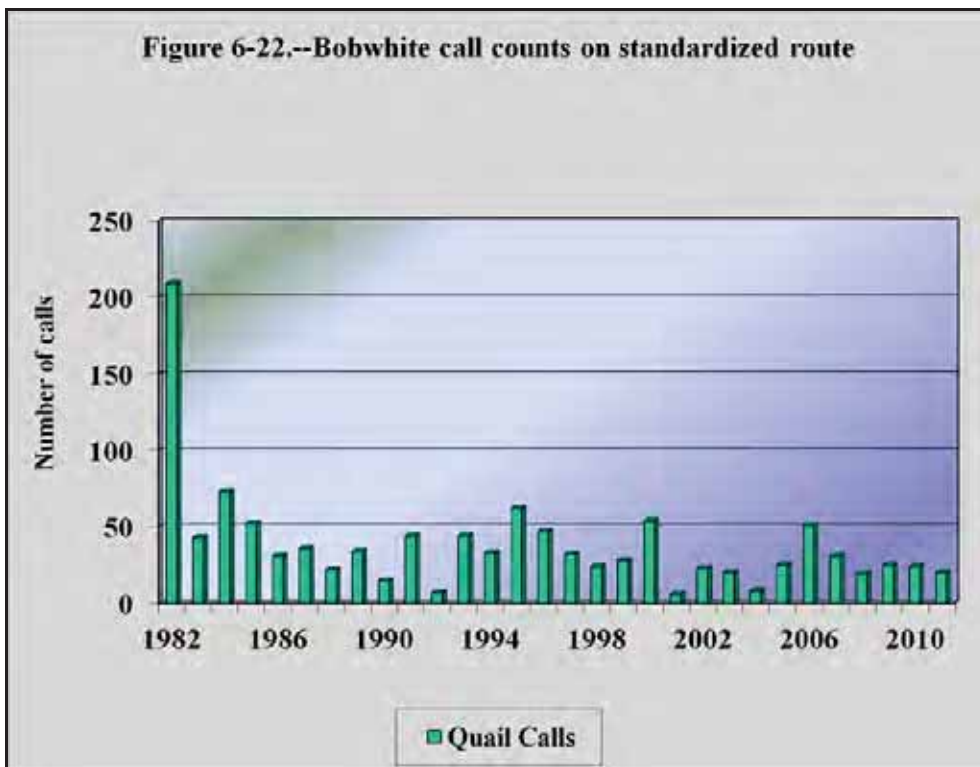
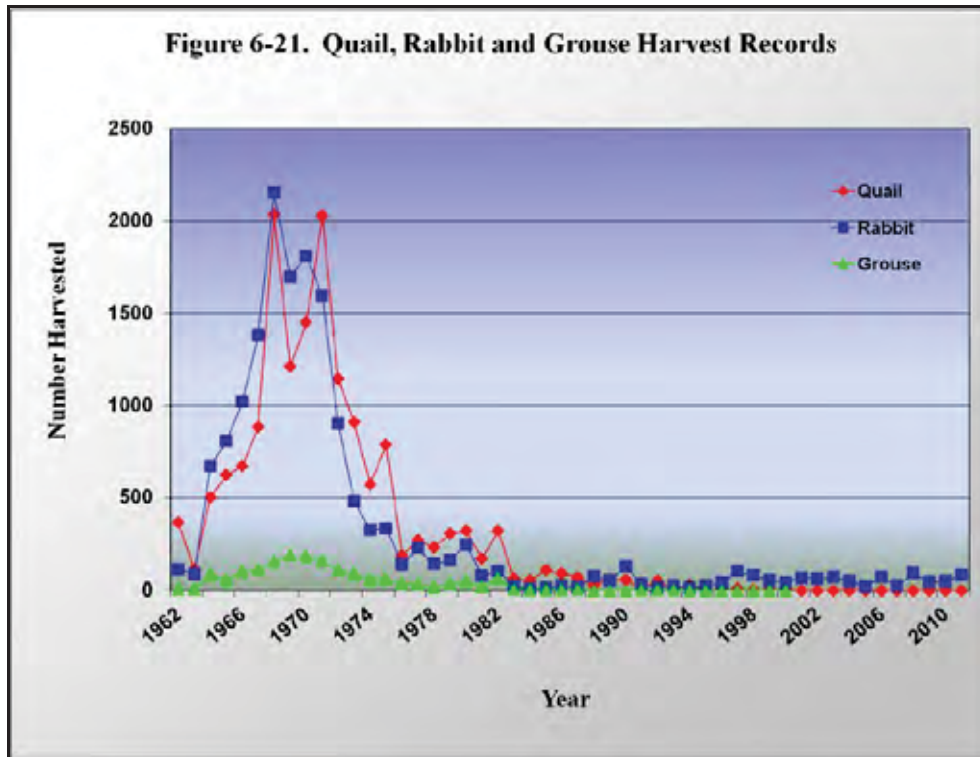
f. Predator-Prey Study. The scientific study of predator-prey relations and efficacy of predator controls should be done to evaluate if mammalian predator control could contribute to the recovery of small game species.

### 6607. REFERENCES

- Baker, R. H. 1944. An ecological study of tree squirrels in eastern Texas. J. Mammal. 25:8-24.
- Barkalow, F. S., Jr., R. B. Hamilton, and R. F. Soots, Jr. 1970. The vital statistics of an unexploited gray squirrel population. J. Wildl. Manage. 34:489-500.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- Caple, S. 1992. Warm season grasses for Virginia and North Carolina: Benefits for Livestock and Wildlife. VDGIF Game and Inland Fisheries. 10 pp.
- Cherepy, A. K. 2006. Population trend and habitat selection of northern bobwhite (*Colinus Virginianus*) at the U.S. Marine Corps Base, Quantico, Virginia. M.S. Thesis, George Mason University, Fairfax. 47 pp.
- MCBQ. 1997. Fish and wildlife management plan: section III of the Integrated Natural Resources Management Plan. Natural Resources and Environmental Affairs Branch, Facilities Division, Marine Corps Base, Quantico, Va.
- Mosby, H. S. 1969. The influence of hunting on the population dynamics of a woodlot gray squirrel population. *J. Wildl. Manage.* 33:59-73.
- Nixon, C. M. 1968. Squirrel management guidelines for wildlife areas. Ohio Dep. Nat. Resour. Div. Wildl. Inservice Document 55. 8 pp.
- \_\_\_\_\_, and M. W. McClain. 1975a. Breeding seasons and fecundity of female gray squirrels in Ohio. *J. Wildl. Manage.* 39:426-438
- \_\_\_\_\_, \_\_\_\_\_, and R. W. Donohoe. 1975b. Effects of hunting and mast crops on a squirrel population. *J. Wildl. Manage.* 39:1-25.
- \_\_\_\_\_, S. P. Havera, and L. P. Hansen. 1980. Initial response of squirrels to forest changes associated with selection cutting. *Wildl. Soc. Bull.* 8:298-306.
- Shaw, S. P. 1971. Wildlife and oak management. Pages 84-89 *In Proc. Oak Symp., Northeast. For. Exp. Sta., USDA For. Serv., Upper Darby, Pa.*
- Taylor, W. H. 1977. Woodcock breeding and migration data in Piedmont Virginia. *Proc. Woodcock Symp.* 6:
- USDA. 1971. Wildlife habitat management handbook. Southern region. For. Serv. FSH 2609.23 R. 189pp.



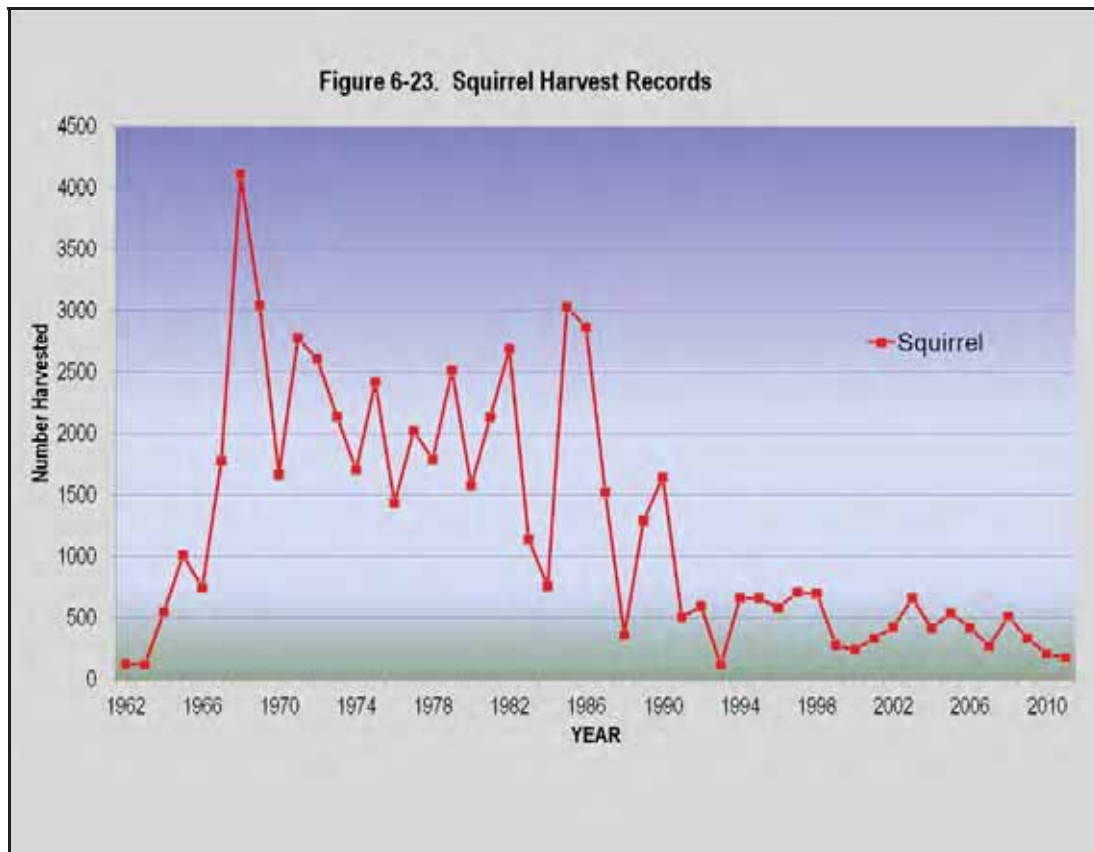


Table 6-7. Primary and supplemental plant foods available at MCBQ that are commonly used by the gray squirrel.

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PRIMARY PLANT FOODS

Hickories ( <i>Carya</i> spp.)	Yellow poplar ( <i>Liriodendron tulipifera</i> )
Oaks ( <i>Quercus</i> spp.)	Fungi
American beech ( <i>Fagus grandifolia</i> )	Flowering dogwood ( <i>Cornus florida</i> )
Maples ( <i>Acer</i> spp.)	Black walnut ( <i>Juglans nigra</i> )
Blackgum ( <i>Nyssa sylvatica</i> )	

SUPPLEMENTAL FOODS

American hornbeam ( <i>Carpinus caroliniana</i> )	Greenbrier ( <i>Smilax</i> spp.)
Ash ( <i>Fraxinus</i> spp.)	Hazelnut ( <i>Corylus americana</i> )
Blackberry ( <i>Rubus</i> spp.)	Black cherry ( <i>Prunus serotina</i> )
Blueberries ( <i>Vaccinium</i> spp.)	Persimmon ( <i>Diospyros virginiana</i> )
Pine ( <i>Pinus</i> spp.)	Sweetgum ( <i>Liquidambar styraciflua</i> )
Sycamore ( <i>Platanus occidentalis</i> )	Chinquapin ( <i>Castanea pumila</i> )
Grapes ( <i>Vitis</i> spp.)	

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## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 7: FURBEARER MANAGEMENT

6700. MANAGEMENT GOALS. The beaver (*Castor canadensis*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), river otter (*Lutra canadensis*), mink (*Mustela vison*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), and opossum (*Didelphis marsupialis*) are the primary furbearing species found at MCBQ. The coyote is only a recent arrival, becoming common since 1995. Although these species historically were trapped for their fur, their economic significance and recreational importance have diminished in recent years due to the decline of the fur market. These species have ecological significance as natural predators, disease vectors, and, in the case of beavers, as vegetation and water level managers. Water impounded by beaver actions can increase wetland area and improve habitat for waterfowl and other wetland wildlife. On the other hand, clogged culverts due to beaver activities can result in road flooding and costly repair and maintenance work constituting a nuisance if not properly managed. Some furbearer species, such as raccoons, skunks, and foxes are implicated for predation on the nests and young of both songbirds and upland game species. The goals of furbearer management at MCBQ are to sustain predators at levels that do not imperil other declining species, to diminish the risk of disease outbreaks, and to minimize the potential for damage complaints.

#### 6701. LIFE HISTORIES

##### 1. Beaver

a. The beaver occupies slow-moving freshwater habitats and is found throughout MCBQ wherever reliable water supplies are found. Females produce 1 litter of 3 to 4 kits per year (Novak 1977). The kits are incorporated into the family unit, which typically includes the adult pair and siblings from the previous year's litter. This family unit is generally called a "colony." The average number of individuals in a family group in the United States is 5.2 (Denney 1950). Densities have been reported to range from 0.8 families per mile of stream in New York (Buckley 1950) to 1.2 families per mile of stream in Alabama (Hill 1976).

b. The beaver's diet is largely composed of vegetation that grows on moist soils, particularly woody vegetation. Woody vegetation is a vital component of beaver habitat. Trees and shrubs are not only important dietary items, but are essential materials for dam and lodge construction. Woody plants are especially important during winter when herbaceous food availability is limited (Allen 1982). Tree and shrub limbs are cut and stockpiled in underwater "caches" to provide winter food. Beavers consume the leaves, twigs and bark of woody



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vegetation but display preferences for certain species and size-classes (Jenkins 1979). At MCBQ, aspen (*Populus tremuloides*), yellow poplar (*Liriodendron tulipifera*), and sweet gum (*Liquidambar styraciflua*) are important food species but almost all tree species near water are used. Herbaceous plants favored by beavers include evergreen Christmas fern (*Polystichum acrostichoides*), sedges (*Carex* sp.), duck potato (*Sagittaria* spp.), pondweed (*Potamogeton* spp.), and water lily rhizomes (*Nymphaea* spp.) (Svendsen 1980). Beavers usually exploit food closest to the water first and then range farther as this supply is depleted.

### 2. Raccoon

a. The raccoon is one of the most ecologically tolerant furbearers in terms of its habitat requirements. Raccoons are found throughout MCBQ. Raccoon breeding season extends from late Winter to early Spring. February is generally considered to be the month of peak breeding activity. The average litter size is 3 (Edwards et al. 1992).

b. Raccoons consume a tremendous variety of foods, including meat carrion, garbage, birds, mammals, a host of plant species, and almost any food prepared for human or animal consumption. Hard and soft mast are foods of choice. Agricultural crops, especially corn, can be of local importance (Giles 1940). Since raccoons are closely associated with water, aquatic vertebrates and invertebrates comprise a significant portion of their diet and include crayfish, frogs, turtles, snakes and their eggs, fish and mollusks (Dearborn 1932, Edwards et al. 1992). Insects, particularly beetles (Llewellyn and Uhler 1952) and grasshoppers, are also common foods. Raccoons are adept at locating and consuming waterfowl nests.

### 3. Red and Gray Foxes

a. Red and gray foxes are both common species at MCBQ. Throughout much of their range they display distinct habitat preferences. Gray foxes tend to favor deciduous woodland habitats (Fritzell 1987) while red foxes are more commonly linked with agricultural lands (Voigt 1987). Although there are few agricultural lands at MCBQ, red foxes are found throughout the Base, even in training areas with little open land. Yearling females of both fox species are capable of producing a litter annually (Harris 1979, Fritzell 1987). Breeding takes place in December through March among red foxes and January through April in gray foxes (Edwards et al. 1992). The average litter size is 5 pups for red foxes and 4 pups for gray foxes. In both cases, pups remain with their parents until the Fall of their first year (Edwards et al. 1992).

b. Both red and gray foxes are highly susceptible to rabies. At MCBQ red foxes frequently are infected with sarcoptic mange, caused by the mite *Sarcoptes scabiei*. Animals infected with sarcoptic mange become emaciated, lose hair, and their skin becomes crusty and flaky in appearance. This is the most common disease of red foxes and may cause significant mortality. Gray foxes are not susceptible to



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sarcoptic mange but are very susceptible to canine distemper, which causes significant mortality.

### c. Food habits

(1) Red and gray foxes are opportunistic, non-specific predators in that they eat a broad array of foods. Small mammals, birds, reptiles, amphibians, and their respective eggs are readily consumed by both fox species (Edwards et al. 1992). Insects, especially grasshoppers and crickets, often make up a substantial part of the Spring and Summer diets of foxes (Fritzell 1987, Edwards et al. 1992). In addition to live animals, foxes will readily consume both wild and domestic carrion when available. Voigt (1987) reported that white-tailed deer and livestock carrion were of local importance to red fox populations during Winter.

(2) Generally, both species prefer deciduous fruits, such as apples (*Malus* spp.), pears (*Pyrus* spp.), persimmons (*Diospyros virginiana*), blackberries (*Rubus* spp.), and grapes (*Vitis* spp.) (Hockman and Chapman 1983, Edwards et al. 1992). Acorns, grasses, sedges, and domestic grain crops are also consumed, when available.

4. Mink. Mink reside in an assortment of wetland habitats, including freshwater and saltwater marshes, and along streams, rivers, and lakes (Eagle and Whitman 1987). Shoreline areas with adequate concealment cover are preferred by minks. Primary mink habitats at MCBQ include the lower Chopawamsic Creek tidal area and the Cedar Run floodplain. However, mink are very scarce as only one has been reported by trappers since 1985.

### 5. River Otter

a. Historically, river otters occupied aquatic ecosystems across North America. Victims of habitat degradation, over harvesting, and human encroachment, otter populations declined (Melquist and Dronkert 1987) or were extirpated in some regions. The river otter is found at MCBQ in scattered locations at beaver ponds and reservoirs.

b. Upon reaching sexual maturity at 2 years of age, otters mate in late Winter or early Spring (Edwards et al. 1992). The average litter consists of 2 or 3 blind, helpless pups. The pups will be weaned at 3 months of age and become self sufficient in 5 to 6 months (Edwards et al. 1992). The female river otter and her offspring usually remain together for 7 or 8 months or until the birth of a new litter is imminent (Melquist and Hornocker 1983).

c. Fish are the mainstay of the river otter diet (Melquist et al. 1981, Cooley 1983), though a variety of aquatic vertebrates and invertebrates, birds, and mammals are opportunistically consumed (Edwards et al. 1992).

6. Muskrat. Muskrats require a permanent water supply, and thus can be found in the tidal marshes of Chopawamsic Creek. Like beavers, muskrats are largely herbivorous (Edwards et al. 1992) and consume a

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vast array of wetland vegetation. Cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) are preferred items, often constituting up to 80% of the animal's diet (O'Neil 1949). Other common food items include duck potato, water lily, sedges, willow sprouts, pickerelweed (*Pontederia* spp.), and wild rice (*Zizania aquatica*) (Allen and Hoffman 1984, Edwards et al. 1992).

### 7. Coyote

a. Coyotes have been established at MCBQ since 1995. They are known for their adaptability and have been found in a wide range of habitats. Average litter size is six. Food habits are diversified and carrion, fruit, insects, rodents, songbirds, woodchucks, rabbits, deer, and domestic animals (including pets) have all been recorded in the coyote diet. Coyotes may compete for space with other predators and may reduce populations of foxes, raccoons, and feral cats.

b. Bozarth (2010) conducted a study at MCBQ from 2002 thru 2008 to understand coyote colonization of northern Virginia and population density of coyotes at MCBQ. DNA extraction, amplification, and analysis were employed to meet study objectives. Coyote DNA was obtained by collecting 331 scat samples along road transects and acquiring 7 tissue samples from hunter harvested coyotes. Seven haplotypes were observed in coyote DNA samples, and analysis of the 7 haplotypes demonstrated that coyote range expansion to northern Virginia occurred from multiple sources from northern, southern, and western parts of the United States. The haplotype structure of MCBQ coyotes most closely resembles that of western Pennsylvania/western New York coyotes. Additional analysis revealed that one of the haplotypes present in coyotes in northern Virginia is identical to a haplotype found in Great Lakes wolves. Such a finding indicates coyotes and wolves have interbred in the past.

c. In addition to examining coyote colonization of northern Virginia, Bozarth (2010) attempted to estimate coyote densities at MCBQ by using statistical models parameterized with DNA data collected from scat and harvested coyote tissue samples. Scat and tissue samples were collected over a 2 year period at MCBQ from November 2006 through October 2008. DNA analysis identified 18 males, 11 females, and 1 unknown individual on Base. Estimates of relatedness among the DNA samples revealed that most of the individuals were not closely related. Population density estimates from the first year of the study suggested there was 0.041 coyotes per square kilometer (approximately 9.96 total individuals on Base). The second year study data showed an estimated increase in coyote population to 0.052 coyotes per square kilometer (12.64 total individuals on Base). These relatively low estimates are not to be taken conclusively, as hunter observations, hunter kills, and remote camera photographs of coyotes continue to increase on Base. Rather Bozarth's (2010) estimates represent a potential baseline that appears to be highly conservative and biased low.

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6702. CENSUS TECHNIQUES. Furbearing animals are particularly difficult to census because they are elusive and highly mobile. The majority of techniques used to census furbearers result in an index rather than a true population estimate.

1. Harvest Indices. Harvest reports from licensed trappers can be used to obtain insights into general population trends for many furbearers (Sanderson 1987), but are variable based on pelt prices, trapper numbers, and trapper effort (Voigt 1987). Thus, harvest data must be used cautiously. Currently, the decline of active trapping has resulted in very limited harvest data being available.
2. Sign Counts. This method simply entails counting furbearer tracks, droppings, or dens to estimate populations. Results are most useful in determining the presence or distribution of a species, not actual numbers. This method is particularly useful for beaver estimates, because beaver signs such as feeding areas, dams, and lodge building are so obvious and easy to detect, which allows survey crews to readily locate these activities in the field and mark maps to record the locations of beaver colonies. New technologies are allowing the use of DNA markers in droppings to be used for other furbearer population sampling.
3. Calls. Sumner and Hill (1980) reported that predator calling was as effective as scent stations in eliciting responses from red and gray foxes in various habitats in Alabama. The study recommends that predator calling be further investigated as a potential means of indexing populations of certain wild canid species in the Southeast. Some biologists use coyote howling to elicit responses from territorial animals during breeding season.
4. Scent Station Surveys. The scent station survey is an indirect census technique used to obtain an index of abundance of foxes and other furbearers. Scent stations are baited to attract furbearers to enable counting. The relationship between population density and the rate of visitation at scent stations will vary from survey to survey due to a number of factors which may lead to biased results - not the least of which is the fact that some species may be more attracted to bait than others.

## 6703. HISTORICAL DATA

### 1. Beaver Populations

a. The MCBQ beaver population was censused in 1991, 1994, 1997, 2000, 2004, 2008, and 2013, using sign count techniques. All perennial and intermittent streams within MCBQ boundaries were walked and the locations of active beaver cuttings, dams, and lodges were recorded. Areas of activity were drawn onto maps and were designated as colony sites based upon geographic separation from other active beaver areas.

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b. Surveys recorded 112 colonies in 1991, 111 in 1994, 124 in 1997, 126 in 2000, 108 in 2004, 109 in 2008, and 46 in 2013. Colony numbers seemed stable from 1991 through 2008 but the 2013 survey suggests there has been a population decline. Possible reasons for the decline could be increased predation from coyotes, disease, or drought conditions and reduced water flow.

c. Prior to 2013, a range of 72-86 colonies were found on the 90 miles of perennial streams at MCBQ (0.8 - 0.96 colonies per mile). This compares closely with the 0.8 colonies/mile reported by Buckley (1950) for New York. In 2013, this dropped nearly in half to 0.47 colonies per mile with only 3 colonies located on the 136 miles of intermittent streams at MCBQ (0.02 colonies per mile). This most recent data indicates that most intermittent streams do not have enough year-round flow to support active beaver colonies.

d. Based on the surveys, the beaver colonies are maintaining 2.5-3.0 dams per colony. About one-half of the colonies have typical mud and stick lodges; the other colonies maintain bank lodges. Many dams are placed within stream channels and do not result in large ponds because the water level remains within the stream banks.

e. Beavers have modified many of the deciduous forested wetlands at MCBQ. Wetlands occupied by beavers are shown at Figure 6-24. Through the process of tree cutting, damming, and flooding, occupied beaver sites are transformed from heavily forested riparian woodlands to open wetlands. At most older beaver sites, wetlands communities classified as palustrine scrub-shrub, palustrine emergent, and palustrine open water have been created. These beaver created habitats are significant habitats for many wetland species of wildlife, including mink, otter, raccoon, herons, waterfowl, and numerous amphibians and reptiles. Beaver cuttings have significantly thinned some woodlands around active colony sites, resulting in stimulated sprouting and understory development beneficial to woodcock, ruffed grouse, and other species that require dense shrub habitat.

f. During the 1970s and early 1980s trappers harvested up to 50 beavers per year. These were usually taken from colonies that were close to roads and readily accessible. An adult beaver can weigh over 50 pounds and is a considerable load to carry long distances over woodland terrain. Currently, licensed trappers have little incentive to trap due to low fur prices; however, licensed trappers are asked by the Base to remove unwanted beavers during open seasons. NREA staff also trap and remove beavers from locations where they are impacting training, roads, or spillways.

2. Scent Station Surveys. Scent station surveys were conducted 8 times at MCBQ from 1983 to 2005. Results are provided at Figure 6-25. Observers had difficulty distinguishing between red and gray fox tracks, so those values were grouped into total fox tracks. The large number of foxes recorded in 1986 is believed to reflect a high population produced by the record oak mast crop of 1985. Other than

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foxes, the primary trend documented was the arrival and increase of coyotes during the survey period.

3. Trapping Records. Historic trapping records are provided at Table 6-8. These figures do not necessarily reflect relative abundance between species or between years. Trapping trends are often dictated by fur prices, and therefore the target species and amount of trapping effort can change annually. Also, trapping trends rely on access to training areas for trapping, which has changed annually and generally declined due to more restricted issue of range gate keys and access rights.

4. Otter. Studies of river otter home range, food habits, and population size at MCBQ were completed by Cogliano (2003) and Brandhagen(2003). These studies documented that river otters are regular inhabitants of MCBQ watersheds. Brandhagen (2003) analyzed DNA in otter droppings and documented a minimum of 23 individual otters on the Base in February 2001, about 1 otter per 170 acres of wetlands.

6704. MANAGEMENT PRACTICES. Furbearers generally benefit from management practices designed to improve the diversity of forests, openings, and wetland areas.

1. Wetlands. Many of the basic habitat requirements of the raccoon, muskrat, river otter, and mink are provided by wetlands modified by beavers. Therefore, the maintenance of a beaver population is beneficial for these species. Crayfish, frogs, fish, and other aquatic fauna in beaver ponds provide forage for raccoons and river otters.

2. Timber Management. Management of forests should encourage a mixture of timber age classes distributed in such a way as to maximize diversity to support a variety of furbearers dependent on them. Generally speaking, small, irregularly shaped clearcuts amplify edge effect and create openings that may become especially conducive to red foxes. Hard and soft mast producing species should be encouraged as they provide food for both fox species and raccoons. Pockets of forest regeneration result in the proliferation of small mammal populations, an important food source for mammalian predators (Williams 2000).

3. Managed Openings and Prescribed Burning. Prescribed burning in forested areas will benefit furbearers by stimulating the growth of herbaceous species that support a prey base of small rodents reliant on open spaces for habitat and food sources.

4. Brushpiles. Brushpiles provide denning and thermal escape cover for many terrestrial furbearers found at MCBQ. Slash left from logging practices can be piled into mounds to provide shelter.

5. Harvest Management. Harvest levels should be monitored to identify baseline information about the presence and condition of

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furbearer species. Actual harvest management through trapping controls is not necessary unless enthusiasm about commercial trapping rises due to a dramatic increase in fur prices.

### 6. Animal Damage Control

a. Beavers. While beaver ponds are beneficial to a variety of wildlife species, the construction of dams in certain locations constitutes a nuisance. Control measures range from installing water regulatory devices to permanent removal of the dam and the beavers that built it. The installation of a PVC drain pipe to relieve water buildup is a non-lethal option that allows the beavers to remain in place, while eliminating the flooding problems caused by their impoundments. In areas where this compromise is impractical, breaking the dam and trapping the beavers will be required.

b. Raccoons. Raccoons frequenting garbage cans are a source of discontent for some MCBQ housing residents. Live trapping and euthanasia are recommended for the removal of problem raccoons.

7. Sick and Dying Animals. Sick raccoons, foxes, and skunks are generally encountered several times per year at MCBQ, although some years are worse than others. Sick animals commonly have symptoms such as lack of fear, daytime activity in area frequented by humans, and weakness. Some animals may be unable to depart the area; others may be capable but reluctant. Any strange acting furbearers should be removed from inhabited areas and be taken to a testing laboratory if the animal has been in contact with humans, or if recommended by a local County health department.

### 6705. MANAGEMENT RECOMMENDATIONS

1. Ecology. Studies of furbearer ecology to include population densities, home range size, impacts on ground nesting birds, and disease transmission should be implemented.

2. Permit Trapping. The MCBQ trapping program should continue to be administered by the regulations in the MCBQ Fish and Wildlife Management Procedural Manual (Appendix B) and records should be kept of any furbearers taken under this program.

3. Beaver Survey. Beaver population levels should be monitored at 5-year intervals using the sign count procedure. Resulting polygons of colony locations should be entered into the MCBQ GIS database to provide a historical record of beaver colonization over time.

4. Habitat. Implementation of the habitat recommendations in Section 2 of this Chapter should sustain adequate habitat for all terrestrial furbearers discussed in this Section. General management of the beaver population and habitat will maintain a variety of wetland habitats for other aquatic furbearers.



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5. Beaver Culverts. The installation of perforated, double cylinder PVC beaver culverts in some dams may be used on a limited basis as a means to control water levels in some problem areas.

6. Population Controls. The dire circumstances of bobwhite quail and other ground nesting wildlife may warrant control of mammalian nest predators in quail habitat areas.

### 6706. REFERENCES

- Allen, A. W. 1982. Habitat suitability index models: Beaver. U.S. Dept Int., Fish Wildl. Serv. FWS/OBS-82/10.30. 20 pp.
- Brandhagen, M. D. 2003. Monitoring of the North American River Otter (*Lontra Canadensis*) using molecular analysis of scat: a noninvasive technique and its potential application to otter management and conservation. Ph.D. Diss. George Mason Univ. Fairfax, Virginia. 85 pp.
- Bozarth, C. A. 2010. Phylogeography and non-invasive molecular monitoring of coyote (*Canis latrans*) and gray fox (*Urocyon cinereoargenteus*) in northern Virginia and the eastern United States. Ph.D. Diss., George Mason University, Fairfax, Virginia. 122 pp.
- Buckley, J. L. 1950. The ecology and economics of the beaver (*Castor canadensis*). Ph.D. Diss., State Univ., New York, Syracuse. 251 pp.
- Cogliano, M. M. 2003. The Ecology and Status of the North American River Otter (*Lontra Canadensis*) on the Marine Corps Base, Quantico, Virginia. Ph.D. Diss., George Mason Univ., Fairfax, Virginia. 115pp.
- Cooley, L. S. 1983. Winter food habits and factors influencing the winter diet of river otter in north Florida. M. S. Thesis, Univ. Florida, Gainesville. 50 pp.
- Dearborn, N. 1932. Foods of some predatory fur-bearing animals in Michigan. Univ. Michigan, School For. and Conserv. Bull. 1. 52 pp.
- Denney, R. N. 1950. A summary of North American beaver management, 1946-1948. Colorado Game and Fish Dep., Curr. Rep. 28. 58 pp.
- Eagle, T. C. and J. S. Whitman. 1987. Mink. Pages 614-624. In M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ont. Trappers Assoc., North Bay, Ont. 1150 pp.
- Edwards, T. L., L. Short, and C. Logsdon. 1992. Aquatic furbearers. Chapter thirty-four In T. G. Barnes, L. R. Kiesel, and J. R. Martin, eds. 1992. Private Lands Wildlife Management: Technical Guidance Manual and Correspondence Course. KY Coop. Ext. Serv. Univ. KY, Lexington.
- Fritzell, E. K. 1987. Gray fox and island gray fox. Pages 408-420



## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- In M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ont. Trappers Assoc., North Bay, Ont. 1150 pp.
- Giles, L. W. 1940. Food habits of the raccoon in central Iowa. J. Wildl. Manage. 4:375-382.
- Harris, S. 1979. Age-related fertility and productivity in red foxes, *Vulpes vulpes*, in suburban London. J. Zool. (London) 187:195-199.
- Hill, E. P. 1976. Control methods for nuisance beaver in the southeastern United States. Proc., 7th Vertebrate Pest Control Conf., Univ. Calif., Davis. 13 pp.
- Hockman, J. G. and J. A. Chapman. 1983. Comparative feeding habits of red foxes (*Vulpes vulpes*) and gray foxes (*Urocyon cinereoargenteus*) in Maryland. Am. Midl. Nat. 110:276-285.
- Jenkins, S. H. 1979. Seasonal and year-to-year differences in food selection by beavers. Oecologia 44:112-116.
- Llewellyn, L. M., and F. M. Uhler. 1952. The foods of fur animals of the Patuxent Research Refuge, Maryland. Am. Midl. Nat. 48:193-203.
- Melquist, W. E., and A. E. Dronkert. 1987. River otter. Pages 626-641. In M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ont. Trappers Assoc., North Bay, Ont. 1150 pp.
- \_\_\_\_\_, and M. G. Hornocker. 1983. Ecology of river otters in west central Idaho. Wildl. Monogr. 83. 60 pp.
- \_\_\_\_\_, J. S. Whitman, and M. G. Hornocker. 1981. Resource partitioning and coexistence of sympatric mink and river otter populations. Pages 187-220 In J. A. Chapman and D. Pursley, eds. Proc. Worldwide Furbearer Conf., Frostburg, MD.
- Novak, M. 1977. Determining the average size and composition of beaver families. J. Wildl. Manage. 41:751-754.
- O'Neil, T. 1949. The muskrat in the Louisiana coastal marshes. LA Dep. Wildl. and Fish., New Orleans. 152 pp.
- Sanderson, G. C. 1987. Raccoon. Pages 486-499. In M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ont. Trappers Assoc., North Bay, Ont. 1150 pp.
- Sumner, P. W., and E. P. Hill. 1980. Scent stations as indices of abundance in some furbearers of Alabama. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 34:572-583.
- Voigt, D. R. 1987. Red fox. Pages 378-392 In M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Manage. and Conservation in North America. Ont. Trappers Assoc., North Bay, Ont. 1150 pp.
- Williams, J. M. 2000. Small mammal demography and habitat associations in 4 forest cover types on MCBQ, Virginia. M.S. Thesis, Virginia Tech, Blacksburg, VA. 208 pp.

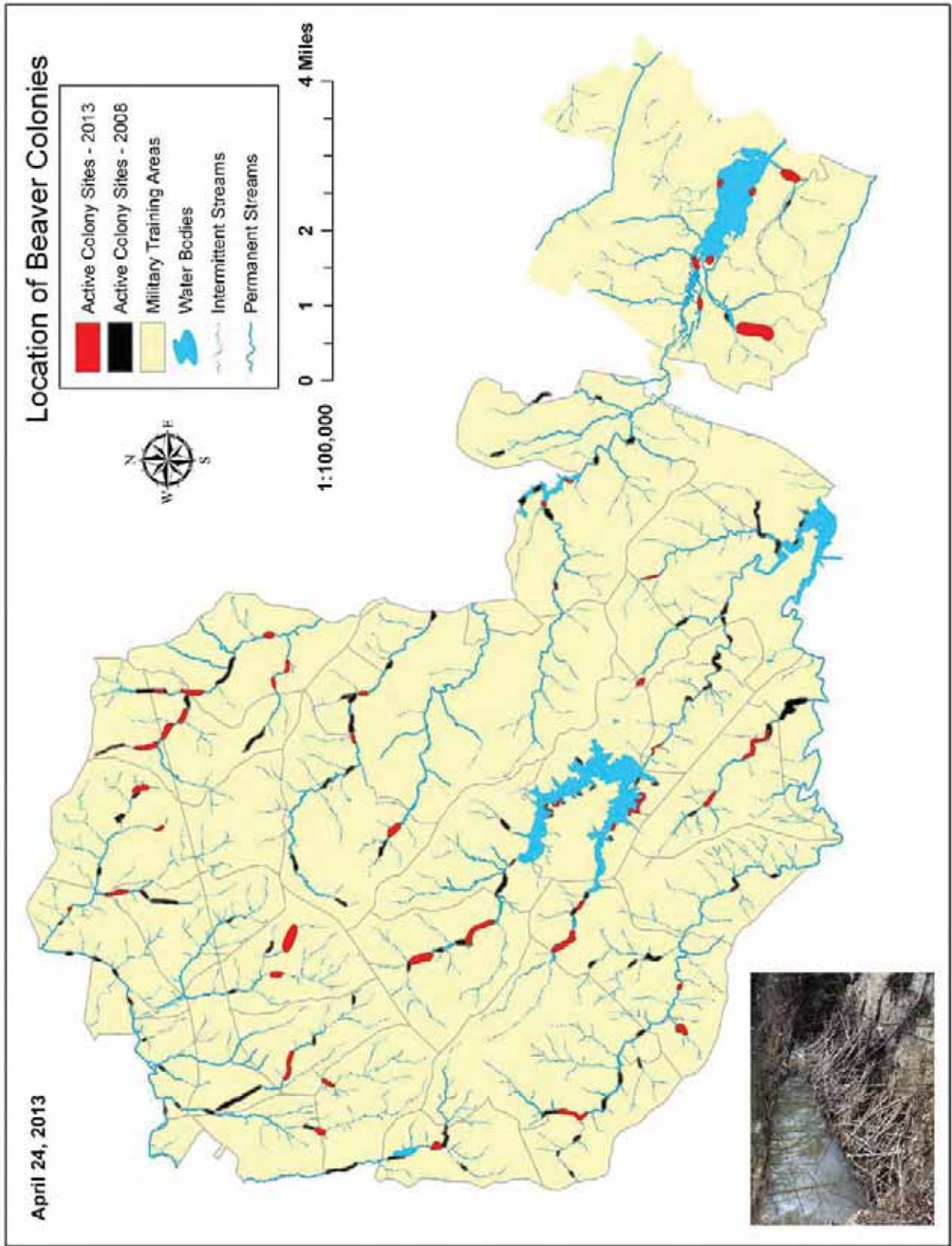


Figure 6-24. Beaver colonies at MCBQ.

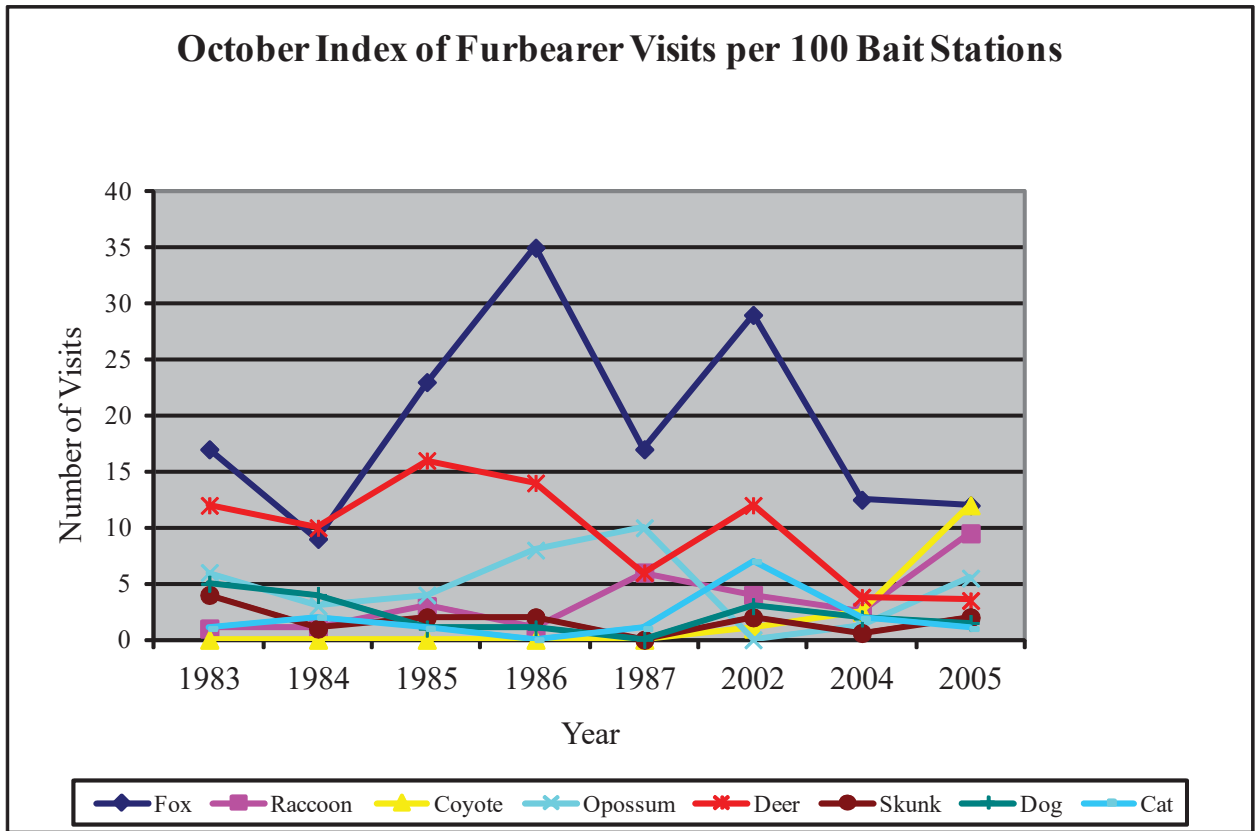


Figure 6-25.—October Index of Furbearer Visits

Table 6-8. Average annual furbearer harvest at MCBQ.

Species	1986-1995	1996-2005	2006-2012
Beaver	23	22.8	10.0
Gray Fox	17	12.4	5.0
Red Fox	6.6	16.8	24.0
Raccoon	21.9	2.8	7.3
Opossum	12.9	1.3	10.0
Skunk	1.6	0.4	1.3
River Otter	1.4	0.4	0.5
Muskrat	0.4	0.3	5.8
Mink	0.1	0.0	0
Coyote	0.0	0.0	0.5

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## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 8: NONGAME SPECIES

6800. MANAGEMENT GOALS AND OBJECTIVES. Most species native to the MCBQ area are not pursued for harvest under regulations governing the take of sport fishes, game animals, and furbearers, and are known as nongame species. Ecosystem management has been prescribed by DoD as the means to perpetuate all of the component parts of the biological community. Along those lines, the VDGIF has completed a Virginia Wildlife Action Plan which identifies the wildlife species in the Commonwealth having the greatest conservation need. To meet DoD prescriptions, MCBQ will strive, to the extent practical within the military training environment, to implement land management programs that will maintain the habitat diversity goals and methods in the Virginia Wildlife Action Plan to perpetuate these species. Nongame species at MCBQ occupy habitats ranging from early successional old fields to mature forest stands and various wetlands and streams. Consequently, land management at the Base must perpetuate a diversity of plant communities. This will include maintaining designated stands of mature forest, maintaining intermediate forest age classes ranging from 0 to 100+ years of age, establishing protected buffer strips in riparian habitats, maintaining wetlands, reestablishing native vegetation in previously disturbed areas, and using fire or other disturbances to maintain grassland communities. Incorporating concepts from the Chesapeake Bay Program to protect water quality will help maintain biological diversity in wetlands and streams. Artificial techniques, such as installing nest boxes, may be used to improve habitat for some species, but the management emphasis will be on providing natural habitat components.

#### 6801. NONGAME SPECIES

##### 1. Birds

a. MCBQ's diverse habitats provide for a variety of migratory and resident bird species. The Base is guided in its conservation and management of these species through compliance with the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA). A Checklist of Birds for MCBQ is provided at Appendix D based on observations made by northern Virginia bird clubs affiliated with the Virginia Society of Ornithology. Information taken from Christmas Bird Counts conducted by the Nokesville Bird Club were important for indicating the common winter birds found on the western portion of the Base. The checklist was also edited by the Base wildlife staff to include their recent observations about species abundance. Common woodland species include the blue jay (*Cyanocitta cristata*), Carolina chickadee (*Parus carolinensis*), tufted titmouse (*P. bicolor*), red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), Carolina wren (*Thryothorus ludovicianus*), wood thrush

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(*Hylocichla mustelina*), white-breasted nuthatch (*Sitta carolinensis*) and red-eyed vireo (*Vireo olivaceus*). Species found in openings and edge habitats include the mockingbird (*Mimus polyglottos*), brown thrasher (*Toxostoma rufum*), eastern bluebird (*Sialia sialis*), American Robin (*Turdus migratorius*), American crow (*Corvus brachyrhynchos*), indigo bunting (*Passerina cyanea*), prairie warbler (*Dendroica discolor*), song sparrow (*Melospiza melodia*), yellow-breasted chat (*Icteria virens*), and white-throated sparrow (*Zonotrichia albicollis*). The wood thrush, red-eyed vireo, indigo bunting, prairie warbler, and yellow-breasted chat are among the neotropical migratory bird species that breed at MCBQ. Populations of many of these migratory species appear to be declining and, therefore, are the subject of a nationwide conservation program, "Partners in Flight" or PIF.

b. Common wetland and aquatic species include the double-crested cormorant (*Phalacrocorax auritus*), great-blue heron (*Ardea herodias*), green heron (*Butoroides striatus*), belted kingfisher (*Megaceryle alcyon*), and a variety of waterfowl (see Section 3, Chapter 6). Congregations of over 50 great blue herons can often be seen feeding in the shallow tidal flats of Chopawamsic Creek. A large heron rookery is located in the wetlands of the lower Chopawamsic Creek.

c. The most common birds of prey observed or heard at MCBQ include the bald eagle, osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*B. lineatus*), broad-winged hawk (*B. platypterus*), sharp-shinned hawk (*Accipiter striatus*), American kestrel (*Falco sparverius*), turkey vulture (*Cathartes aura*), black vulture (*Coragyps atratus*), barred owl (*Strix varia*), and great horned owl (*Bubo virginianus*). The tidal waters of Chopawamsic Creek provide important foraging habitat for osprey that nest along adjacent waters in the Potomac River and Quantico Creek. As many as 32 osprey have been counted at one time feeding in these wetlands during herring and shad runs in April and May. Ospreys are a common nesting species on buoy markers in the Potomac River, but also nest on communication towers, ball field lights, and power poles.

2. Mammals. A listing of mammals found at MCBQ is shown at Appendix D. The list was refined in 1992 by drift fence samples collected by the Virginia Natural Heritage Division (VDCR 1992) and by small mammal habitat studies (Williams 2000). Common small mammals include the eastern mole (*Scalopus aquaticus*), least shrew (*Cryptotis parva*), northern short-tailed shrew (*Blarina brevicauda*), eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*) and woodland voles (*Microtus pine-torum*). One specimen of the star-nosed mole (*Condylura cristata*) was found in drift fence samples; in Virginia it is listed as a State Species of Concern per the Virginia Wildlife Action Plan.

### 3. Reptiles and Amphibians

a. A list of MCBQ amphibians and reptiles is provided at Appendix D. This list was compiled by Dr. Joe Mitchell during 1990-1991 surveys (VDCR 1992) and was further refined by pitfall trapping done by Williams (2000) and Mitchell (1998). Species were collected and



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identified through intensive searches, call counts, drift fences/pitfall traps, dipnets, turtle traps, and minnow traps. Most individuals were collected or sighted in mesic forest and floodplain habitats, suggesting that these habitat types are critical to the maintenance of amphibian diversity at MCBQ.

b. The known reptile fauna of MCBQ consists of 24 species, and the expected number is 35 (VDCR 1992). During the VDCR study, five of the expected 6 species of lizards, 5 of the 9 species of turtles, and 12 of the 20 expected species of snakes were confirmed. Since that study, the smooth earth snake (*Virginia valeriae*) and the spotted turtle (*Clemmys guttata*) have been confirmed on the Base (T. Stamps pers. comm.). The spotted turtle and box turtle (*Terrapene carolina*) are considered Virginia Wildlife Action Plan Tier III species (high conservation need).

c. Based on drift fence samples, the areas of greatest herpetofaunal diversity at MCBQ appeared to be mesic, forested floodplains and mature hardwood forests. Mitchell (1998) and VDCR (1992) strongly recommended that these habitats be maintained as much as possible in their natural state. Mitchell (1998) further suggested that they should not be converted to pine monocultures, which would provide habitat for few amphibians.

4. Fish. Nongame fish species within MCBQ watersheds were identified by surveys conducted by the USFWS and George Mason University (see Section 1, Chapter 6, page 6-10). Forty species were identified and are listed at Appendix D. Recommendations for management included the continuing protection of water quality and improvement of stream crossings in the training areas.

### 5. Invertebrates

a. In 1990-1991, Base watersheds were surveyed for the presence of rare mussels and the federally listed dwarf wedgemussel (*Alasmidonta heterodon*) was found in Aquia Creek (see Chapter 7).

b. Lepidoptera (butterflies and moth) surveys were conducted on Base in 1998 and 1999 (Chazal 2000). The diversity, complex life cycle, and sheer numbers of Lepidoptera make them an important component of ecological systems as pollinators, prey, and primary consumers. Sixty-one species of butterflies and 301 species of moths were identified (Appendix D). No rare species were found, but a number of county occurrence records were made. The habitats with the highest number of species were bottomland forest, native grasslands, and mixed-upland forests.

c. Benthic macroinvertebrates were studied at 13 stream sites at MCBQ in 1998 and 1999 (Kelso et. al. 2000). The most numerous insect order was Diptera, with substantial numbers of midges, blackflies, and craneflies detected. Mayflies (Ephemeroptera) were the second most numerous insect. Other important insects found, in decreasing order of abundance, were caddisflies (Trichoptera), stoneflies (Plecoptera), beetles (Coleoptera), hellgrammites (Megaloptera), dragonflies

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(Odonata), and true bugs (Hemiptera). Most Base streams had an Index of Macroinvertebrate Integrity (IMBI) ranking of "non-impaired" which can best be described as "comparable to the best situation to be expected within an ecoregion" (Plafkin et. al. 1989).

6802. SPECIES GROUPS AND HABITAT REQUIREMENTS. It is not necessary to identify a habitat management program for every species. Rather, it is appropriate to develop habitat management programs that meet the requirements of groups of species that have similar life requisites. For the purposes of this plan, the following groups have been identified: cavity nesting birds, neotropical migratory birds, grassland and forest edge birds, amphibians, small mammals, lepidoptera, and aquatic invertebrates. Within these groups are species that rely on the range of habitats found at MCBQ, including stream corridors, grasslands, forest edges, and mature closed canopy forests.

### 1. Cavity Nesting Birds

a. Woodpeckers, nuthatches, chickadees, bluebirds, kestrels, barred owls, and bats are a few examples of species that require nesting cavities to satisfy their life requisites. Bluebirds and kestrels are found on the edges of open habitats. Small birds such as nuthatches and chickadees can find cavities in a variety of intermediate aged forest habitats. The pileated woodpecker and barred owl, however, are large birds that require expansive forested areas that contain large trees that provide cavities suitable for security and reproduction (Schroeder 1982, Allen 1987). In all probability, if the habitat requirements of the pileated woodpecker and barred owl are met, the life requisites of other woodland cavity-nesting species will also be met.

b. MCBQ forest stand inventory data collected during 1991 and 1992 were used to calculate habitat values used in USFWS Habitat Suitability Index (HSI) Models for these species (Prose and Cade 1993). The findings concluded that hardwood (HMHD), mixed pine-hardwood, and non-mast hardwood timber stands provided about one-half optimum habitat value at 40 years of age and gradually increased to optimum habitat conditions at 100 years of age. Land management zones 2-6, described in Chapter 5, , which have limited access and are not subject to regular timber harvest, should provide optimum habitat for these species and others that require extensive closed canopy mature forest. Land management zone 1, which is subject to regular planned timber harvest, will normally have at least 50% of the acreage in forest ranging from 40-100 years of age. This zone should also accommodate these species but will perhaps be at a lower population density.

c. Nesting boxes for the eastern bluebird and kestrel have been installed along forest edge and grassland habitats. The CVP assists NREA staff with managing about 50 bluebird boxes in TAs west of Interstate 95, and the Northern Virginia Bluebird Society installed a bluebird trail along the Medal of Honor golf course at Mainside. The



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kestrel boxes, installed as a Boy Scout project, have not been maintained and should be refurbished.

### 2. PIF

a. The PIF program evolved as a nationwide program to study and manage neotropical migratory birds that breed in North America and migrate to Central and South America to overwinter. Population indices for many of these species have declined in recent years, focusing national attention on the status of these species. PIF has since grown to include temperate migratory and resident birds, and DOD, DON, and U.S. Marine Corps are active participants in this program.

b. DOD goals and objectives for migratory and resident bird management (DOD 2002) are to:

- (1) Apply information collected from this partnership program to support DOD mission requirements.
- (2) Take proactive management actions to prevent bird species from reaching threatened or endangered status.
- (3) Facilitate cooperative partnership efforts consistent with the military mission.
- (4) Determine the status of migratory and resident bird populations on DOD lands and the causes of population fluctuations.
- (5) Reduce bird aircraft strike hazard risks through implementation of mobile radar.
- (6) Maintain and restore priority habitats on DOD lands for migratory and resident bird populations.
- (7) Reduce or eliminate pesticide use in sensitive habitats, especially in and around wetlands and riparian areas.
- (8) Reduce the spread and impact to birds and their habitats of invasive and nuisance species on military lands, including feral and free-roaming cats.

c. The wood thrush, scarlet tanager, and red-eyed vireo are common neotropical migrants found in mature MCBQ woodlands. Much research is ongoing nationwide to determine the factors affecting the population densities and breeding success of these species. Under the DoD Legacy Resource Management Program, MCBQ hosted research concerning reproductive biology and landscape level habitat relationships of these species (Vega-Rivera 1997, Penhollow and Stauffer 2000). In 1995, MCBQ enrolled three bird-banding stations in the Monitoring Avian Productivity and Survival (MAPS) program and has operated MAPS stations in years when funding has been available. (Figure 6-26).

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3. Edge Species. Some year-round resident and migratory bird species use open grassland and woodland edges. Among the nongame birds utilizing these habitats are the eastern bluebird, American robin (*Turdus migratorius*), cardinal, indigo bunting (*Passerina cyanea*), yellow-breasted chat, prairie warbler, eastern phoebe (*Sayornis phoebe*), and song sparrow. Native grasses and shrubs should be encouraged along edges, and the openings should contain structural features such as downed logs and perch sites. Forest openings created by clearcuts are usually colonized by native grasses prior to canopy closure. Therefore, carefully planned timber harvesting operations can be supportive of non-game birds that require early successional habitats. It is important that timber harvests are planned and scheduled over time so as to balance adequate mature timber to meet the requirements of the larger cavity-nesting species with cutover habitat to support early successional species. Fire-maintained landscapes at MCBQ support a diverse assemblage of bird species as documented by LeClerc and Paxton (2004).

4. Wetland Species. The diversity of wetland habitats present at MCBQ (described in Chapter 2) provide habitat for a variety of nongame species. Amphibians have recently received considerable media and scientific attention because of species extinctions and population declines worldwide. Since amphibians rely on shallow wetlands for the reproductive portion of their life cycle, their population status should closely relate to the quality and availability of wetland habitats. A DOD Legacy Resource Management Program-sponsored Mid-Atlantic regional study determined that amphibian populations at MCBQ are currently stable (Mitchell 1998).

5. Small Mammals. Williams (2000) conducted studies at MCBQ to determine whether the abundance, species composition, density, survival, and reproductive effort of small mammals varied with respect to forest cover type. Catch per unit effort was greatest in shelterwoods followed by riparian, clearcut, and mature forest types. The results of the study suggest that current even-aged forest management practices at MCBQ are compatible with the maintenance of native populations of small mammals. Disturbances created by harvesting, at least temporarily, resulted in favorable microhabitat conditions for a variety of small mammals.

### 6803. MANAGEMENT RECOMMENDATIONS

1. Forest Landscapes. Studies by Welsh and Healy (1993) suggest that in extensively forested areas, timber management and maintenance of the native breeding forest songbird community can be compatible. In their study area 50% of the area was in forest reserve rather than active timber management. The other 50% of forest-land was under active timber management being harvested by clear-cutting or shelterwood methods on an 80 year rotation. This practice provided large areas of mature timber, but also provided seedling and edge habitat for species that required early successional habitats. The forest habitat management program prescribed in Section 2 of this Chapter is very similar and should accommodate species requiring both

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young forest stands and extensive mature forested habitats.

2. Open Landscapes. Species adapted to open landscapes include the American kestrel, killdeer, kingbirds, purple martin, barn swallow, meadowlarks, a variety of sparrows, and meadow voles. The promotion of native grasses in managed open fields and maintenance of transitional zones along forest edges is recommended. The prescription of fire in Section 2 along with other maintenance practices to increase the acreage of grasslands should be of benefit to these species.

### 3. Edge Habitats

a. Edges and their ecotones (the area influenced by the transition between plant communities) are frequently rich in wildlife, both in numbers of species and individuals, because of the additive effect created when two or more plant communities and structural conditions come together. The management of openings and even-aged forest management prescriptions in Section 2 will ensure that edge habitats are relatively abundant in land management zone 1 where timber harvests are scheduled. Infrequent forest disturbances, insect disease, storms, and fire may less predictably create edge habitats in the land use zones 2-6.

b. Transitional landscapes offer opportunities for habitat improvement in urban areas. Birds commonly attracted to wood margins, shrub thickets, and other edge habitats include doves, hummingbirds, wrens, mockingbirds, bluebirds, thrashers, cedar waxwings, orioles, cardinals, indigo buntings, and several species of warblers and sparrows. Many of these species nest in woodlands but feed heavily along edges because of the generally high production of seeds, fruits, and insects within this transition zone. The VDGIF and National Wildlife Federation can provide information about backyard habitat programs. This should be made available for schools and civic groups aboard the Base that would like to do conservation projects in the housing and developed areas.

4. Riparian Corridors. The control of non-point source pollution and maintenance of vegetated buffer strips along streams and other watercourses is essential for the maintenance of healthy amphibian populations and aquatic systems. These riparian zones are extremely beneficial to non-game wildlife and are also important for erosion control, bank stabilization, and maintaining water quality (see Chapter 4).

5. Pesticide Use. Because a variety of insects, including moths, butterflies, and benthic macroinvertebrates are important as pollinators and/or prey, caution must be exercised in the use of pesticides. These invertebrates are important in the food chains of aquatic and terrestrial vertebrates. The majority of forest-dwelling bird species are insectivorous and require a constant food supply to feed nestlings and store fat for migration; pesticides must be used judiciously so as not to eliminate their food supply. Integrated Pest

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Management programs for control of pests, such as the gypsy moth, are described in Chapter 5 and attempt to balance ecosystem risks.

6. Nesting Structures. Under natural conditions, cavities in live trees and snags usually provide preferred homes for cavity-nesting species. It is seldom practical to leave diseased trees standing where they can become a potential hazard in residential neighborhoods, or high-use recreation areas. Therefore, providing artificial nest structures may be the best way to encourage cavity-nesters in some environments. Nest boxes are recommended for greenspace management, and their construction often lends itself to community projects undertaken by scouting groups and other civic organizations. Continuation of the bluebird nest box program and restoration of the kestrel nest box program is recommended.

### 7. Research and Surveys

a. Short and long-term surveys should be supported to improve knowledge about nongame species distribution and response to land management actions.

b. Support DOD PIF program studies involving ecology of neotropical migratory and resident birds. Continue the operation of MAPS stations.

c. Develop monitoring programs for species of greatest conservation concern found in the Virginia Wildlife Action Plan.

### 6804. REFERENCES

- Allen, A. W. 1987. Habitat suitability index models: barred owl. U.S. Fish and Wildl. Serv. Rep. 82(10.143). 17 pp.
- Chazal, A. C. 2000. Zoological surveys for the dwarf wedgemussel and Lepidoptera at Marine Corps Base, Quantico, Virginia. Natural Heritage Tech. Rep. 00-05. Va. Dept. Conserv. and Rec., Div. Nat. Heritage. Richmond, VA. 16pp. plus appendices.
- DOD. 2002. Department of Defense Partners in Flight Strategic Plan: The Conservation and Management of Migratory and Resident Landbirds and their Habitats on Department of Defense Lands. Partners in Flight. The Plains, VA.
- Kelso, D. P., R. C. Jones, K. D. Brittingham, A. M. Maher, D. R. Morgan, E. Tuszyńska. 2001. Quantico Marine Corps Base stream monitoring 1998-1999 final report. Dept. of Biology, George Mason Univ., Fairfax, VA. 40pp.
- LeClerc, J. E. and B. J. Paxton. 2004. Investigations of avian diversity within a large-scale active firing range on the Quantico Marine Base CCBTR-04-15. Center for Conservation Biology, College of William and Mary, Williamsburg, VA. 42 pp.
- Mitchell, J. C. 1998. Amphibian decline in the mid-Atlantic region: monitoring and management of a sensitive resource. Legacy Resources Management Program, U.S. DoD. 144pp.

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- Penhollow, M. E. and D. F. Stauffer. 2000. Large-scale habitat relationships of neotropical migratory birds in Virginia. *J. Wildl. Manage.* 64(2):362-373.
- Plafkin, J. L., M. Barbour, K. Porter, S. Gross and R. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates and fish. EPA/44/4-89-001. U.S. Environmental Protection Agency, Office of Water.
- Prose, B., and B. Cade. 1993. Progress Report for Application of the Habitat Management Evaluation Method (HMEM) on the Quantico Marine Corps Base, Virginia. National Ecology Research Center, Fort Collins, Co. 40pp.
- Schroeder, R. L. 1982. Habitat suitability index models: Pileated woodpecker. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.39. 15 pp.
- VDCR. 1992. A natural heritage inventory - Marine Corps Base Quantico, Stafford County, Virginia. Nat. Heritage Tech. Rep. #92-25. Va. Dept. Conserv. and Rec., Div. Nat. Heritage. Richmond, VA. 41pp.
- Vega-Rivera, J. H. 1997. Premigratory movements of a long distance migratory species: the wood thrush. PhD dissertation. Virginia Tech, Blacksburg, VA. 120pp.
- Welsh, C. E., and William M. Healy. 1993. Effect of Even-aged Timber Management on Bird Species Diversity and Composition in Northern Hardwoods of New Hampshire. *Wildl. Soc. Bull.* 21:143-154
- Williams, J. M. 2000. Small mammal demography and habitat associations in 4 cover types on Quantico Marine Corps Base, Virginia. M.S. Thesis, Virginia Tech, Blacksburg, VA. 208pp.



Figure 6-26. Ecosystem management projects: (top) stream electroshocking to monitor fish populations; (lower right) radio-monitoring wood thrush dispersal movements; (lower left) mist-netting and leg-banding migratory birds to determine reproductive success, migratory movements and feeding ecology.



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## CHAPTER 6

### FISH AND WILDLIFE RESOURCES

#### SECTION 9: SUMMARY AND WORK PLAN

##### 6900. SUMMARY

1. The chapter has identified a wide range of species and their habitat requirements, reviewed literature pertinent to maintaining viable populations, and recommended management projects that are compatible with the military mission and other land use objectives. Some management recommendations dealing more with outdoor recreation will be shown in project listings in Chapter 8, Outdoor Recreation.
2. Fisheries management recommendations include: continuing coordination with the VDGIF to sample fisheries populations in small ponds and impoundments; continuing the put-and-take trout fishing program; ensuring that fishing access is maintained at ponds and impoundments; maintaining dams of small impoundments by brush clearing, maintenance and construction of proper emergency spillways; controlling SAV if essential for waterway access; cooperating with regional fisheries management projects and research; protecting water quality by control of nonpoint source sedimentation pollution; and maintaining habitat structures in the major impoundments.
3. Terrestrial habitat management focuses on maintaining habitat for grassland species, early successional forestland species, and species that require larger blocks of closed canopy mature forest. Guidelines include: maintaining 50% or more of forest compartments in timber 40 years of age or older to promote hard mast production; scattering small forest regeneration units (less than 25 acres) among older forest stands; managing riparian zones to protect water quality, provide large snags and den trees, and provide small pockets (less than 5 acres) of early successional forest; maintaining remnant fruit and nut tree orchards at old home-sites; maintaining 2% or greater of habitat in managed openings; planting managed openings on a rotational cycle to enhance nutrition and cover values for wildlife; coordinating conservation plantings with military training, right-of-ways maintenance, and forestry operations to optimize multi-purpose use of open lands; using prescribed burning to promote habitat values for grassland species; and controlling the spread of non-native plants such as tall fescue and autumn olive.
4. Waterfowl/wetlands management recommendations include promoting wetlands conservation by implementing the DON "no-net loss" wetlands policy; maintaining the beaver population at a desirable level; and controlling damage caused by resident Canada geese.
5. Population monitoring surveys for wild turkey, bobwhite quail, cottontail rabbit, white-tailed deer, beaver, waterfowl, and migratory birds should be continued or expanded. Studies of predator/prey ecology are recommended. Wildlife disease surveillance in support of



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the VDGIF CWD and avian influenza monitoring programs will be done as requested by the VDGIF. Consideration will be given to research, monitoring and conservation measures that can be taken for species of greatest conservation concern identified in the Virginia Wildlife Action Plan.

6901. FIVE-YEAR WORK PLAN. The proposed five-year work plan and budget estimate for fish and wildlife resources management is shown at Table 6-9. The table does not include labor costs for federal employees in the overall budget. Dollar value estimates are for the costs of materials, supplies, equipment, and contracts. Projects to repair and maintain structures such as dams and spillways are listed in Table 8-2, Chapter 8.

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Table 6-9. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
II. To support and enhance the preservation of all animal and plant life endemic to the Base ecosystem.						
1. Goal: To provide for the stewardship of fish and wildlife resources by managing the soil, water, vegetation and other natural features to sustain quality habitats and diversified biological communities.						
1. Participate in NEPA review of land disturbing projects to evaluate impacts on fish and wildlife populations.	A	*	*	*	*	*
2. Use agronomy practices to establish and maintain about 150 acres per year of crops/grasslands to support military training, wildlife habitat, soil and water conservation, and recreation.	A	50	50	50	50	50
3. Promote recreational fisheries by placement of habitat structure in Lunga Reservoir, Breckenridge Reservoir and Dalton Pond.	A	2	2	2	2	2
4. Protect aquatic habitat by point and non-point source pollution abatement (see Chapter 4).	A	-	-	-	-	-
5. Maintain walnut and fruit trees in old homesites for aesthetic values, and hard/soft mast production.	A	1	1	1	1	1
6. Use prescribed burning to maintain grassland habitat in conjunction with military range management and other land uses.	A	1	1	1	1	1
7. Install artificial nest boxes for bluebirds, kestrels, wood ducks, and other wildlife where appropriate.	A	1	1	1	1	1
8. Increase land clearing and agronomy practices to treat 250 acres per year.	B	75	75	75	75	75
9. Plant impoundment shorelines with moist soil plants during summer draw-downs when feasible.	C	1	1	1	1	1
10. Increase agronomy practices to treat 350 acres per year.	C	150	150	150	150	150
4. Goal: To professionally monitor projects and programs, and directly or indirectly, gather data beneficial to the conservation and management of fish and wildlife.						
1. Conduct acorn count per VDGIF protocol to monitor this important wildlife food source.	A	*	*	*	*	*
2. Survey Base impounded waters to maintain database of game fish populations	A	#*	#*	#*	#*	#*

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 6-9. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
II. To support and enhance the preservation of all animal and plant life endemic to the Base ecosystem.						
3. Conduct turkey spring gobbler index count and compile summer brood observations.	A	*	*	*	*	*
4. Collect deer and wild turkey data at GCS and maintain electronic database to assess long-term population trends.	A	*	*	*	*	*
5. Conduct quail/rabbit route for annual VDGIF survey. Conduct base-wide call routes to map quail presence/absence.	A	*	*	*	*	*
6. Deer population counts. Conduct snow track and post-hunt night-lighting surveys to provide index of deer herd sizes.	A	*	*	*	*	*
7. Beaver Census. Conduct beaver inventory every five years.	B					*
8. Support nationwide PIF by operating MAPS stations.	A	26	26	27	28	29
9. Monitor the relative abundance and distribution of submerged aquatic vegetation in tidal waters and impoundments.	B	*	*	*	*	*
10. Monitor effectiveness of IVM control practices on ROWs.	B	5	5	5	5	5
11. Ecosystem Studies. Sponsor research to monitor the impact of on and off-Base actions, including predation, on regional ecosystems.	A	100	105	105	110	110
12. Fishing Creel Survey. Conduct field interviews and creel checks to evaluate the utilization of Base waters and angling success.	B	0	*	*	0	
13. Furbearer Index. Operate 100 scent-station route and/or game camera stations to monitor mammalian predator populations.	B	1	1	1	1	1
14. Provide support for VDGIF wildlife disease monitoring programs.	A	*	*	*	*	*
15. Develop monitoring programs for wildlife species of greatest conservation concern as ranked in the Virginia Wildlife Action Plan.	B	25	30	30	30	30
16. Tuition and registration fees to provide professional training and symposia attendance concerning ecosystem management.	A	20	20	20	20	20
5. Goal: To control damage to human health, property, or natural communities by controlling damage due to the overpopulation or encroachment of flora and fauna.						

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Table 6-9. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOAL, PROJECT	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
II. To support and enhance the preservation of all animal and plant life endemic to the Base ecosystem.						
1. Use IVM practices to control phragmites, tall fescue, autumn olive and other invasive plant species.	A	25	25	25	25	25
2. Apply lethal and non-lethal controls approved by USDA APHIS, VDGIF, and permitted by the USFWS to reduce/control resident goose, gull, and vulture populations near administrative, recreational, and air facilities. Support Marine Corps Air Facility to reduce Bird Airstrike Hazards (BASH).	A	5	5	5	5	5
3. Apply lethal and non-lethal control measures approved by USDA APHIS and VDGIF to reduce/control property damage, predation, disease, or other problems caused by furbearing mammals.	A	1	1	1	1	1
4. Install deer bait stations to transmit acaricide (tick pesticide) to a sample area of the Base. The purpose is to reduce tick populations and reduce health risks and discomfort due to tick bites and tick-borne diseases.	C	50	50	50	50	50
<b>Subtotal for "A" projects</b>		<b>232</b>	<b>237</b>	<b>238</b>	<b>244</b>	<b>245</b>
<b>Subtotal for "B" projects</b>		<b>106</b>	<b>111</b>	<b>111</b>	<b>111</b>	<b>111</b>
<b>Subtotal for "C" projects</b>		<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>
<b>Grand Total</b>		<b>539</b>	<b>549</b>	<b>550</b>	<b>556</b>	<b>557</b>

\*Projects costs are mostly labor related.

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CHAPTER 7

THREATENED AND ENDANGERED SPECIES

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## CHAPTER 7

### THREATENED AND ENDANGERED SPECIES

#### SECTION 1: INTRODUCTION

7100. ENDANGERED SPECIES ACT. The Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.) requires the development and implementation of programs to protect and conserve any species of plant and wildlife listed as threatened or endangered by the Secretary of the U. S. Department of the Interior (USDI). The habitat, as well as the individuals of the listed species, must be protected. As a steward of federally-owned land, Marine Corps Base, Quantico (MCBQ) must comply with the requirements of this act. The ESA does not protect state-listed species. However, Marine Corps Order 5090.2A, Environmental Compliance and Protection Manual, states that each installation should conduct baseline species inventories to identify state-listed species because a proposed action's impact on those species may have to be considered during the National Environmental Policy Act (NEPA) planning process (42 U.S.C. § 4321 et seq). Rare species, because they may someday be subject to state or federal listing, should also be identified during inventory and monitoring surveys so that MCBQ will be prepared to address impacts that future listings may have on Base operations. Further, Virginia laws and regulations may also govern the possession, propagation, sale or taking of state-listed and rare species on the Base.

7101. OBJECTIVES. Objectives of the MCBQ Threatened and Endangered (T&E) species management program are to: (1) conduct natural heritage inventories to search for and identify rare and T&E species occurring, or potentially occurring, aboard the installation, (2) perform field surveys and inventories needed to determine the presence, distribution, and population status of rare and T&E species; (3) identify habitat critical to T&E species that requires protection or special consideration; (4) develop specific management strategies to protect existing populations of T&E species; (5) develop and implement a monitoring program to track changes in population levels of T&E species over time; (6) maintain liaison with other state and federal agency personnel when actions may affect known T&E species and (7) educate base personnel about T&E species and applicable laws.

7102. T&E AND RARE SPECIES SURVEYS. Field surveys to detect rare and federally-listed plants and animals at MCBQ were conducted by the Division of Natural Heritage, Virginia Department of Conservation and Recreation, and were reported in VDCR (1992), Mitchell (1991), Fleming (2000), and Chazal (2000). Additional biological inventories, including searches for rare and listed species, were conducted by Mitchell (1998), USFWS (1998), and Kelso (2000). Bald eagle nest searches aboard MCBQ have largely been conducted by Natural Resources

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

and Environmental Affairs (NREA) Branch personnel. The following paragraphs summarize the findings of these surveys.

### 1. Birds

a. The bald eagle, once federally-listed as endangered, has made a significant comeback from problems caused by pesticide pollution, and is now delisted (see Section 2). A bald eagle nest was discovered on Chopawamsic Creek in 1984. Since that time, nests have also been found in the Quantico Creek and Beaverdam Run watersheds. Bald eagle habitat requirements and management recommendations are discussed in Section 2 of this chapter.

b. A population of the state rare least bittern (*Ixobrychus exilis*) was documented aboard MCBQ during field surveys conducted on 2 August 1991. A total of 3 least bitterns were observed in the lower Chopawamsic Creek area at two locations. Only 8 breeding records are known for the species in Virginia, including Chopawamsic Creek. Although the least bittern is secretive and a comprehensive survey has not been conducted, existing data indicate that Chopawamsic Creek may be an important habitat for this species.

2. Mammals. No federally listed mammal species are known to occur at MCBQ. Bat surveys conducted by VDCR in 1990-1991 only verified two species at MCBQ: the little brown bat (*Myotis lucifugus*) and the red bat (*Lasiurus borealis*). However, there is some chance that the northern long-eared bat, *Myotis septentrionalis*, a species that will soon be listed as a federally threatened species, may use MCBQ forest habitat during the summer period. The listing will become effective on 4 May 2015 and will include an interim 4(d) rule that will provide some flexibility to landowners, land managers, government agencies and others as they conduct activities in northern long-eared bat habitat. Surveys to verify the presence or absence of the northern long-eared bat at MCBQ are scheduled to begin in 2015 and MCBQ will need to determine what kind of land and forest management protocols may be required under the 4(d) rule.

3. Reptiles and Amphibians. As part of the VDCR study, a field survey of reptiles and amphibians at MCBQ was conducted from June 1990 through May 1991 (Mitchell 1991). No T&E or rare species were documented during this investigation. Mitchell (1998) conducted further amphibian studies at MCBQ from 1995-1997 under the Department of Defense Legacy Resource Management Program and again detected no rare or listed species.

4. Fishes. Stream fishes were surveyed in 1988 by the U. S. Fish and Wildlife Service (USFWS 1988) and in 1998 and 1999 by George Mason University (Kelso 2000). These surveys did not detect the presence of any rare or T&E fish species.

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### 5. Plants

a. Three populations of small whorled pogonia (SWP) (*Isotria medeoloides*), a federally-listed threatened species, were found during the 1992 VDCR study. Since the discovery of the SWP at MCBQ, surveys for the plant have been conducted in forested areas being proposed for any land disturbance, including construction activities and timber harvests. SWP stems have now been located at 22 locations at MCBQ. Management considerations for the SWP are provided in Section 3 of this chapter.

b. The VDCR report identified several rare plants not found during the survey that have the potential of occurring at Quantico: the federally listed threatened sensitive joint-vetch (*Aeschynomene virginica*); one-sided wintergreen (*Pyrola secunda*); large-fruited sanicle (*Sanicula trifoliata*); Parker's pipewort (*Eriocaulon parkeri*); and vetchling (*Lathyrus palustris*). None of these species has been found on MCBQ property to date but any future botanical inventories should continue to search for these species.

c. In 1998 and 1999, VDCR was contracted to inventory plants in the fire maintained dud impact area, Training Area (TA) 9A. During the study, two state rare plants, Buxbaum's sedge (*Carex bubaumii*) and red milkweed (*Asclepias rubra*), were found.

d. In 2002, VDCR found a population of the federally-listed endangered species harperella (*Ptilimnium nodosum*) growing in the bed of Aquia Creek. This species is discussed in Section 5.

6. Invertebrates. A population of the federally-listed endangered species dwarf wedgemussel (*Alasmidonta heterodon*) was found in Aquia Creek during the 1992 VDCR survey. Life history and management of this species is discussed in Section 4 of this chapter. An inventory of moths and butterflies was completed in 1999 by VDCR (Chazal 2000). No rare or listed species were found.

### 7103. REFERENCES

- Chazal, A. C. 2000. Zoological surveys for the dwarf wedgemussel and Lepidoptera at Marine Corps Base, Quantico, Virginia. Natural Heritage Technical Report 00-05. Va. Dept. of Cons. and Rec., Div. of Nat. Heritage. Richmond, Va. 17 pp. plus appendices.
- Fleming, G. P., K. M. McCoy, and N. E. Van Alstine. 2000. An inventory of the flora of the fire-maintained grasslands and woodlands at Marine Corps Base, Quantico, Virginia. Natural Heritage Technical Report 00-04. Va. Dept. of Cons. and Rec., Div. of Nat. Heritage. Richmond, Va. 14 pp. plus appendices.
- Kelso, D. P., Jones, R. C., Brittingham K. D., Maher, A. M., Morgan D. R., and Tuszynska, E. 2000. Quantico Marine Corps Base Stream Monitoring 1998-1999 Report. George Mason University. 40 pp.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

- Mitchell, J. C. 1991. Amphibians and reptiles of Marine Corps Base Quantico. Dep. Biol., Univ. Richmond, Va., Report submitted to Va. Div. Nat. Heritage, Va. Dep. Cons. and Rec. 10 pp.
- Mitchell, J. C. 1998. Amphibian Decline in the Mid-Atlantic Region: Monitoring and Management of a Sensitive Resource. Final Report, Legacy Resource Management Program, U.S. Department of Defense. 144 pp.
- U.S. Fish and Wildlife Service. 1988. Fish distribution/stream habitat evaluation report, Marine Corps Base Quantico, Virginia - June 1988. U.S. Fish and Wildl. Serv., Office of Fisheries Assistance, White Marsh, Va. 12pp.
- VDCR. 1992. A natural heritage inventory - Marine Corps Base Quantico, Stafford County, Virginia. Natural Heritage Technical Report 92-25. Va. Dep. Cons. and Rec., Div. of Nat. Heritage, Richmond, Va. 41 pp.

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## CHAPTER 7

### THREATENED AND ENDANGERED SPECIES

#### SECTION 2: BALD EAGLE

##### 7200. LIFE HISTORY AND HABITAT REQUIREMENTS

###### 1. Breeding biology

a. Bald eagles are monogamous and are thought to establish pair bonds for several years, and possibly for life. Males and females are not able to breed successfully until they are four years old (Nye 1983), however, the percentage of bald eagles that actually breed at this age is probably quite low - especially in areas with high nesting site competition for young birds (Green 1985).

b. Adult bald eagles often use the same nesting location in consecutive years and build/refurbish nests from November to January in the Chesapeake Bay region. One to three eggs are usually laid in February through March, but may be laid as early as January. The eggs hatch from mid-March into April, and sometimes early May, after 34 to 36 days of incubation (Cline 1983, Green 1985). The young birds fledge from 70 to 98 days after hatching and usually remain dependent on the parents for an additional 60 to 80 days while learning to hunt. Mated birds do not necessarily produce eggs every year, depending on factors such as chemical contamination, habitat disturbance, poor physical condition due to severe weather, shortages in prey during the nonbreeding period, and low prey availability at the beginning of the nesting season (Green 1985).

c. Population Status. In Virginia, the number of active bald eagle breeding pairs has grown from 45 in 1982 to over 720 in 2011. Due to similar population increases throughout the bald eagle's entire range, the species was federally delisted in August, 2009, and Virginia delisted on 1 January 2013. The bald eagle continues to receive protection under the Bald and Golden Eagle Protection Act (BGEPA) of 1940 and the Migratory Bird Treaty Act of 1918.

d. Mortality. Major causes of bald eagle mortality and reproductive failure have historically included organochlorine pesticides, shooting, and habitat loss. Lead poisoning, polychlorinated biphenyls, and electrocution from power lines have also been implicated. Noise associated with logging, mining, construction, recreation, and other land uses are known to disturb eagles in some instances, but the degree of impact depends on a variety of factors including the type of action, proximity to the nest site, intensity, frequency, duration, and timing. Bald eagle sensitivity to human disturbance appears to be variable among breeding pairs. Pairs that historically nested in more "pristine" areas, that received minimal disturbance, may be more prone to adverse impacts

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from human activities near a nest site. In contrast, birds that have historically nested near humans and human disturbance may be less affected by human activities. The factor most consistently responsible for declines in nesting and wintering birds in recent years is habitat loss (Green 1985).

### 2. Feeding Habits

a. Bald eagles feed primarily on fish throughout their range but are opportunistic and will consume a variety of other food items if available (Green 1985). Both live and dead fish are taken; dead fish comprise 25-67 per cent of all fish captured. Bald eagles are only able to capture live fish near the surface or in very shallow water. Species most commonly reported in the diets of bald eagles include catfish (*Ictalurus* spp.), carp (*Carpinus carpio*), and gizzard shad (*Dorosoma cepedianum*) (Green 1985).

b. Other prey items collected beneath bald eagle nests in the Chesapeake Bay region included birds (29 species), mammals (6 species), and turtles (5 species) (Cline 1983). Waterfowl and seabirds have occasionally been reported as being more important than fish in the diets of some bald eagle populations. Where this is the case, most birds taken are sick, dead, or injured individuals. Remains of numerous species of mammals have been found at eagle nests, but regular use of mammalian prey is thought to occur only when such prey is readily available.

### 3. Habitat Requirements

a. Nesting Habitat. Nearly 100 percent of all nests are within 2 miles, and more frequently within 0.5 mile, of a coastal area, river, lake, or other body of water. Proximity to water reflects the dependence of bald eagles on fish, waterfowl, and sea birds as primary food items (McEwan and Hirth 1979, Andrew and Mosher 1982, Green 1985). Some bald eagle breeding territories have been known to be used for over 50 years (Cline 1985).

b. Bald eagles nest primarily in tall trees that extend above the surrounding forest. The nest height averages 90 feet (Cline 1985). Two characteristics are common to almost all bald eagle nests: (a) a clear flight path to at least one side of the nest, and (b) excellent visibility, often with an unobstructed view of water (Green 1985). In the Chesapeake region most bald eagle nest trees are about 100 yards from breaks in the forest such as field edges, timber cuts, bodies of water, or roads.

c. Most nest trees have a stout limb structure or a branching pattern that is suitable for supporting a large nest near the treetop. Some nests are built in the tops of dead trees, but most are in the upper branches of a living tree, with foliage above the nest providing shade or protection during inclement weather (Green 1985). The nest is a large mass of sticks about 3 feet deep and 5 feet across. Some

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bald eagles will use the same nest every year, whereas others will alternate from year to year among two to five different nests in their breeding territory (Cline 1985). Nests that are used over an extended period often become immense in size. Only one nest is used for rearing young in a particular year. The other sites, referred to as alternate or supernumerary nests, are often used as feeding platforms or perches (Green 1985).

d. Wintering Habitat. Most bald eagle wintering areas are associated with open water or inland areas with dependable food resources. The availability of suitable roost sites is also critical to wintering bald eagles, and communal roosting by several eagles is not uncommon. Communal roost sites ranging in size from 0.8 to 628 acres and from 0.16 to 15 miles away from food sources have been reported (Chester et al. 1990). Eagles will arrive at a night roost just before dusk and leave the site immediately after daybreak (Cline 1985). Roosts may also be occupied for significant periods during the day, especially when weather conditions are inclement.

e. Roost Sites. Suitable roosting sites are critical to bald eagles throughout the year. In addition to during winter months, communal roosts may also be used in the late summer and during migration. Shoreline trees along the Potomac River and its tidal tributaries from Mason Neck National Wildlife Refuge north of Quantico to Caledon State Park south of Quantico are known to provide important roosting habitat for bald eagles. Roost trees are usually the oldest and largest trees within a stand, and most have stout horizontal limbs and an open branching pattern that allows room for takeoff and landing. Visibility to the surrounding area is unobstructed, and there is little or no human activity in the immediate vicinity. The distance between roost sites and feeding areas is highly variable, suggesting that proximity to food is less critical than other roost site characteristics (Green 1985).

#### 4. Census Techniques

a. Aerial Surveys. Basic procedures used to census eagles, are searches of specific habitats (e.g., lakes, coastal areas, and riparian zones) to count birds that congregate in these habitat types. Aerial surveys, using a fixed-wing aircraft or helicopter, are most practical for locating nests. Although helicopter flights are more expensive, they are perhaps a more effective means of surveying nesting eagles in specific regions because eggs and nestlings can be counted much more accurately from a helicopter. Another advantage of aerial censusing is the ability to locate birds that have pioneered into new habitat.

b. Winter surveys. When conducting a winter census, the habitat evaluated is broader than during other times of the year, because migrant and wintering birds tend to use a greater diversity of habitat types. Winter counts can be done by aerial surveillance, ground or boat transportation, but aerial surveys are by far the most efficient.



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5. Management. Bald eagle protection guidelines applicable to Virginia are published in *Bald Eagle Management Guidelines and Conservation Measures*, November, 2012, by the USFWS Northeast Region. The following guidelines are excerpted from that website at: <http://www.fws.gov/northeast/ecologicalservices/eagleguidelines>

### a. Recommendations for Nest Sites

(1) Maintain a buffer of at least 660 feet (200 meters) between project activities and the nest (including active and alternate nests). If a similar activity is closer than 660 feet, then maintain a distance buffer as close to the nest as the existing tolerated activity.

(2) If the activity is closer than 660 feet due to an existing similar activity, then restrict all clearing, external construction and landscaping activities within 660 feet of the nest to outside the nesting season, 15 December to 1 June.

(3) Maintain established landscape buffers that screen the activity from the nest.

(4) Avoid aircraft flyovers within 1000 feet of the nest.

(5) Avoid non-motorized recreational activities within 330 feet of the nest if the activities are visible from the nest. These activities include walking, biking, canoeing, camping, fishing and hunting. None of these activities near a nest would disturb the eagles if the activity cannot be seen or heard from the nest.

(6) Avoid the use of motorized boats and jet-skis within 330 feet of a nest site, or 660 feet if in open areas where there is increased exposure to noise.

b. Additional Recommended Conservation Measure. Protect potential roost and nest sites by retaining mature trees and old growth stands, particularly within 0.5 mile from water.

c. Nest/Nest Tree Protection. Per the BGEPA, the eagle nest and the tree/structure in which it is located is protected and cannot be removed as long as any portion of the nest remains in the tree/structure. Where nests are destroyed by storms, the nest tree and site should be protected for at least three complete breeding seasons. Eagles will often rebuild and reoccupy previously used nest sites.

## 7201. MCBQ HISTORICAL INFORMATION

1. Active bald eagle nests have been observed at MCBQ since 1984. Nests on the Base are monitored by the MCBQ Fish, Wildlife and Agronomy (FWA) Section, using both ground and aerial surveys. The FWA

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Section also communicates with the Virginia Department of Game and Inland Fisheries (VDGIF) office and The College of William and Mary's Center for Conservation Biology to monitor nest production in the Quantico vicinity. Figure 7-1 shows nest locations and nest protection zones.

2. The FWA Section uses helicopter airlifts to search for nests and conduct late winter eagle counts along the major watersheds. On average, about eight eagles are seen during these late January - late February flights. Areas frequented by eagles include Lunga Reservoir, Breckenridge Reservoir, Smith Lake, Chopawamsic Creek, Quantico Creek, and the Potomac River shoreline. These areas are considered to be the primary eagle feeding and roosting areas at Quantico (Stamps, pers obs). Once eagle nest locations are known, observers use spotting scopes from ground locations to monitor nests and get a count of the young successfully reared to fledging.

3. Special Protection Area. In 1993, following a VDCR recommendation that the Chopawamsic Creek Marsh be designated for special protection and management consideration, the Commanding General, MCBQ, conferred Special Natural Area designation upon the lower Chopawamsic Creek Basin (see Chapter 3, 3010). The Chopawamsic Creek Basin was determined to be important to the Base's bald eagle populations as well as many other wetland dependent fish and wildlife species.

### 7202. MANAGEMENT RECOMMENDATIONS

#### 1. Shoreline Habitat Protection

a. The primary threats to the continued existence of the bald eagle at Quantico would be the loss of habitat due to deforestation and development near shorelines and food supply impacts from the degradation of water quality. MCBQ shorelines should remain undeveloped to maintain Riparian Protection Areas (RPAs) in keeping with the Chesapeake Bay program. This will serve to protect water quality as well as maintain eagle roosting and feeding habitat.

b. Construction should be planned as far from the shoreline habitats as possible and best management practices should be used to control stormwater discharges.

c. Timber harvesting practices should ensure the retention of mature timber along shorelines for feeding perches, nest sites, and roosts.

2. Nest Surveys. Annual surveys to locate active nests and monitor their productivity should be conducted in coordination with the VDGIF to maintain records of eagle breeding success. Census data should be sent to the VDGIF.

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3. Nest Protection Zones. The USFWS nest protection recommendations in paragraph 7200.5 should be followed. Consultation with the VDGIF/USFWS should be conducted for any activities that cannot comply with those guidelines.

### 7203. REFERENCES

- Andrew, J. M., and J. A. Mosher. 1982. Bald eagle nest site selection and nesting habitat in Maryland. *J. Wildl. Manage.* 46:383-390.
- Chester, D. N., D. F. Stauffer, T. J. Smith, D. R. Luukonen, and J. D. Fraser. 1990. Habitat use by nonbreeding bald eagles in North Carolina. *J. Wildl. Manage.* 54:223-234.
- Cline, K. W. 1983. Chesapeake Bay bald eagle banding project report. Natl. Wildl. Federation, Raptor Info. Center, Washington, D.C. 43 pp.
- \_\_\_\_\_. 1985. Bald eagles in the Chesapeake: A management guide for landowners. Natl. Wildl. Federation. 16 pp.
- Green, N. 1985. The bald eagle. Pages 508-531 In A. S. Eno, Project Dir., and R. L. Di Silvestro, ed., Audubon Wildlife Report 1985. The Natl. Audubon Soc., New York, N.Y. 671 pp.
- McEwan, L. C., and D. H. Hirth. 1979. Southern bald eagle productivity and nest site selection. *J. Wildl. Manage.* 43:585-594.
- Nye, P. E. 1983. A biological and economic review of the hacking process for the restoration of bald eagles. Pages 127-135 In D. M. Bird, chief ed., *Biology and Management of Bald Eagles and Ospreys*. Harpell Press, Ste. Anne de Bellevue, Quebec.

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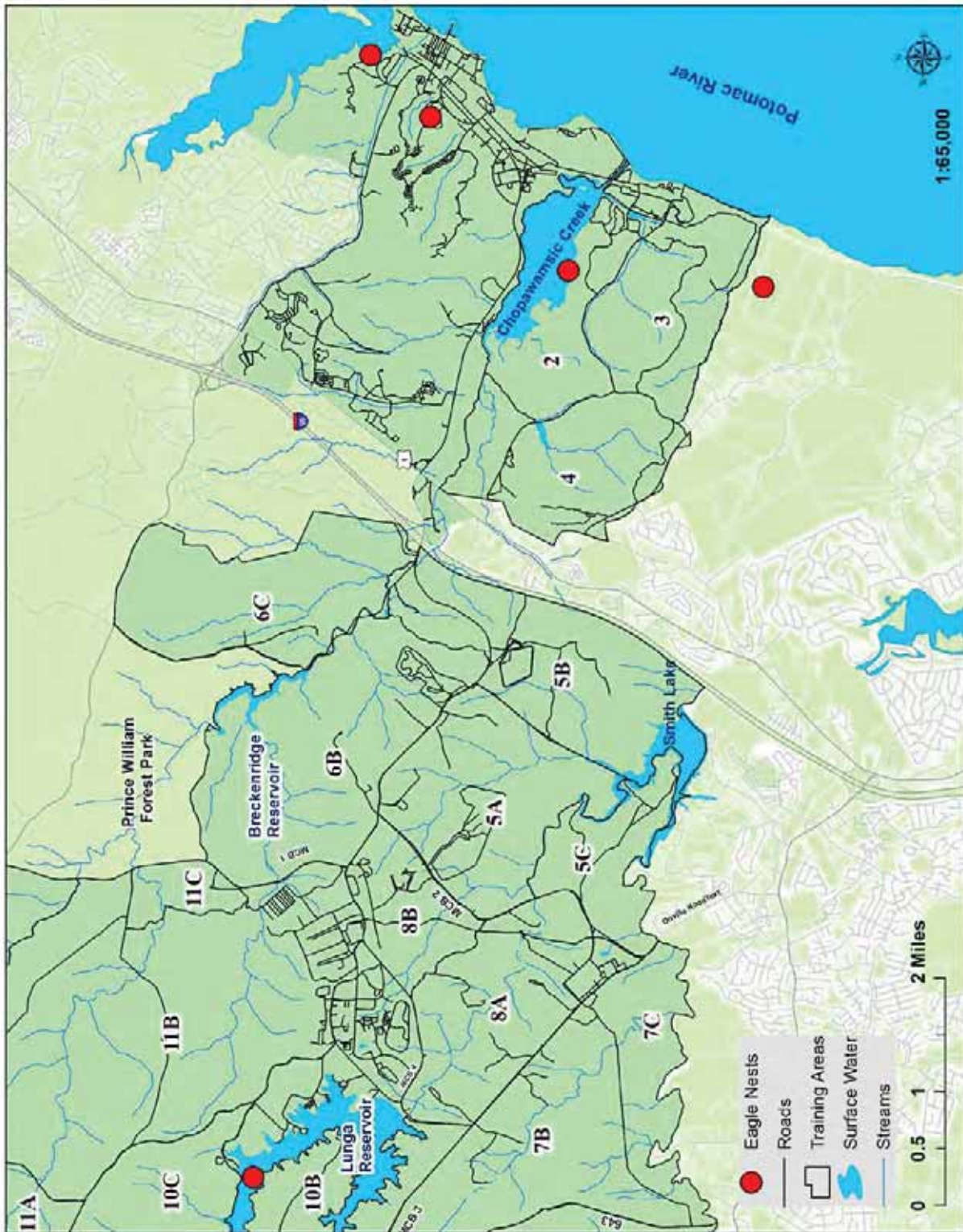


Figure 7-1.--Active bald eagle nest sites in 2014.

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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 7

### THREATENED AND ENDANGERED SPECIES

#### SECTION 3: SMALL WHORLED POGONIA

##### 7300. LIFE HISTORY AND HABITAT REQUIREMENTS.

1. General Description. A member of the orchid family, the SWP is a small, perennial, herbaceous plant. The species is distinguished by the glaucous, pale-green whorl of 4-6 leaves (usually 5) at the apex of a thickened, pale-green stem. Plants range in height from 2-8 inches and are solitary; however, stems may be found clustered together in colonies. The SWP may be distinguished from its relative, the common (or large) whorled pogonia (*Isotria verticillata*), by the reddish-purple coloration along the stem of the common whorled pogonia. The Indian cucumber root (*Medeola virginiana*) also appears superficially similar to the SWP, but differs in flower and in the thin, brown stem that usually exhibits cobwebby hairs. More descriptive information about the life history of the SWP can be obtained through the USFWS (1992).

2. Reproduction. Flowers of the SWP are yellowish-green with a greenish-white lip (0.5-1.0 inches in length) and are borne on a short stalk at the apex of the stem. Flowering usually occurs about May 15<sup>th</sup> at Quantico, with the flowers persisting 4-10 days. The flowers are self-pollinating, and if fertilization occurs, a green capsule (0.5-1.5 inches in length) will appear that may persist into early July. Flowering plants are generally 5-7 inches tall (apparently there is some correlation between plant size and reproduction). As with most orchids, the seeds are very small and contain no stored food for the embryo.

3. Dormancy. The SWP possesses a subterranean rootstock that may persist for years. While it may produce stems annually from overwintering buds at the apex of the rootstock, it also may lay dormant for one to several years. Therefore, assessment of colony viability can only be made from several years' worth of observations of stem emergence to account for dormancy.

4. Habitat. The SWP grows in mixed-deciduous or mixed-deciduous/coniferous forests that are generally in second- or third-growth successional stages. Most sites share several common characteristics such as sparse to moderate ground cover and a relatively open understory canopy. There is a mycorrhizal association in this species; however, no specific species of fungus has been identified to date. It is presumed that the mycorrhizal association is with a fungus that metabolizes cellulose and or lignin. The presence of a mycorrhizal fungus is also considered to be essential in the germination of seeds and the early growth of the embryo into a photosynthesizing plant.

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### 7301. MCBQ HISTORICAL INFORMATION.

1. The locations of SWP colonies found at MCBQ are shown at Figure 7-2. SWP are found mostly in hardwood stands consisting primarily of American beech (*Fagus grandifolia*), yellow poplar (*Liriodendron tulipifera*), assorted oaks (*Quercus* spp.), and maples (*Acer* spp.). These stands are secondary growth of 40+ years maturity. Dense canopy, little understory, very little to no herbaceous cover, and deep moist leaf litter characterizes these sites. Indian cucumber root is often observed near sites where SWP are found, and therefore its presence is used as an indicator of suitable site conditions for SWP at MCBQ. A few stems have been found on hardwood ridges or elevated streamside terraces that are not considered typical of "prime" habitat.
2. Monitoring Techniques. The USFWS recommends that SWP surveys in northern Virginia occur after blooming and be conducted between June 1 and July 15. Known colonies on Base are monitored annually from the peak date of blooming, May 15, to July 15. Personnel physically search for and record each SWP stem on a sketch map of the colony site, and note whether each stem is in reproductive or vegetative state. Distances of plants from recognized reference points are noted on the sketch map. Any changes in habitat such as defoliation, beaver cutting or fire are documented. The results of annual stem counts are shown at Table 7-1. If sites do not produce stems for 10 consecutive years, they are designated historic sites and site protection measures are no longer required (Eric Davis, VA office USFWS, pers. comm.).
3. Survey Techniques. All construction and land management projects on Base that require disturbance of mature forest stands require that the site be surveyed during the NEPA process to detect the presence or absence of the SWP. Due to the narrow blooming season for SWP, the NEPA SWP surveys must be conducted during the USFWS recommended survey period in order to be valid for NEPA purposes. Personnel approved by the USFWS for SWP surveys must carefully inspect all suitable habitat within the project area. Early successional forest habitats are excluded from survey. Any stems/colonies located are mapped using Geographical Information System/Global Positioning System technology and the findings are forwarded to the NEPA Coordination Section, NREA Branch, for inclusion in the NEPA documentation for the proposed action.
4. Disturbance History. The majority of the colony sites are in woodlands where they are isolated from routine military training activities. Hence, disturbance concerns on Base are related primarily to gypsy moth defoliation, beaver flooding, fire, and timber harvest. While most colonies have not been subject to these disturbances in the past, the few cases are discussed below.



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### a. John's Colony

(1) This SWP colony is located in TA 16C about 200 feet north of an abandoned powerline right-of-way and 150 yards west of a gravel road. Marines use the area for defensive tactical training. Although training activities are focused near the road, in 1996, units dug foxholes in the vicinity of the plant stems. To prevent a future disturbance of this sort, a single strand barbed wire fence and "Natural Resources Protection Zone" signs were installed to keep personnel out of the site. A 50-foot buffer was maintained between the fence and the plant stems. These actions have effectively prevented encroachment into the zone to date.

(2) This site was impacted by a wild fire in about 2007 after several years of either zero or very few stems. As with many species of the SWP plant family, Orchidaceae, the site has flourished since the fire and had a record high number of stems in 2010 - 2012. It is unknown whether the recent population explosion is a matter of emergence from dormancy or whether the fire itself proved beneficial for the species.

### b. Chestnut Branch

(1) In 1991, a small beaver dam created a pond at the downstream edge of this SWP colony. The USFWS recommended that the beaver dam and pond remain unless they threatened imminent flooding of the SWP colony (USFWS 1991). Although some understory clearing occurred due to beaver cuttings, beavers moved downstream and did not impact the overstory or hydrologic conditions at the site.

(2) The watershed area upstream of the colony is used for low intensity military training, and historic signs of wild fires and bivouac sites are present. In the fall, 2000, training exercises produced a wild fire that burned about 50 percent of the ground litter in the colony site. Although the fire was mostly contained on the north side of Chestnut Branch, bulldozers used to drag smoldering snags away from the creek caused some soil disturbance near the colony site.

(3) In 1991, the USFWS did an on-site evaluation of the potential impacts of a proposed timber sale within the watershed of this colony. The USFWS concluded that the timber harvest would not impact the SWP but recommended the following guidelines for land-altering activities (USFWS 1991):

(a) Contact the VDCR and the USFWS when these activities are planned within 0.25 mile and within the watershed of a known SWP population, or within 300 feet of a population but in a different watershed.

(b) Delineate ecological protection boundaries on Base natural resources maps. These sites may be posted or otherwise marked

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on the ground, at the MCBQ's discretion.

c. The Basic School (TBS) Colony. This colony is located along a footpath in forestland south of TBS and 200 feet east of the Nuclear Biological Chemical training facility. Use of the trail poses a potential trampling hazard to the plants so a fence with protection zone signs was established. The operation of the training facility does not appear to impact the site because the training does not involve the placement of personnel into the surrounding woodlands.

d. Charlie -Demolition (C-Demo) Colony. This colony is located within the controlled access zone for the C-Demo Range in TA 5A, north of the firebreak that encircles the detonation area. The ground-cover layer consists of features common to most other sites (e.g., dead wood and leaf litter), with rock outcrops and moderate herb layer. In March 1999, a fire escaped from the C-Demo range and burned across the litter surface in the colony site. The number of stems ranged from four to eight during the four years the site was monitored prior to the fire. Immediately after the fire, the number of stems dipped to four and returned to seven the following year. As such, the fire does not appear to have had adverse effects on the number of stems and did not impact the overstory cover.

### 7302. RECOMMENDED ACTIONS

1. Notification. The VDCR and the Virginia Field Office of the USFWS should be notified whenever land-altering activities are planned within 0.25 mile and within the watershed of a known SWP population, or within 300 feet of a population but in a different watershed.

2. Annual Inspection. Known colonies should be visited annually from May 15 to July 15 to count the number of stems and make notes of any disturbances or changes that have occurred in or near the colony.

#### 3. Protection Zone

a. Fencing and signs should be used to mark the protection zone around colonies where there is a significant threat from trampling or ground disturbing activities. Natural resources maps that show the protection zones should be provided to the organizations responsible for fire fighting.

b. Only signs should be used to mark a protection zone around a colony in remote areas. The purpose is to alert fire-fighting personnel to the presence of an SWP site so they can avoid the colony if they have to install firebreaks.

4. Surveys. Any woodland areas of the Base that are proposed sites for construction, logging, or other disturbances must be identified at least one year in advance of disturbance to ensure that a SWP search has been done, or can be done during the growing season prior to the

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project. A new SWP survey may be required to complete the NEPA review process if the project site is not covered by an existing valid survey. Failure to conduct the SWP search in a timely manner can result in project delays. Per USFWS guidelines, SWP surveys are valid for two years.

### 7303. REFERENCES

U.S. Fish and Wildlife Service. 1991. Letter re: Endangered species comments on units 5 and 6 timber sale. Div Ecol. Services. Chesapeake Bay Field Office Annapolis, Maryland. 2 pp.

\_\_\_\_\_. 1992. Small Whorled Pogonia (*Isotria Medeoloides*) Recovery Plan, First Revision. Newton Corner, Massachusetts. 75 pp.

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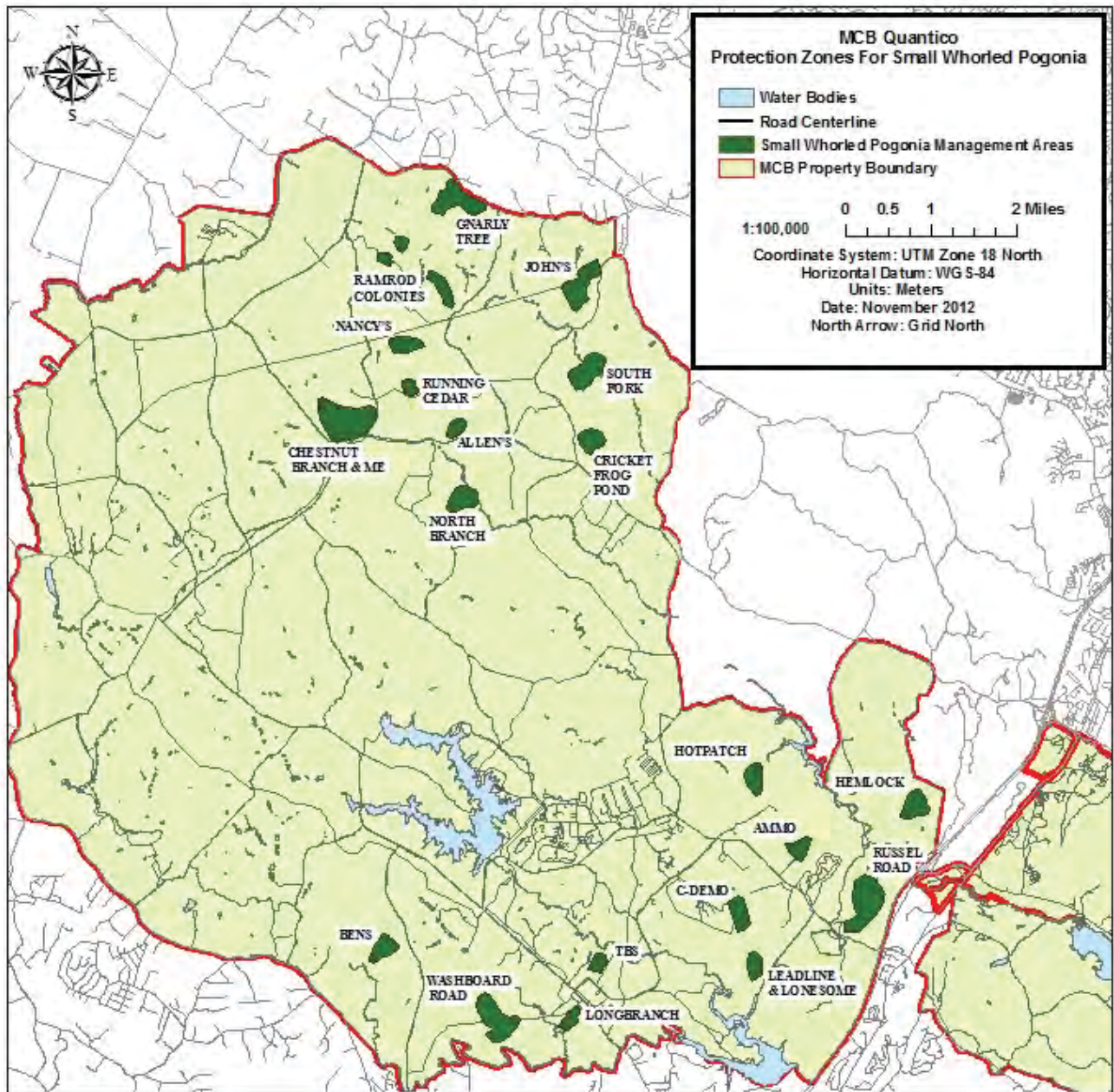


Figure 7-2.--Protection zones for small whorled pogonia.

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Table 7-1. Small Whorled Pogonia stem counts.

\*Historic colony with no stems recorded for 10 consecutive years. "--" indicates colony site either not yet discovered or no longer monitored annually.

Colony Name	Year 1991 - 2002												
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Cricket Frog Pond	33	12	16	29	16	16	5	7	2	3	2	5	
North Branch	23	20	25	17	14	16	26	22	24	7	8	6	
Chestnut Branch	4	0	5	4	2	2	7	6	3	2	1	1	
Gnarly Tree	-	-	-	1	0	1	0	0	0	1	2	6	
TBS	-	-	-	-	3	2	8	8	11	10	2	6	
John's	-	-	-	-	8	3	11	12	4	5	1	5	
Ammo*	-	-	-	-	2	1	1	0	0	0	0	0	
Hotpatch*	-	-	-	-	1	0	0	0	0	0	0	0	
C0Demo	-	-	-	-	-	-	8	5	4	7	2	2	
Leadline*	-	-	-	-	-	-	3	0	0	0	0	0	
Russell Rd.	-	-	-	-	-	-	9	6	7	2	3	3	
Washboard Road	-	-	-	-	-	-	-	-	24	6	11	5	
Ben's Colony*	-	-	-	-	-	-	-	-	-	1	1	1	
South Fork	-	-	-	-	-	-	-	-	-	-	1	1	
Long Branch	-	-	-	-	-	-	-	-	-	-	-	6	
Lonesome	-	-	-	-	-	-	-	-	-	-	-	-	
ME	-	-	-	-	-	-	-	-	-	-	-	-	
Allen's	-	-	-	-	-	-	-	-	-	-	-	-	
Hemlock	-	-	-	-	-	-	-	-	-	-	-	-	
Nancy's	-	-	-	-	-	-	-	-	-	-	-	-	
Running Cedar	-	-	-	-	-	-	-	-	-	-	-	-	
Ramrod	-	-	-	-	-	-	-	-	-	-	-	-	
YEARLY TOTAL	60	32	46	51	46	41	80	66	79	44	34	47	

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Table 7-1. Small Whorled Pogonia stem counts.  
 \*Historic colony with no stems recorded for 10 consecutive years. "--" indicates colony site either not yet discovered or else no longer monitored annually.

Colony Name	Year 2003 - 2014											
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cricket Frog Pond	1	4	4	3	2	0	0	0	1	0	0	13
North Branch	2	5	11	18	23	18	9	4	3	2	1	2
Chestnut Branch	0	1	4	3	7	3	2	0	0	0	0	0
Gnarly Tree	3	3	75	39	12	17	11	4	6	8	4	9
TBS	3	2	8	12	7	8	9	6	3	3	2	3
John's	3	0	1	0	0	0	4	14	21	16	9	7
Ammo*	0	0	0	0	0	-	-	-	-	-	-	-
Hotpatch*	0	0	0	0	0	-	-	-	-	-	-	-
C-Demo	1	3	2	9	10	5	6	3	3	3	3	4
Leadline*	0	0	0	0	0	-	-	-	-	-	-	-
Russell Rd.	1	2	4	4	6	7	3	6	3	2	2	3
Washboard Road	1	2	6	7	9	5	6	14	13	8	11	13
Ben's Colony*	0	0	0	0	0	0	0	0	0	0	0	0
South Fork	1	2	2	2	0	0	0	0	0	0	0	0
Long Branch	4	4	4	11	14	16	5	3	8	3	5	6
Lonesome	-	-	-	1	1	0	0	0	0	0	0	0
ME	-	-	-	-	1	0	0	0	0	0	0	0
Allen's	-	-	-	-	5	2	0	0	0	0	0	1
Hemlock	-	-	-	-	9	2	3	5	4	3	1	2
Nancy's	-	-	-	-	1	0	0	0	0	0	0	0
Running Cedar	-	-	-	-	2	2	1	0	0	0	0	0
Ramrod	-	-	-	-	-	-	-	-	3	2	1	1
YEARLY TOTAL	20	28	121	109	109	85	59	59	68	50	39	64

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Table 7-1. Small Whorled Pogonia stem counts.  
 \*Historic colony with no stems recorded for 10 consecutive years. "--" indicates colony site either not yet discovered or else no longer monitored annually.

Colony Name	Year 2015 - 2026											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Cricket Frog Pond												
North Branch												
Chestnut Branch												
Gnarly Tree												
TBS												
John's												
Ammo*												
Hotpatch*												
C-Demo												
Leadline*												
Russell Rd.												
Washboard Road												
Ben's Colony*												
South Fork												
Long Branch												
Lonesome												
ME												
Allen's												
Hemlock												
Nancy's												
Running Cedar												
Ramrod												
YEARLY TOTAL												



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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 7

### THREATENED AND ENDANGERED SPECIES

#### SECTION 4: DWARF WEDGEMUSSEL

##### 7400. DESCRIPTION, LIFE HISTORY, AND HABITAT REQUIREMENTS

1. Description. The dwarf wedgemussel (DWM) is a relatively small freshwater mussel species, seldom exceeding 38 mm in length. The shell outline of the DWM is more or less ovate or trapezoidal. The chief distinguishing characteristic of this species is that its right valve possesses two lateral teeth and the left valve only has one tooth. All other North American freshwater mussels having lateral teeth are opposite. There is a degree of sexual dimorphism in DWM, however, male and individuals are distinguished by the outline of the female shell, which is shorter, swollen posteriorly, and more trapezoidal than the more compressed, ovate and elongated male counterparts (USFWS 1993).

2. Life History. The reproductive cycle of this species is similar to that of other freshwater mussel species. During the spawning period, August 15 - October 15, males discharge sperm into the water. Females take in the sperm during siphoning which fertilizes the eggs as they pass into and mature within water tubes in the gills. The resulting embryos mature into glochidia which are released into the water from April 15 - June 15 and must attach to an appropriate species of fish. If the glochidia attach to a suitable host, they encyst and eventually metamorphose to the juvenile stage. When metamorphosis is complete, the juvenile mussels drop to the streambed (USFWS 1993).

3. Habitat. This species lives on muddy sand and gravel bottoms in freshwater creeks and rivers of varying sizes, in areas of slow to moderate current and little silt deposition (USFWS 1993).

##### 7401. MCBQ HISTORICAL INFORMATION.

1. The VDCR (1992) found DWMs in a 0.5 mile reach of Aquia Creek extending from above the pool at the old Route 643 crossing upstream to the Route 610 bridge (Figure 7-3). Eight live mussels were observed between the pool and Cannon Creek, and 14 individuals were found as fresh or relict shells. Three live individuals were recorded in the shallow areas below the culvert pool below the old Route 643 crossing (VDCR 1992).

2. Michaelson and Neves (1995) reported finding dozens of animals during their study of this population in 1991 and 1992 and transported a number of individuals to the Virginia Polytechnic Institute and State University in Blacksburg, Virginia. The tessellated darter

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

(*Etheostoma olmstedi*), found in MCBQ watersheds, was confirmed as a host fish for DWM glochidia. Analysis of shell sections suggested that DWM in Aquia Creek reach a maximum length of 45.26 mm and have a theoretical maximum lifespan of 14 years. In laboratory habitat suitability experiments, the DWM preferred the finer substrates offered but showed little preference for lotic versus lentic flow regimes.

3. Michaelson and Neves (1995) also noted in 1992 that there appeared to be a large die-off as they found 49 fresh-dead individuals in Aquia Creek. Strayer (1994) conducted a range-wide assessment of major DWM populations and concluded that the Aquia Creek population was the least robust of the studied populations. In 1994, only one live DWM was found in the reach between the old Route 643 bridge and Cannon Creek, a stretch where Michaelson and Neves (1995) had reported dozens of individuals in 1991-1992. Strayer reported that between Cannon Creek and the Route 610 bridge, the population had a moderate density ( $0.03/m^2$ ) and contained some young animals. He estimated the Aquia Creek population to be comprised of about 50 individuals.

4. In 1998, VDCR zoologists (Chazal 2000) spent three field-days searching for DWM between route 643 and route 610. No DWM were found below the confluence of Cannon Creek and Aquia Creek. Only two live DWM individuals and two relict shells were found upstream of the confluence. The only other live mussel species seen during the 1998 search were *Elliptio complanata* (Eastern elliptio) and the Asian clam (*Corbicula fluminea*). In addition to the decreased DWM numbers, VDCR's 1998 searches also failed to observe other freshwater species previously observed by Michaelson and Neves (1995), *Elliptio icterina* (variable spike) and *Strophitus undulatus* (squawfoot). Based on the 1998 study, there appears to have been a significant decline in native mussel populations across the board. The reasons for this decline are unknown, however, potential causes could be significant new construction upstream in the Aquia Creek watershed off-Base, the introduction of a non-native species (Asian clam) and significant drought occurring in Aquia Creek watershed.

5. Field surveys were again conducted in 2003 and 2009 by VDCR (Roble 2004; Chazal and Roble 2009). In 2003, no live DWM specimens and only one shell fragment of DWM was located. In 2009, no live DWM and no shells of this species were located. Roble (2004) suggested that it was too early to conclude that the DWM had disappeared entirely from this section of Aquia Creek, however, it was clear that significant declines had occurred in the native mussel fauna. Chazal and Roble (2009) recommended that the section of Aquia Creek from Onville Road to Cannon Creek be surveyed since no comprehensive surveys had been focused on that stream reach in recent years.

6. The Conservation Management Institute, Virginia Tech, conducted a comprehensive mussel survey in Aquia Creek in June 2014 and found no evidence of the DWM (pers. com.). The Eastern elliptio and Asian clam were the only species detected in waters where DWM used to exist.

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### 7402. MANAGEMENT RECOMMENDATIONS

#### 1. Water Quality Protection

a. The VDCR recommended that the MCBQ watershed area shown at Figure 7-3 be protected from disturbances to water quality. The site includes Aquia Creek, its associated riparian zone, and adjacent steeply sloped uplands. Also included are portions of Cannon Creek, a tributary stream that enters Aquia Creek at the location of the DWM colony. VDCR recommended that any proposed disturbances of the stream channel and flow conditions should be referred to the USFWS for comment.

b. Any timber harvest activities in the Aquia Creek watershed should be administered to protect water quality by minimizing disturbance to the vegetation or soils.

c. If the use of pesticides for controlling forest pests is required in this area, the following buffer zones are recommended; (a) 150-ft wide buffer for *Bacillus thuringiensis* (BT), and (b) 300-ft wide buffer for Dimilin. The Virginia Division of Natural Heritage, VDCR, highly recommends that BT be used instead of Dimilin because BT is not known to harm freshwater mussels or other aquatic invertebrates whereas negative effects have been reported for Dimilin.

2. Population Monitoring. Although the DWM may have been extirpated from Aquia Creek, it is recommended that one more comprehensive survey be conducted to search for this species downstream from the confluence of Cannon Creek and Aquia Creek to Onville Road. Sampling to identify the presence and number of DWMs in this population should be conducted by a qualified surveyor who has necessary state and federal permits.

### 7403. REFERENCES

- Chazal, A. C. 2000. Zoological surveys for the dwarf wedgemussel and Lepidoptera at Marine Corps Base, Quantico, Virginia. Natural Heritage Technical Report 00-05. Va. Dept. of Cons. and Rec., Div. of Nat. Heritage. Richmond, Va. 17 pp. plus appendices.
- Chazal, A. C. and S. M. Roble. 2009. Status survey for the dwarf wedgemussel (*Alasmidonta heterodon*) in Aquia Creek, Marine Corps Base, Quantico, Virginia, 2009. Natural Heritage Technical Report 09-15. Va. Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. 8 pp.
- Michaelson, D. L. and R. J. Neves. 1995. Life history and habitat of the endangered dwarf wedgemussel *Alismidonta heterodon* (Bivalvia:Unionidae). J. N. Am. Benthol. Soc. 14(2):324-340.

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- Roble, S. M. 2004. Status survey of the dwarf wedgemussel (*Alasmidonta heterodon*) in Aquia Creek, Marine Corps Base, Quantico, Virginia, 2003. Natural Heritage Technical Report 04-03. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. 8 pp.
- Strayer, D. L. 1994. A range-wide assessment of populations of the dwarf wedgemussel (*Alasmidonta heterodon*). Inst. of Ecosystem Studies. Millbrook, NY. 59 pp.
- U.S. Fish and Wildlife Service. 1993. Dwarf wedgemussel *Alasmidonta heterodon* recovery plan. Hadley, Massachusetts. 52pp.
- VDCR. 1992. A natural heritage inventory - Marine Corps Base Quantico, Stafford County, Virginia. Natural Heritage Technical Report 92-25. Va. Dep. Cons. and Rec., Div. of Nat. Heritage, Richmond, Va. 41 pp.

**Dwarf Wedge Mussel Location & Water Quality Protection Zone**

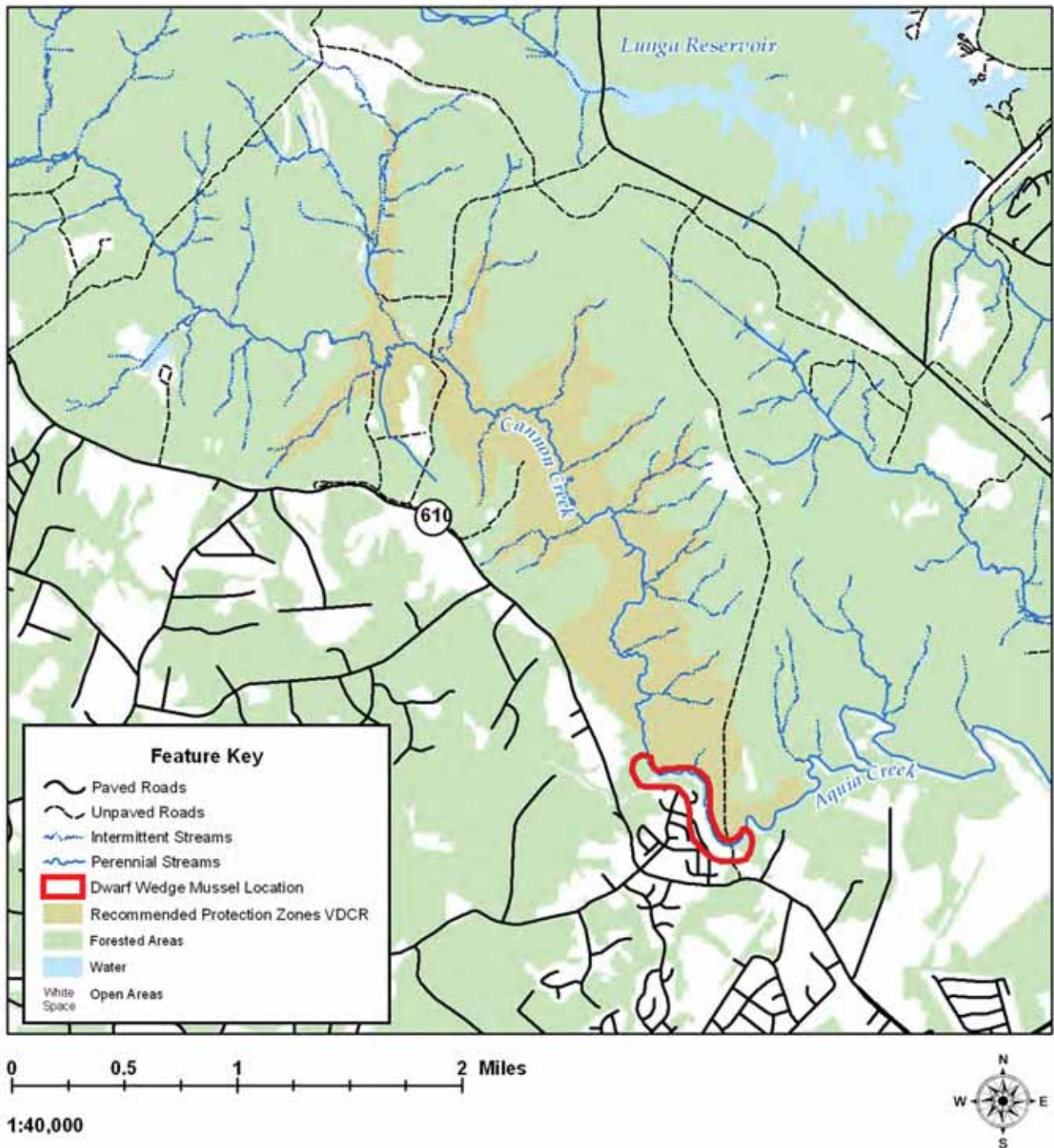


Figure 7-3. Dwarf wedge mussel location and protection zone.

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## CHAPTER 7

### THREATENED AND ENDANGERED SPECIES

#### SECTION 5: HARPERELLA

##### 7500. DESCRIPTION, LIFE HISTORY, AND HABITAT REQUIREMENTS

1. General Description. Harperella (*Ptilimnium nodosum*) is an annual herb belonging to the carrot family (Apiaceae). In 1988, the plant was listed as a federal endangered species. In 2004, it was listed as an endangered species under the Virginia Endangered Plant and Insect Species Act. Harperella grows to a height of 40 - 100 centimeters, with hollow, quill-like leaves. Its flowers are similar in appearance to Queen Anne's Lace, a common roadside plant (USFWS 1990).

2. Reproduction. Harperella produces small white flowers in clusters called umbels during the flowering period, May - June. The plant germinates, grows and flowers in one season. Seedling germination has not been observed, but the fall die-back of adults suggests that germination occurs in late spring (USFWS 1990).

3. Habitat. This plant is found in rocky substrate along edges of coastal plain ponds and seasonally flooded streams (USFWS 1990). In the northern part of its range, it grows on sandy or gravelly shoals or in bedrock crevices of clear, swift-flowing streams or rivers. It appears to favor sunny areas and is often associated with the herb water willow (*Justicia Americana*) (Maddox and Bartgis 1990).

##### 7501. MCBQ HISTORICAL INFORMATION.

1. The VDCR found a harperella site along Aquia Creek in 2002 (Belden 2002). The site is located about 0.9 mile northwest of Garrisonville Road and about 0.4 mile southwest of the junction of Aquia Creek and Onville Road (Route 641). It is estimated that there were 350 ramets of Harperella within a 10 by 20 meter area extending from the northern bank of Aquia Creek to about the middle of the creek.

2. All riverine habitat on the Base deemed suitable for Harperella was surveyed in 2004. No new populations of harperella were found beyond that found by VDCR in 2002 (Belden 2004). The Aquia Creek population had declined from about 350 in 2002 to only 20 ramets in 2004. It is believed that high water levels and accompanying increase in flood scouring in 2003 from hurricane Isabel may have accounted for the decline. In 2005, the VDCR found 50-60 ramets and it appeared that the population was rebounding (Townsend, pers. comm.).

3. Fieldwork conducted at the Aquia Creek site by VDCR in August, 2009, located 57 Harperella ramets (Belden 2009). While the population appears to be stabilizing, there remains a threat in the

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

form of sediment loading from substantial development within the Aquia Creek watershed.

7502. MANAGEMENT RECOMMENDATION. MCBQ should monitor this Harperella site annually in August/September to make population size counts and note hydrologic conditions. The site should be evaluated by VDCR or other subject matter personnel at least once every 5-years.

### 7503. REFERENCES

- Belden, A. Jr. and N. E. VanAlstine. 2002. Surveys for small whorled pogoia (*Isotria medeoloides*) in Timber Compartments 9, 10, and 25 in 2002 at Marine Corps Base, Quantico, Virginia. Natural Heritage Tech. Rep. 02-22. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond. 24 pp. plus appendix.
- Belden, A. Jr. 2004. Surveys for Harperella (*Ptilimniun nodosum*) at Marine Corps Base, Quantico, Virginia. Natural Heritage Tech. Rep. 04-18. Va. Dept. of Cons. And Rec., Division of Natural Heritage, Richmond. 15pp.
- Belden, A. Jr. 2009. 2009 status of harperella (*Ptilimnium nodosum*) at MCBQ, Va. Natural Heritage Tech. Rep. 09-14. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond. 4 pp.
- Maddox, D. and R. Bartgis. 1990. Harperella (*Ptilimnium nodosum*) recovery plan. U. S. Fish and Wildlife Service. Newton Corner, MA. 51 pp. plus appendices.

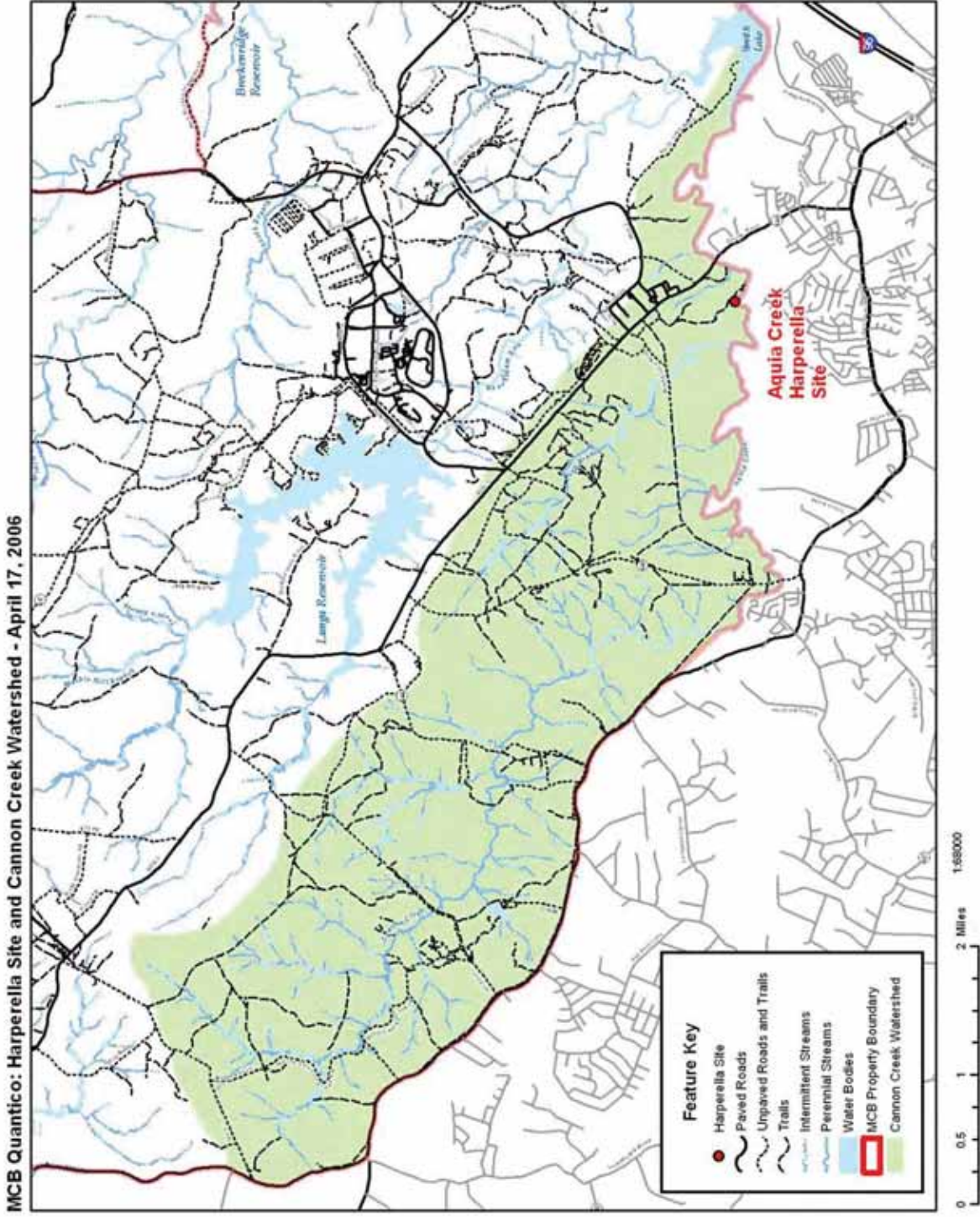


Figure 7-4. Harperella location and watershed.

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CHAPTER 7

THREATENED AND ENDANGERED SPECIES

SECTION 6: WORK PLAN

7600. WORK PLAN. Based on the recommendations provided in Sections 2-5 of this chapter, the work plan summary is provided at Table 7-2.

Table 7-2. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOALS, AND PROJECTS	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
II. TO SUPPORT AND ENHANCE THE PRESERVATION OF ALL ANIMAL AND PLANT LIFE ENDEMIC TO THE BASE ECOSYSTEM						
2. Goal: to promote the preservation and recovery of endangered, threatened and declining native species.						
1. Review NEPA documents re: proposed actions. Coordinate with USFWS/VDGIF on actions that may affect T & E species.	A	*	*	*	*	*
2. Locate nests and monitor bald eagle populations (see footnote 1).	A	*	*	*	*	*
3. Annually visit SWP colonies to count the number of stems and flowers.	A	*	*	*	*	*
4. Conduct SWP surveys of all forested lands prior to land disturbances, as necessary.	A	30	30	35	35	40
5. Maintain/install fences, gates or signs at SWP colonies and bald eagle nest protection zones.	A	1	0	1	0	0
6. Survey DWM population in Aquia Creek from Rt 641 to Rt 610.	A	0	0	0	5	0
7. Count ramets (stems) of Harperella; contract survey every 5 years.	A	*	2*	*	*	*
8. Conduct surveys to inventory bat species and develop management plan for the long-eared bat (See footnote 2).	A	20	50	50	50	50

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 7-2. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOALS, AND PROJECTS	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
II. TO SUPPORT AND ENHANCE THE PRESERVATION OF ALL ANIMAL AND PLANT LIFE ENDEMIC TO THE BASE ECOSYSTEM						
9. Conduct 10-year ecology study of SWP micro-habitat to monitor dormancy and change in colony vigor over time.	B	15	15	15	15	15
<b>Subtotal for "A" projects</b>		<b>51</b>	<b>82</b>	<b>86</b>	<b>90</b>	<b>90</b>
<b>Subtotal for "B" projects</b>		<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>
<b>TOTAL</b>		<b>46</b>	<b>47</b>	<b>51</b>	<b>55</b>	<b>55</b>

1. Bald eagle capture, banding, and radio-monitoring to be initiated in 2015 per Cooperative Ecosystem Study Unit agreement. Future funding requirements TBD.

2. The federal listing of the northern long-eared bat, effective 4 May 2015, will likely require MCBQ to develop a management plan and annual surveillance strategy to prevent destruction of any forest habitat occupied by this species.

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CHAPTER 8

OUTDOOR RECREATION

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# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

## CHAPTER 8

### OUTDOOR RECREATION

#### 8000. INTRODUCTION

1. The Sikes Act Improvement Act (SAIA), 16 U.S. Code § 670a, requires that consistent with the accomplishment of the military mission, the integrated natural resources management plan (INRMP) shall provide for:

- fish and wildlife-oriented recreation;
- sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources; and
- public access to the military installation that is necessary or appropriate for the use described above, subject to requirements to ensure safety and military security.

2. The SAIA also allows for issuance of special fishing and hunting licenses to individuals and collection of nominal fees; and said fees shall be used for the protection, conservation, and management of fish and wildlife in accordance with the INRMP.

3. Paragraph 12204.2a of Marine Corps Order (MCO) P5090.2A, The Marine Corps Environmental Compliance and Protection Manual, requires that all lands managed or owned by the Marine Corps are off-limits to off-road vehicles, unless the authorized uses are specifically identified by the installation Commanding General/Commanding Officer.

8001. MANAGEMENT GOALS. The objectives of this section of the INRMP are to:

- Identify the recreational activities allowed under the SAIA.
- Optimize outdoor recreation opportunities within the constraints of the military mission and capability of the resources.
- Identify opportunities to enhance allowable recreational programs.
- Document the opportunities for public participation in allowable Marine Corps Base, Quantico (MCBQ recreational activities).

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### 8002. OUTDOOR RECREATION DEFINITION

1. Outdoor recreation opportunities can generally be classified as dispersed or concentrated. Dispersed recreation does not require the presence of highly developed facilities and consists of programs, activities, or opportunities dependent on the natural environment. Examples are picnicking, bird watching, nature trails, off-road vehicle use, hiking, fishing, hunting, scenic waterway use, and primitive camping (Marine Corps Order 5090.2A Ch 1). Concentrated recreation activities require highly developed facilities such as golf courses, swimming pools and athletic fields. This INRMP covers dispersed activities. Reference is made to Marine Corps Community Services (MCCS) developed facilities where their rental and facility services are directly related to enjoyment of the natural environment.

2. The Natural Resources and Environmental Affairs (NREA) Branch, G-F (Installation and Environment Division) manages dispersed recreational programs (i.e., hunting, fishing, wildlife viewing, nature trails, and firewood gathering) where the activities rely mostly on undeveloped training lands and waterways. NREA Branch manages an archery site as part of the hunting program for training and qualifying archers. Military and non-Department of Defense (DoD) civilians typically are authorized to participate in these activities per Marine Corps Base Order (MCBO) P11015.2B, Fish and Wildlife Management Procedural Manual, and annual updates published in MCBQ Bulletins (see Appendix B), as long as they meet the Base Access Control Policy requirements of Marine Corps Base Order 5530.1.

3. Marine Corps Community Services (MCCS) manages most concentrated recreation programs where facility use fees are collected. Lunga Park (currently closed during Military Munitions Response Program clean-up actions as of February 2014) and the Marina are operated to support activities such as camping, picnicking, and boating. Patrons authorized to use MCCS facilities typically must have military ID, be students at the Federal Bureau of Investigation (FBI) or Drug Enforcement Agency (DEA) academies, or else be DoD civilian employees. Specific policies for concentrated recreation programs are published in MCO P1710 w/Ch 1, Semper Fit Policy Manual, and MCBO 1700.2, Recreation Business Activities Policy.

### 8003. OUTDOOR RECREATION PROGRAMS

#### 1. Hunting

a. A hunting program based upon previous SAIA agreements and INRMPs has been in existence at MCBQ since at least 1964. The MCBQ directive specifying the rules and procedures for hunting is provided at Appendix B. Military personnel receive first priority in obtaining hunting permits and, if the entire

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allotted quota allows, all remaining permits are issued first-come first-served to non-DoD civilians. On average, at least 15% of the daily hunting permits are made available to non-DoD civilians. By this quota system, the Base has been able to support the morale and recreation needs of military personnel while making hunting opportunities available to the public in accordance with SAIA goals.

b. Figure 8-1 documents the number of annual hunting trips made at MCBQ. During the 5-year period, 2008-2012, annual hunting license sales and hunting trips averaged 2,041 and 14,770, respectively. This represents a 4% decline in license sales and a 21.5% decline in the number of hunting trips compared to the previous 5-year period.

c. Hunting, fishing and firewood permit sales, hunter orientation programs, issuance of daily hunting passes, and game check-in are all conducted at the Game Checking Station (GCS), Building 5-9 located on the West Side of MCBQ (Figure 8-2). Administration of hunter licensing and ingress/egress from the installation is done using an automated local network known as the Hunter Tracking System. Manpower requirements to operate the GCS and the Hunter Tracking System are further addressed at paragraph 9007, Chapter 9.

d. MCBQ maintains four hydraulic lift stands, two tracked wheelchairs, three wheelchair accessible waterfowl hunting blinds, and four pop-up blinds for use by mobility-impaired hunters. Procedures for scheduling the use of these facilities are included in MCBQ hunting procedures at Appendix B. MCBQ also partners with an authorized private organization, The Quantico Injured Military Sportsman Association, to ensure hunting is made available for wounded warriors.

### 2. Fishing

a. Over 700 acres of impounded waters, 3.0 miles of put and take trout stream, and three boat launch sites to the tidal waters of the Potomac River and its tributaries, Quantico Creek and Chopawamsic Creek, are provided for recreational fishing enjoyment. Fishing areas are open to members of the public that satisfy Base Access Control Policy criteria. Access policies and procedures for designated fishing areas are provided at Appendix B. Projects required for the improvement of fishing opportunities are described at Chapter 6, Section 1.

b. An average of 3,225 MCBQ fishing licenses were sold annually from 2002-2006. Sales declined about 7% to 2,994 during the 5-year period, 2008-2012. In a limited survey conducted in 1986, it was estimated that over 23,000 man-days of fishing were done annually. In 2006, a creel survey conducted at Lunga Reservoir indicated that over 90% of the anglers were using catch-and-release tactics only. Of the few fish being kept for

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food, 44% were black crappie, 44% were sunfish, 11% were white and yellow perch, and 1% were largemouth bass.

c. Fishing in the Potomac River and tidal tributaries has grown in popularity since 1990. The resurgence of submerged aquatic vegetation (SAV) appears to have stimulated an improvement of sportfish stocks in the river. There is also growing angler interest in catching the invasive exotic fish, the northern snakehead (*Channa argus*), which has recently become abundant in the tidal waters at Quantico. MCBQ began an annual fishing tournament in 2013 that features snakeheads and bow-fishing. Potomac River boating access from MCBQ is only available at the Hospital Point boat launch on Quantico Creek for individuals that obtain a fishing license from MCBQ. Access to the Potomac River used to be available from the Officer Candidates School (OCS) boat ramp. Marine Corps Air Facility (MCAF) security concerns closed access from that ramp to the river; anglers and waterfowl hunters have requested additional river access along the shoreline south of the MCAF protection zone.

d. Wheelchair accessible docks have been installed at Smith Lake and at Gray's Reservoir on Chopawamsic Creek. MCBQ has made the boat rental office at Lunga Reservoir wheelchair accessible and the Joe Foxx fishing area along tidal Chopawamsic Creek near the Marine Corps Air Facility (MCAF) also is wheelchair accessible (Figure 8-3). Pursuant to a designated National Security area within the Potomac Rivers surrounding MCAF, the Joe Foxx area is currently open for fishing only by personnel with official DoD and U.S. Government credentials and a MCBQ fishing license.

3. Trapping. Trapping licenses for furbearers are issued per the procedures at Appendix B. Depressed fur markets have resulted in declining interest in trapping on MCBQ, as described at Section 7, Chapter 6. Trapping is a resource management tool that can reduce government costs associated with controlling nuisance animal populations.

4. SAIA Fees. Funds collected from the sales of MCBQ hunting, fishing, and trapping licenses are deposited into the U. S. Treasury fund receipt account 17R5095.27FY per MCO 5090.2A. These fees must be returned to MCBQ to be used for the protection, conservation, and management of fish and wildlife.

### 5. Wildlife Viewing

a. The Chopawamsic Creek Wildlife Viewing Area was constructed in 1992 and overlooks the tidal marsh (Figure 8-5). The viewing area is located within the Chopawamsic Creek Special Natural Area (SNA). The SNA was first designated by the Commanding General, MCBQ, in 1993 per guidance in DoD Instruction 4715.3 (now DODI 4715.03) to identify areas with special

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biological resources and/or ecological significance. The goals of the designation were to promote the use of the area for protection, environmental education, and perpetuation of the unique wetland system that distinguishes the area. Interpretive displays and access for canoeing and kayaking are available at the site (Figure 8-5). Wildlife visible from a platform constructed in the SNA includes migratory waterfowl (October-March), herons, bald eagles, ospreys (March-September), beavers, and a variety of songbirds.

b. The SNA site is included in the Prince William loop of the Virginia Birding and Wildlife Trail, developed by the Virginia Department of Game and Inland Fisheries (VDGIF). A checklist of bird species historically observed at MCBQ is provided at Appendix D.

6. Arboretum Trails. An arboretum nature trail network was completed in 2001 that consists of two 1-mile trail loops with a 0.4-mile connector in-between. The trails are located in the Mainside area north of the Marsh Center (Figure 8-3) and are for foot traffic only. A 200-yard portion of the trail extending from the Argonne Hills parking lot is handicapped accessible. The trail features mature forestland, a wetland drainage, mountain laurel thickets, forest birds, white-tailed deer, and wild turkey. Trail entrance signs are maintained in kiosks at the trailheads and interpretive tags are posted along the trails. Twelve benches provide resting areas along the trails, and six bridges provide wetland crossings (Figure 8-6).

7. Mainside and Geiger Ridge Trail System. Work was completed in 2009 to expand the nature trail system to a 16.8 mile network of trails within Training Area 1 (Mainside). In 2015, an additional 5.5 miles of trails were added in the Geiger Ridge area. Trail system development included the development of a trail map, installation of trail signage and blaze markers, and installation of map kiosks at major trail heads (Figure 8-4). Guidelines for trail use are found in MCBO 5090.4A, Policy for Mainside Trail Use at Marine Corps Base Quantico.

8. Firewood Gathering. Some individuals enjoy firewood gathering as a recreational experience. The Base offers a firewood permit, valid for a six-month period, to cut dead and down timber for personal use by individuals satisfying the Base Access Control Policy. Permits are issued for a fee, as specified in MCBO 11015.1B, Woodland Tree and Shrub Removal. About 125 permits are bought annually. The Base benefits by the removal of fallen woody debris along roadsides, which helps maintain the appearance of these high visibility areas.

9. Greenery. The greenery permit program allows active and reserve duty military and federal employees stationed at MCBQ to cut holiday greenery from designated areas of the Base. The permit is free and typically allows gathering on the three

## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Sundays prior to Christmas Eve. Authority for the program is contained in MCBO 11015.1B, Woodland Tree and Shrub Removal. Greenery permits will only be issued on a seasonal basis, at the discretion of the Commander MCBQ.

### 10. Camping

a. Five very popular major camping areas are maintained and operated at Lunga Park by MCCA. No backcountry camping is authorized in Base training areas due to the potential conflicts with military training and safety concerns. Pavilions, boat docks, playgrounds, and restrooms are available at the Lunga Park camping areas. Campsites are rented on a first-come first-served basis to eligible personnel as determined by MCO P1700.2A. All campers must check in and register at the main MCCA office at Lunga Park.

b. Restroom facilities generally consist of privies with holding tanks; although two have been upgraded to state-of-the-art biological composting systems. There are no shower or laundry facilities available for campers. Water, electrical hookups for recreational vehicles (RVs), tables, grills, and fire rings are also available; however, the water and electrical utility systems are in constant disrepair and are in dire need of replacement or upgrade. Recurring leaks in the water system result in chlorinated water discharges that may constitute spills reportable to Virginia regulatory agencies.

c. The Base has two RV storage lots, one of which is located at Lunga Park and the other adjacent to the Mainside water treatment plant. While the intent is to provide Base residents a place to store their RVs, boats, and trailers, the location of the lot near the Lunga General Store is inappropriate for a high-visibility recreation area and should be relocated.

d. There are three areas at Lunga Reservoir that are not managed by MCCA. These include the MCBQ Rod and Gun Club buildings assigned to NREA Branch, a recreation area assigned to the FBI Academy, and the Civilian Welfare and Recreation Association (CRWA) campground. Recreational use of these areas is dictated by the individual groups assigned to these areas.

e. Lunga Park, including camping areas, was closed in April 2012 for unexploded ordnance (UXO) removal operations. The duration of the closure is uncertain but remedies are being sought to restore access for authorized activities and events. Enhanced communication and coordination will be required among all users to ensure compliance with safety measures and any applicable land use restrictions once the facilities are reopened.

11. Picnicking. Picnic facilities at MCBQ are very limited while Lunga Park is closed. Individuals often carry a bag lunch



## INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

to eat at the Wildlife Viewing Area, located off of Russell Road, while relaxing and observing the wetland area. There are also picnic tables at the Joe Foxx fishing area. The best options for organizational picnics near MCBQ may be at Locust Shade Park and Prince William Forest Park.

### 12. Boating

a. Marina. The Marina is located on the Potomac River adjacent to the Town of Quantico (Figure 8-3). There are currently 120 slips for various sized boats, but plans have been developed to try to expand the Marina's capacity to 30 additional wet-slips. A small number of sailboats and motorboats are available for rental through MCCA for authorized MCCA patrons. Recently, concerns have arisen regarding the structural integrity of the Marina due to the pier-head being undercut, and a project to repair the damage is awaiting funding.

b. Lunga Park. MCCA authorized patrons may rent sailboats, windsurfers, rowboats, canoes, paddleboats, and motorboats at the Lunga Park boathouse.

c. Privately-owned boats may be used by persons who have a valid MCBQ fishing license for fishing or recreational paddling in MCBQ waters per the guidelines in the Fishing Regulations at Appendix B, and in accordance with Base Access Control Policy requirements.

13. Jogging and Bicycling. The Marine Corps community is actively engaged in physical fitness training. Enjoyment of these recreational and fitness activities is enhanced when done in natural settings where vehicle noise, pollution, and traffic are minimized. Fitness trail systems have been designated within the broader MCBQ trail system east and west of Interstate 95. Implementing guidance for use of the fitness trails is provided at MCBO 5090.4, Policy for Mainside Trail Use at MCBQ, and MCBO 6100.2, Policy for Physical Training aboard MCBQ. A map of all the Mainside Trails is located at Figure 8-4.

14. Off-road Vehicles. There are no areas designated at MCBQ for the use of off-road motorized recreational (ORVs) vehicles. ORV use is authorized only for implementing the guest-hunting program per Appendix B and for official military training and land management activities. Environmental constraints for military ORV use are addressed in the MCBQ Range Regulations, MCBO 3570.1, and through MCBQ Environmental Standard Operating Procedures. The use of ORVs on the highly erosive soils at MCBQ is compatible with neither the Chesapeake Bay sedimentation water quality concerns nor the need to maintain the functionality of trails for authorized training and land management activities. Nevertheless, a significant illegal ORV problem exists on the Base to the point where four-wheeled ORVs are known to enter a number of training areas, including off-limits impact areas.

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Conservation law enforcement officers spend considerable time patrolling for trespassers illegally using ORVs.

### 8004. OUTDOOR EDUCATION

1. NREA Branch staff members, time permitting, provide educational information to local schools and scout groups concerning outdoor careers and natural history interpretation. Annual presentations are given to the MCBQ Rod and Gun Club (when active) and to Conservation Volunteer Program (CVP) members about the status of natural resources management programs at MCBQ. NREA Branch also maintains taxidermy displays of local birds, mammals, fish and butterflies at the GCS and the NREA Log Cabin offices on the West Side of MCBQ.

2. The Base has hosted portions of the VDGIF "Becoming an Outdoors Woman" and "Project Wild" programs. Lunga Park hosts summer camps that involve natural history studies and outdoor recreation. While year-round naturalist programs are not available on Base, they are provided adjacent to Base at the Prince William Forest Park nature center.

3. Pamphlets and interpretive signs at the Wildlife Viewing Area and Arboretum Trails provide interpretive information for self-guided nature walks and viewing experiences.

4. Champion Trees. The register of champion trees, Table 8-1, is a MCBQ program to keep a running record of the largest and second largest trees of each species on Base. These "relic" trees are considered worthy of special recognition for their significant aesthetic appeal, contributions to the gene pool, and for their potential education and scientific values. The register is similar to the American Forestry Association's "Virginia Social Register of Big Trees." The Forestry Section, NREA Branch, maintains, evaluates, and validates all nominations for the register. Input comes from a variety of sources, including CVP members. Precise site locations are identified by Global Positioning System and are available for mapping in the Geographic Information System. The marking of the trees with small identification tags is in progress.

### 8005. INTERGOVERNMENTAL COOPERATION AND CITIZEN INVOLVMENT

1. A number of park and outdoor recreation facilities are located in the immediate vicinity of MCBQ. Locust Shade Park (Prince William County Park Authority) and Prince William Forest Park (National Park Service) are immediately adjacent and offer a wide range of trails, nature study, camping, and outdoor recreation activities. The VDGIF and Prince William Conservation Alliance (PWCA) have offices at Merrimac Farm Wildlife Management Area adjacent to Camp Upshur. There are opportunities for the

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exchange of services and information between these agencies and the Base. For example, MCBQ currently assists the PWCA with an annual Christmas Bird Count and a Virginia Bluebell Festival.

2. A Memorandum of Understanding (MOU) was signed in 1998 between Prince William Forest Park and MCBQ to enter into a land exchange to create discrete boundaries that would better enable the agencies to accomplish their mission objectives. As part of the MOU, the agencies meet regularly to discuss cooperative watershed management plans pertaining to Quantico Creek and Chopawamsic Creek. Also, the MOU suggested the creation of a Joint-Use Recreation Plan for Breckenridge Reservoir.

3. The Sportsman Advisory Council (MCBO 11015.5) was formed in 2010 to facilitate sportsman input into natural resources management policies. Citizens also contribute to MCBQ natural resource management activities through the CVP, various private organization assistance, and NREA hunter satisfaction surveys.

### 8006. RECOMMENDATIONS

#### 1. Hunting, Fishing and Trapping

a. Operate programs per current issue of MCBO 11015.2B, Fish and Wildlife Management Procedural Manual, at Appendix B.

b. Implement meetings with the VDGIF, patrons, Area Commanders, Operations Division (G-3), MCBQ Sportsman Advisory Council, and others to:

- (1) provide annual opportunities for public input;
- (2) update procedures in keeping with Virginia regulation changes;
- (3) brief new MCBQ and tenant commanders of outdoor recreation procedures; and
- (4) maintain daily communication with Operations Division (G-3) to coordinate recreational activities with military needs.

c. Ensure adequate technology support and staffing to operate the Game Checking Station per current regulations. Technology upgrades to the current Hunter Tracking System are needed to comply with growing needs for background checks and access controls for all dispersed recreation activities.

d. Conduct survey to document annual fishing pressure and angler satisfaction concerning MCBQ fishing opportunities.

e. Per Disabled Sportsman Act (16 U.S.C. § 670c "Section 103"), continue to provide, maintain, and improve facilities and equipment to provide access for persons with disabilities.

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f. Continue to partner with Wounded Warrior Regiment, state and local agencies, and authorized private organizations to provide equipment and access to outdoor recreation.

2. Wildlife Viewing, Mainside Trails, and Arboretum Trails. Maintain the cleanliness of these areas by regular litter patrols and maintenance of signs, fences, kiosks, boardwalks and interpretive displays. Post trail maps.

### 3. Camping

a. Complete the Munitions Response Program clearance of UXO from Lunga Reservoir and Lunga Park so that associated recreational services can be resumed.

b. Relocate the current RV storage site at Lunga Park camping area to another site that does not clash with the aesthetic quality of Lunga Park camping areas and pavilions.

c. Replace or upgrade the water and electrical utility systems serving Lunga Park.

### 4. Boating

a. Repair undercutting of the Marina pier-head.

b. Continue conservation law enforcement patrols to deter unsafe and unauthorized boating practices.

c. Develop boating access to Potomac River tidal waters south of Chopawamsic Creek to address the loss of boating access to the Potomac River from the OCS boat ramp.

### 5. ORVs

a. Continue conservation law enforcement surveillance to deter illegal ORV use on the Base.

b. Ensure training units receive environmental awareness training concerning the impacts of illegal ORV use.

### 6. Inter-Governmental Cooperation

a. Pursuant to 1998 MOU with Prince William Forest Park, determine if joint recreation plan for Breckinridge Reservoir is still desired or necessary.

b. Continue to work cooperatively with VDGIF, Prince William Conservation Alliance, and other neighboring government agencies to promote outdoor recreation and natural history study.

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8007. WORK PLAN. The 5-year work plan and budget for NREA Branch dispersed outdoor recreation programs are provided at Table 8-2.

**Figure 8-1.--Hunting trips at Marine Corps Base, Quantico.**

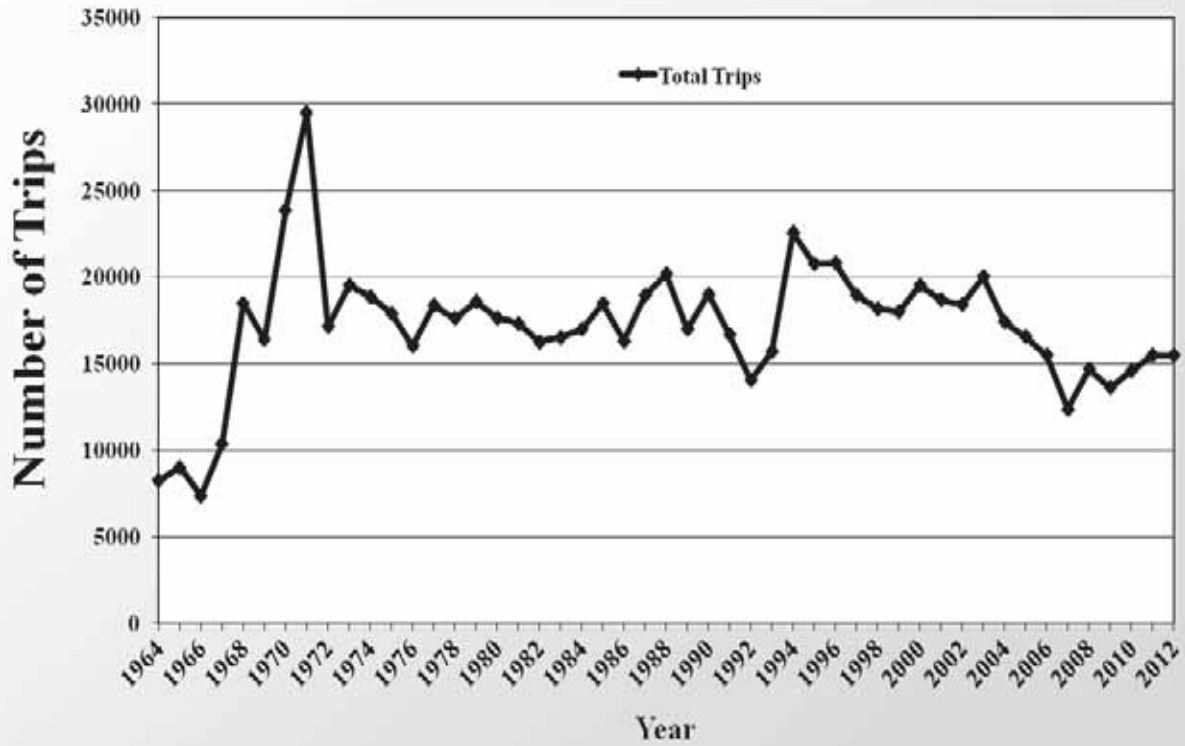


Figure 8-2.-- Game Checking Station: archer qualifying for the Mainside hunting program (left) and hunter orientation class at the (right).



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

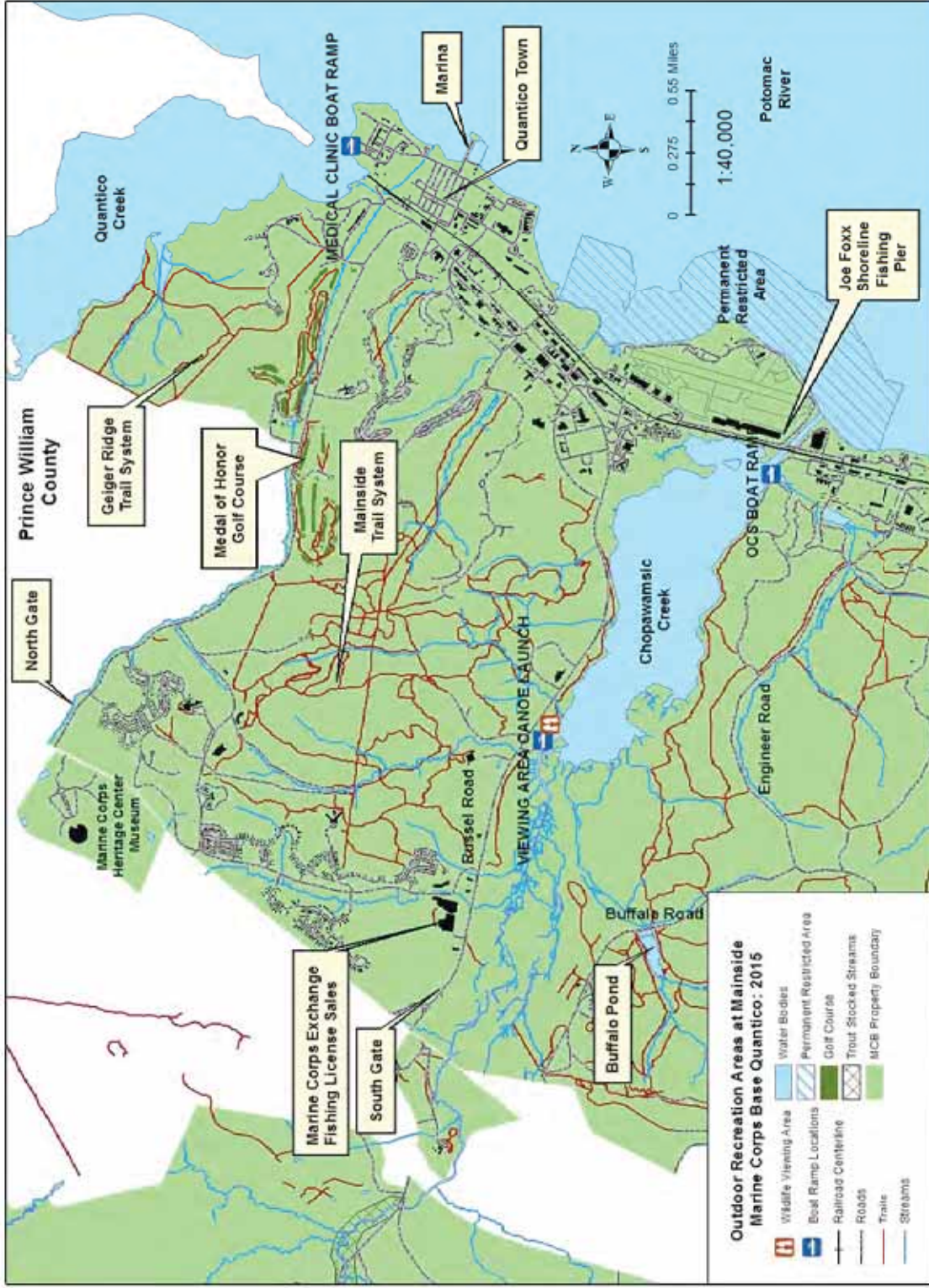


Figure 8-3. Outdoor recreation areas east of Interstate 95.





INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

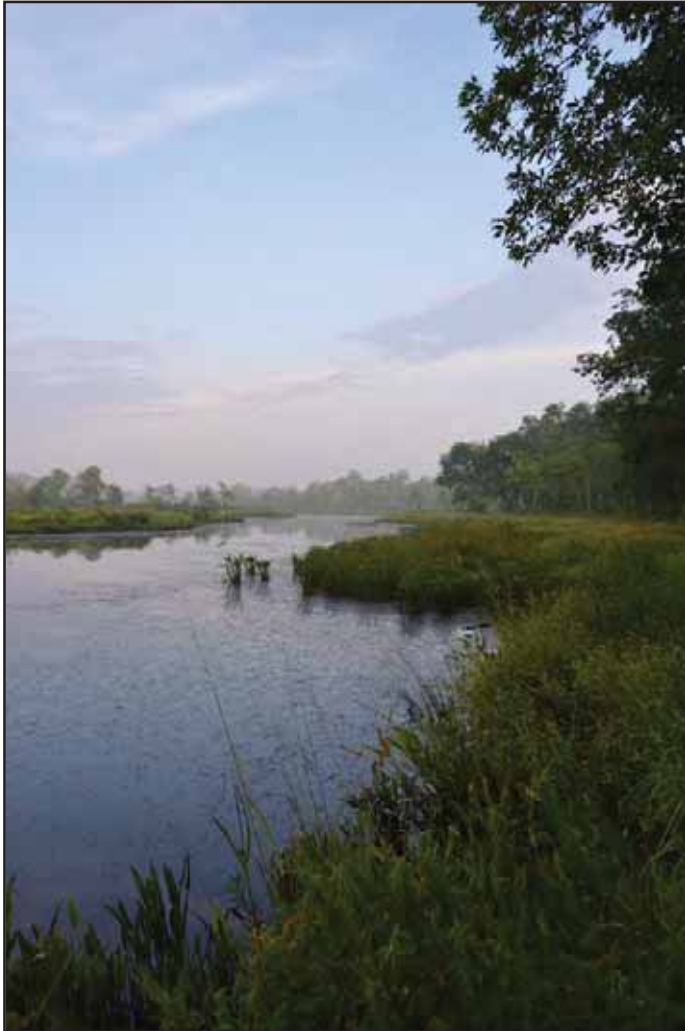


Figure 8-5.-Chopawmsic Creek Wildlife Viewing Area.



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Figure 8-6.-Arboretum trails.

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<b>Table 8-1. List of Champion Trees at Marine Corps Base, Quantico</b>							
<b>Genus_Species</b>	<b>Common Name</b>	<b>Rank</b>	<b>TA</b>	<b>DBH</b>	<b>Height</b>	<b>Nominator</b>	<b>Date</b>
Acer negundo	Boxelder	1st	17B	19.3	36	Gene Silverthorn	Jul-96
Acer rubrum	Red Maple	1st	10A	39.7	112	John Giannico	Jul-97
Acer saccharinum	Silver Maple	1st	1	43.5	87	John Giannico	Jul-09
		2nd	1	40.1	80	John Giannico	Jul-09
Asimina triloba	Paw Paw	1st	6C	5.1	18	Sandra Kilpatrick	Jul-01
Betula nigra	River Birch	1st	9C	31.4		John Giannico	Apr-10
		2nd	1	28.7	63	John Giannico	Jul-09
Carpinus caroliniana	Musclewood	1st	6C	7.5	25	John Giannico	Oct-08
Carya glabra	Pignut Hickory	1st	6C	39.0	85	John Giannico	Aug-96
		2nd	17B	32.2	108	John Mowrey	Oct-08
Carya illinoensis	Pecan	1st	11B	33.7		Gene Silverthorn	Jul-96
Catalpa speciosa	Northern Catalpa	1st	6A	58.5	54	Gene Silverthorn	Jul-97
		2nd	6A	56.7	78	Gene Silverthorn	Jul-97
Celtis occidentalis	Hackberry	1st	17B	25.0	84	Gene Silverthorn	Jan-12
Cornus florida	Flowering Dogwood	1st	17B	8.6		Gene Silverthorn	Jul-96
Diospyros virginiana	Persimmon	1st	1	20.8	49	John Giannico	Jul-09
		2nd	1	20.2	64	John Giannico	Jul-09
Fagus grandifolia	American Beech	1st	1	48.7	93	Dave Wilson	Jul-09
		2nd	7B	38.9	104	John Giannico	Jun-97
Fraxinus americana	White Ash	1st	1	41.6	91	John Giannico	Jul-09
Fraxinus pennsylvanica	Green Ash	1st	1	44.5	87	John Giannico	Jul-09
Ginkgo biloba*	Ginkgo*	1st	3	21.0		Jeff Gardner	Jul-09
Gleditsia triacanthos	Honeylocust	1st	6A	21.5	105	Gene Silverthorn	Jul-97
Gymnocladus dioicus	Kentucky Coffee Tree	1st	3	29 ??	120	John Giannico	Jul-09
		2nd	6A	19.0	79	John Mowrey	Jul-96
Ilex opaca	American Holly	1st	1	28.1	41	John Giannico	Jul-09
Juglans nigra	Black Walnut	1st	17B	38.5		Gene Silverthorn	Jul-96
Juniperus virginiana	Eastern Redcedar	1st	7B	38.8		Gene Silverthorn	Jul-96
		2nd	7B	22.5		Mark Healey	Feb-01
Liquidambar styraciflua	Sweetgum	1st	1	43.4	107	John Giannico	Jul-09
Liriodendron tulipifera	Yellow-poplar	1st	3	74.2	148	Gene Silverthorn	Jul-09
		2nd	3	73.5	140	Gene Silverthorn	Jul-09
Magnolia grandiflora	Southern Magnolia	1st	3	23.9		Gene Silverthorn	Jul-96
Nyssa sylvatica	Blackgum	1st	9C	31.0		John Giannico	Apr-10
		2nd	1	30.8	101	Bill Cross	Jul-09
Pinus echinata	Shortleaf Pine	1st	3	25.8	118	Ron Moyer	Jul-09
		2nd	3	22.5	106	Ron Moyer	Jul-09
Pinus pungens	Table Mountain Pine	1st	10C	19.3	77	John Giannico	Jun-97
		2nd	10C	16.6	72	John Giannico	Jun-97
Pinus strobus	Eastern White Pine	1st	16A	40.5	100	Ron Moyer	Feb-09
		2nd	16A	38.2	110	Gene Silverthorn	Jul-96
Pinus taeda	Loblolly Pine	1st	15B	28.0		John Giannico	May-99
Pinus virginiana	Virginia Pine	1st	14A	26.1	77	Ron Moyer	Feb-06
Platanus occidentalis	American Sycamore	1st	1	75.1	110	John Giannico	Jul-09
		2nd	17B	43.3		Gene Silverthorn	Jul-96
Prunus avium*	Domestic Cherry*	1st	2	26.4		Gene Silverthorn	Jul-96
Prunus serotina	Black Cherry	1st	1	28.8	52	John Giannico	Jul-09
		2nd	1	27.0	68	John Giannico	Jul-09
Pyrus communis*	Common Pear*	1st	8A	12.1	20	John Giannico	Jul-09
Quercus alba	White Oak	1st	2	7+E13	107	Gene Silverthorn	Jul-09
Quercus bicolor	Swamp White Oak	1st	17A	49.6	121	Ron Moyer	May-07
		2nd	17A	31.5	105	Ron Moyer	May-07
Quercus coccinea	Scarlet Oak	1st	1	51.8	88	Bill Cross	Jul-09
Quercus falcata	Southern Red Oak	1st	1	65.6	96	John Giannico	Jul-09
		2nd	1	58.1	102	Scott Simmons	Jul-09
Quercus marilandica	Blackjack Oak	1st	12A	16.5	42	Bill Cross	Sep-06
Quercus phellos	Willow Oak	1st	1	70.2	81	John Giannico	Jul-09
		2nd	1	54.4	92	John Giannico	Jul-09
Quercus prinus	Chestnut Oak	1st	3	58.4		Ben Fulton	Dec-99
		2nd	2	44.6	105	John Giannico	Jul-09
Quercus rubra	Northern Red Oak	1st	1	49.2	118	John Giannico	Jul-09
		2nd	16G	43.0		John Giannico	May-99
Quercus stellata	Post Oak	1st	1	43.7	84	John Giannico	Jul-09
		2nd	1	34.8	74	John Giannico	Jul-09
Quercus velutina	Black Oak	1st	4	60.5	105	Gene Silverthorn	Jul-96
Robinia pseudoacacia	Black Locust	1st	1	40.0	86	John Giannico	Jun-05
		2nd	6C	24.9	94	Carol Pollio	Jul-01
Thuja occidentalis	Northern White Cedar	1st	1	25.7	65	John Giannico	Jul-09
Tilia americana	American Basswood	1st	16G	49.9		John Giannico	Jun-99
Tsuga canadensis	Eastern Hemlock	1st	6C	30.8	101	Bill Cross	May 01
		2nd	6C	29.6	110	Bill Cross	May 01
Ulmus american	American Elm	1st	17B	35.0	89	John Giannico	Feb-12
Ulmus rubra	Slippery Elm	1st	16B	18.3		John Giannico	Sep-05

\*Exotic or non-native species

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table 8-2. Summary List of INRMP Drivers, Goals, and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOALS AND PROJECTS	PRTY	Estimated annual cost in \$1,000 increments.				
		2015	2016	2017	2018	2019
III. TO PRESERVE AND DEVELOP AN OUTDOOR RECREATIONAL PROGRAM THAT WILL INCORPORATE AND PROMOTE BASE ORGANIZATIONAL PARTICIPATION AND ESTABLISH COOPERATIVE AGREEMENTS FOR MUTUAL RECREATIONAL BENEFITS.						
1. Goal: To systematically emphasize and develop outdoor recreational programs within the constraints of the military mission and the capability of MCBQ natural resources to provide for the enjoyment of military personnel and the general public.						
1. MCCA operate Lunga Park and the Marina to support camping, picnicking, and boating.	A	!	!	!	!	!
2. Manage programs for gathering of firewood and holiday greenery for personal use.	A	*	*	*	*	*
3. Complete Breckenridge Reservoir Joint-Use Recreation plan per 1998 MOU with Prince William Forest Park.	B	*	*	*	*	*
4. Maintain weir structures, dams and spillways of impounded waters (structural inspections).	A	*	*	*	*	*
5. Maintain pedestrian, vehicle and boating access to impounded waters.	A	2	2	2	2	2
6. Ensure trifold brochures of maps and policies detailing availability of recreational trails are posted at access kiosks.	A	#	#	#	#	#
7. Provide conservation law enforcement patrols to enforce boating and ORV regulations.	A	*	*	*	*	*
8. Develop additional boating access on tidal waters of Quantico Creek and Potomac River.	A	10	50	0	0	0
9. Repair utility infrastructure at Lunga Park.	B	!	!	!	!	!
10. Develop joint interpretive programs for guided bird walks/canoe trips at the Chopawamsic Creek Wildlife Viewing Area.	B	*	*	*	*	*
11. Repair Marina pier-head.	B	!	!	!	!	!
12. Develop shower and bath facility for Lunga Campers.	B	!	!	!	!	!
13. Find and designate a Recreational Vehicle (RV) storage area that does not impact aesthetic values at Lunga Park.	C	!	!	!	!	!



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Table 8-2. Summary List of INRMP Drivers, Goals, and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
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		2015	2016	2017	2018	2019
III. TO PRESERVE AND DEVELOP AN OUTDOOR RECREATIONAL PROGRAM THAT WILL INCORPORATE AND PROMOTE BASE ORGANIZATIONAL PARTICIPATION AND ESTABLISH COOPERATIVE AGREEMENTS FOR MUTUAL RECREATIONAL BENEFITS.						
2. Goal: To promote the morale and welfare of personnel assigned to the installation and the public by providing for their recreational needs related to hunting, fishing, wildlife viewing and natural history study.						
1. Revise, print and distribute directives and maps concerning hunting and fishing procedures.	A	#	#	#	#	#
2. Maintain sales of special MCBQ fishing, hunting and woodcutting licenses in keeping with the SAIA and other directives.	A	2	2	2	2	2
3. Operate the GCS during open hunting seasons. Requires contract for INRMP implementation support, unless civilian hires are made.	A	105	110	115	120	125
4. Schedule meetings for public input and coordination with training Commands.	A	*	*	*	*	*
5. Maintenance, upgrades and supplies for Hunter Tracking System computers, software, printers, thermal paper, blank cards, cleaning kits, etc.	A	10	10	10	10	10
6. Maintain Arboretum Trails, Wildlife Viewing Area, and The Wisdom Tree Park for enjoyment of staff and visitors.	A	1	1	1	1	1
7. Develop natural history tri-fold brochure for Wildlife Viewing Area. Print and provide for visitors.	A	#	#	#	#	#
8. Maintain and improve programs to provide wheelchair accessibility for hunting, fishing and boating programs. Maintain existing equipment: hydraulic lift stands, tracked wheelchairs, and shoreline fishing access mechanisms.	A	1	1	1	1	1
9. Conduct angler satisfaction survey.	B	2	0	0	0	0
10. Install/maintain information kiosks and signs at fishing waters.	A	3	2	2	2	2
11. Provide General Schedule billet to support year-long license sales and more consistent visitor services related to natural resources-related recreation.	B	35	36	37	38	39
12. Conduct angler recognition program. Provide certificates and patches for quality fish.	B	1	1	1	1	1

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Table 8-2. Summary List of INRMP Drivers, Goals, and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVER, GOALS AND PROJECTS	PRTY	Estimated annual cost in \$1,000 increments.				
		2015	2016	2017	2018	2019
III. TO PRESERVE AND DEVELOP AN OUTDOOR RECREATIONAL PROGRAM THAT WILL INCORPORATE AND PROMOTE BASE ORGANIZATIONAL PARTICIPATION AND ESTABLISH COOPERATIVE AGREEMENTS FOR MUTUAL RECREATIONAL BENEFITS.						
<b>Subtotal for "A" projects</b>		<b>134</b>	<b>178</b>	<b>133</b>	<b>138</b>	<b>143</b>
<b>Subtotal for "B" projects</b>		<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>
<b>TOTAL A + B</b>		<b>170</b>	<b>215</b>	<b>171</b>	<b>177</b>	<b>183</b>



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CHAPTER 9

FACILITIES AND SERVICES

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## CHAPTER 9

### FACILITIES AND SERVICES

9000. INTRODUCTION. This chapter provides information about the facilities, property, and services maintained by the Natural Resources and Environmental Affairs (NREA) Branch, GF, (Installation and Environment Division), Marine Corps Base, Quantico (MCBQ) to help achieve Integrated Natural Resources Management Plan (INRMP) objectives.

#### 9001. STRUCTURES AND GROUNDS

1. The following buildings housing the NREA programs dealing with Forestry (FOR), Fish, Wildlife, Agronomy (FWA), and Conservation Law Enforcement (CLE) are located west of Interstate 95 near the intersection of Russell Road and Telegraph Road.

a. Building 5-9 (Ponderosa). This building is a 3,000 square foot renovated barracks housing the Game Checking Station (GCS), the Conservation Volunteer Program (CVP), and contractor/intern offices. Services provided at the GCS consist of: hunting, fishing, and firewood license sales; daily hunter check out; hunter orientation training; conservation education; wildlife displays; and big game check-in. The CVP Office maintains volunteer records, provides space for meetings, stores tools, and operates the daily volunteer check out desk. Several associated outbuildings provide for storage of fuel and small engine equipment, refrigerated storage, big game check-in, and game cleaning and processing. In addition, two trailer hookups are provided to support out-of-town conservation volunteers and graduate students.

b. Log Cabin, Building 27007. This 2,000 square foot building houses the FOR, FWA, CLE and administrative staff.

c. Building 12-9. This 1,000 square foot brick storage building is used to repair FOR/FWA equipment and store supplies for those programs.

d. Storage Shed, Building 27132. This 2,000 square foot shed and attached 768 square foot garage provides storage for CLE and FWA equipment, boats, lumber, and supplies.

e. Building 27009. This 1,200 square foot metal building houses FOR program equipment and supplies.

f. Grounds. All FOR, FWA and CLE buildings are surrounded by improved grounds that are landscaped consistently, as follows: 5 acres of grass which has to be mowed an average of once per

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week from May - October, inclusive; about 200 yards of split rail fencing; and scattered foundation shrubs that require annual pruning.

g. Conex Box. A 40 foot-long Conex box is maintained for storage of auxiliary equipment used for wounded warrior events.

2. NREA, per Memorandum of Agreement of 17 February 2012 between MCBQ and the Quantico Rod and Gun Club (QRGC), became responsible for the QRGC building complex at Lunga Reservoir. This includes building 27357 (club house), building 27357A (quonset hut), building 27357B (storage sheds and walk-in refrigerator), and about 5 acres of forested and grassed landscape. NREA expects to maintain the grounds using CVP volunteers; MCBQ Facilities Maintenance Section (FMS) will be responsible for building upkeep.

3. Boundary Lines Maintenance. There are nearly 300 miles of boundary lines around the MCBQ training areas (Table 9-1). The boundaries are inspected annually to ensure appropriate identification signs are posted and visible.

4. Woodland Trails. There are over 150 miles of woodland trails throughout MCBQ (Table 9-1). Just over 16 miles of trails in the Mainside area are open daily for jogging, biking, and hiking. Remaining trails are located in the Range and Training Areas (RTA). Trails essential for access to training ranges are maintained by FMS but many of the remote semi-improved and unimproved woodland trails do not receive routine maintenance. NREA Branch personnel, with assistance from conservation volunteers, clear blown-down trees from trails after storm events. The FOR program often builds or renovates trail sections for logging access. These trails are essential for emergency evacuations of injured personnel, wildlife surveys, hunter access, forestry operations, and maintenance of woodland openings.

5. Hunting Blinds. Waterfowl hunting blinds, including three wheelchair accessible blinds, are managed by NREA for public access. Blinds east of Interstate 95 must be licensed annually per Virginia Department of Game and Inland Fisheries (VDGIF) regulations. These blinds are subject to ice damage and have an average life span of about 5 hunting seasons, and therefore require annual maintenance inspections and applications of camouflage materials. Some of the blinds have been built on dock floats to reduce weather related damage, which require special attention since they must have significant mooring tackle to keep them in place during exceptionally high tides. A variety of deer hunting stands, including adaptive equipment such as hydraulic lift stands and tracked wheelchairs, are maintained to provide accessible hunting opportunities per the Disabled Sportsman Act provisions of the Sikes Act Improvement Act (16 U.S.C. § 670c,

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Section 103). Adaptive equipment and accessible hunting blinds are pictured at Figure 9-1.

6. Small Water Bodies. The small ponds described in Sections 1 and 2 of Chapter 6, managed for fishing and/or waterfowl, require maintenance of dams and spillway structures. Some shoreline area should be mowed if feasible to provide access where fishing is permitted. Secon Pool is a 50 meter long stretch of Middle Branch, Chopawamsic Creek, which is maintained as a recreational trout fishing area for children 12 years old and younger. An outhouse, parking area, pool and small weir structure are maintained adjacent to Secon Pool. The area is also used to accommodate special events for wounded warriors and access for the mobility impaired.

7. Signs. A variety of informational signs are used to inform the public about fishing, hunting, wildlife viewing, and other wildlife programs. Hazard signs prohibiting swimming, diving, or gasoline motors are required at many fishing areas. Signs identifying MCBQ and training area boundaries, wildlife viewing area, general conservation information, fishing areas, and deer/vehicle hazards are all important for controlling public access, addressing safety concerns and achieving conservation education objectives (Figure 9-2). Signs may be provided by the FMS sign shop or Combat Visual Information Center (MCBQ G-3) but most informational signs have to be custom ordered from outside providers.

8. Wildlife Viewing Area. The Wildlife Viewing Area on Chopawamsic Creek provides a parking area, access trail, viewing deck, information shelter, signs, educational displays, wetland brochure, bird checklist, and boat launch site. The CVP performs trash collection and other maintenance activities at the Wildlife Viewing Area (see Chapter 8).

9. Arboretum Trails. The trails, signage, information kiosks, benches, trail markers, and parking areas are maintained by the FOR program at these nature trails in the Mainside area (see Chapter 8).

### 9002. CONSERVATION LAW ENFORCEMENT

1. Authority. Natural resources laws at MCBQ are enforced by three civilian employees designated as Conservation Law Enforcement Officers (CLEOs). The primary purpose of the CLE program is to ensure compliance with all Federal and Virginia criminal laws and regulations pertaining to natural resources by conducting a full range of investigations and law enforcement techniques resulting in the arrests of persons or parties suspected of such criminal violations.

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2. The CLE staff is responsible for developing a yearly budget that is funded through Land Use and Military Construction (LFL) Branch, Headquarters Marine Corps (HQMC) for:

- a. Procuring, distributing and managing the weapons and ammunition for all Marine Corps CLEOs;
- b. Conducting the initial weapons training and qualification for all new CLEOs within the Marine Corps;
- c. Conducting annual "use of force" training for all Marine Corps CLEOs; and
- d. Acting as training coordinators and liaisons between the Marine Corps and the Federal Law Enforcement Training Center.

3. Jurisdiction. The Marine Corps has entered into a cooperative agreement with the U.S. Fish and Wildlife Service (USFWS) which allows the CLEOs to provide law enforcement support to agencies and lands outside the MCBQ boundaries, including: Quantico National Cemetery (Veterans Administration); Prince William Forest Park (National Park Service); and waters of the Potomac River (National Marine Fisheries). The agreement also includes the rendering of assistance in law enforcement investigations anywhere in the United States when requested by the USFWS Law Enforcement Division.

4. Training. MCBQ CLEOs must attend the Federal Law Enforcement Training Academy, Glynco, Georgia, to comply with the standardized requirements of Navy Marine Corps Directive (NAVMC) 5090.4, Marine Corps Conservation Law Enforcement Order. The CLEOs must comply with all training standards set forth by the Order, and must maintain armor certification for the standard duty weapons they manage for the Marine Corps.

5. Procedures. Basic procedures for processing natural resources violations are provided in Chapter 3 of MCBO P11015.2B, Fish and Wildlife Management Procedural Manual (Appendix B). Most violations are prosecuted in Federal District Court at Alexandria, Virginia. The CLEOs maintain liaison with the United States Attorney's Office and report all case information to the Regional USFWS Office.

6. Security Coordination. The CLEOs conduct liaison with the MCBQ Mission Assurance Office and represent NREA Branch in all meetings or operations concerning security and mission assurance.

### 9003. ANIMAL DAMAGE CONTROL

1. Animal damage control procedures are outlined at Chapter 5 of MCBO P11015.2B, Fish and Wildlife Management Procedural Manual



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(Appendix B). Services for a variety of animal damage problems are available through the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. MCBQ is authorized by a Migratory Bird Depredation Permit (MBDP) #MB047515-0 to take, per limits specified in the permit, Canada geese, ring-billed and herring gulls, black and turkey vultures, and Caspian and common terns. The permit also allows the removal and destruction of Canada goose nests and any eggs contained therein.

2. The CLE and FWA Sections, NREA Branch, implement the removal of migratory birds under the MBDP. The removal of birds protected by the Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) will only be done by NREA personnel per the MBDP or by another authorized permittee, such as the USDA APHIS. The CLE Section obtains other permits from the VDGIF as required to remove deer from the runways at the Marine Corps Air Facility (MCAF) or from the Federal Bureau of Investigation (FBI) Academy. Beavers are trapped and killed by NREA staff, or by authorized trappers, to remove them from sites where their activities are flooding roads and trails. At the MCAF, starlings, pigeons, and English sparrows have caused some nuisance problems in hangars. These species are not protected by the MBTA and can be taken by pellet gun; however, exclusion netting to prevent these species access to ceiling rafters is the preferred solution.

3. Control of mammalian predators is not generally effective to increase reproductive success of ground nesting species such as quail, rabbits and turkeys. However, removal of mammals, such as skunks, foxes, and raccoons, that are particularly susceptible to rabies, may sometimes be necessary to control disease outbreaks. Strange-acting individual animals may need to be dispatched and reported to the appropriate County health department.

4. Ospreys regularly construct nests on power poles and communication towers across MCBQ, particularly Mainside. These nests result in maintenance problems and sometimes cause electrocution of the birds and power outages from transformer damage. MCBQ follows guidelines provided by the VDGIF concerning the removal of osprey nests. March 15 to September 15 is considered osprey nesting period, and nests may be removed outside that time period. Within the nesting period, nests can be removed if there are neither eggs nor nestlings present. The MCBQ NREA wildlife office should be notified of any actions involving an osprey nest.

5. Bird Air Strike Hazards (BASH). MCAF maintains a BASH protocol within their safety office to monitor bird flocks near the runways. Tower personnel advise MCAF ground crews when to use scare devices, water cannons, and vehicles to push birds away from the runways prior to takeoffs and landings. NREA staff members respond as required to implement lethal methods per the

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MBDP to reduce bird congregations at MCAF. Nevertheless, bird strikes involving bald eagles, terns, and gulls have occurred and resulted in damage to aircraft.

9004. CONSERVATION EQUIPMENT. The NREA Branch maintains a large inventory of equipment required for implementing the INRMP. Examples of major equipment maintained by NREA includes: 4X4 trucks; dump trucks; trailers; backhoes; bulldozers; agricultural tractors; chain saws; lawn tractors; weed eaters; Geographic Information System workstations; Global Positioning System equipment; boats/motors; mowing, seeding and tillage attachments for tractors; truck-mounted pumper units for fire management; survey equipment; soil augers; cameras; radios; mechanics tools; power drills and saws; generators; ladders; air compressors; and walk-in refrigerators and freezers. Appropriate Personal Protective Equipment (PPE) is required for most of this equipment. Most FWA and FOR program equipment is acquired by funds derived from sales of fishing/hunting licenses and forest product sales. Most motor vehicles are assigned from the General Services Administration motor pool via the Garrison Mobile Equipment manager.

9005. CVP. A formal volunteer program was established at MCBQ in 1986. Figure 9-3 documents historical participation in that program and indicates the willingness of the public to assist with natural resources management at MCBQ. Volunteers have been allowed to assist Base personnel in almost all natural resources programs, except law enforcement and wildfire suppression. MCBQ policy and procedures for the use of volunteers are provided by the Base order, MCBO 11015.3, "Conservation Volunteer Program." NREA Branch produces a CVP Newsletter to enhance communication, and holds an annual recognition meeting to provide volunteers with non-monetary awards such as plaques and certificates.

### 9006. COMMUNITY OUTREACH

a. Webpage or Social Media. NREA works with the MCBQ Public Affairs Office and G-6 Division to maintain an outdoor section within the MCBQ webpage. However, changes and updates to the webpage often do not occur in a timely manner and better use of technology or social media should be explored to improve communication with patrons. NREA is researching commercial service providers who could manage permitting, daily check-in and -out, and timely communications for dispersed recreation activities.

b. Conservation Education. As work schedules permit, NREA personnel participate in career day, Earth Day, National Public Lands Day, Drug Awareness Resource Education (DARE) Days and

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other community activities on-Base and in the outlying community. NREA maintains taxidermy mounts, aquariums, posters, photo exhibits, study skins, and other items to provide static and mobile displays for these and other community outreach activities.

c. Demonstration Plantings. Backyard garden areas have not been established at MCBQ but could be planted to demonstrate landscaping techniques that are environmentally friendly. These plantings could incorporate "rain-garden" technology that would reduce runoff by using rain-water to irrigate for moist soil plants. Such gardens could serve as demonstration projects at environmental offices, DoD schools, or other designated sites. Both governmental and non-governmental organizations can provide guidance to create backyard wildlife landscapes that are attractive to songbirds and butterflies. In addition, arboretum areas planted to a variety of tree species could be incorporated into the wildlife gardens.

### 9007. GCS

1. GCS operations are responsible for the control of hunting, fishing, and firewood permit sales and control of daily hunting access to the Base. The GCS is currently open a minimum of seven months per year. Annual operation under current hunting guidelines requires about 6,480 man-hours. A local area network (LAN) computer system is maintained to keep a database of all licensed hunters and hunting activities on the installation. A custom software system called "Hunter Tracking System" is in use to provide a telephone answering system and database management system for assigning hunting areas. The current system cannot manage internet-based reservations or license sales. The current system's hardware is nearing operational life.

2. The GCS has a classroom that provides limited space for National Environmental Policy Act (NEPA)-related scoping meetings, training sessions, and presentations. The GCS should be diversified further as an environmental training center to support other Environmental Management System (EMS), natural and cultural resources training and informational programs. Staffing at the GCS was historically done with seasonal Marines, but has, by necessity, transitioned to civilian contractor personnel, student conservation associates and volunteers. Through historical experience, MCBQ has identified a need for future transition to permanent staffing to meet the needs of the programs using the GCS.

3. There is no centralized database maintained at the GCS for MCBQ fishing license and firewood permit buyers. This can pose a hindrance to achieving quality customer support, timely background checks, law enforcement communication, and mission

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assurance goals.

9008. DISABLED SPORTSMAN ACCESS. NREA Branch is committed to providing outdoor recreational access for paralyzed veterans, wounded warriors, and authorized community members who need assistance. NREA works with private organizations and other federal agencies to provide adaptive equipment, support services, and scheduled activities.

9009. LITTER AND VANDALISM. The CVP routinely inspects and cleans fishing access areas and the Wildlife Viewing Area, and litter receptacles have been installed at high use areas. Occasional vandalism occurs and usually involves minor damage to signs and fences. NREA budgets for gloves, trash bags, and occasional replacement parts for fences and signs.

### 9010. PROJECTS/ACTIONS

1. Replace Building 5-9, Game Checking Station. This building is on the demolition list and funding for repairs and sustainment of the building will not be provided. Funding for a replacement Environmental Education Center has been requested. The NREA has identified a need of about 6,800 square feet of interior administrative space and 2,000 square feet of unheated outdoor storage, refrigeration, game cleaning and vehicle maintenance space to meet mission requirements. Military Construction Appropriation (MILCON) dollars for design and construction have not yet been programmed to meet the funding request.

2. Replace Roof and Siding on Building 27132. The thin aluminum cover that is currently on the building should be replaced with a commercial grade of vinyl or aluminum siding/roofing that would enhance the appearance of the building and provide more protection for the materials and equipment inside. Electrical and water service should be extended to the building to provide for security lighting and utilization of power tools.

3. Upgrade Building 27009. This building should be upgraded to include concrete floor, electricity, water, and insulation.

4. Construct Wildlife Garden/Arboretum. One or more demonstration backyard wildlife gardens (such as those certified by the National Wildlife Federation, for example), should be developed as part of the landscape plan at Building 27007, Log Cabin, and at a Mainside site, such as the Whiskey Gulch area near Lejuene, Nicholas, and Biddle Roads .

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5. Maintain grounds at NREA facilities west of I-95. The grass, hedgerows, split rail fencing, parking area, and exterior areas near Buildings 5-9, 27007, 12-9 and 27132 require routine maintenance to sustain the appearance of other Base improved grounds and facilities. NREA personnel currently do the mowing but will require a replacement riding mower, or else have the maintenance taken over by FMS.

6. Inspect and Replace Damaged/Lost Signage. The 300 miles of training area boundaries are inspected on about a two-year cycle and reposted as required by CVP members. An inventory of training area signs, "No Hunting Beyond This Point" signs, and federal property boundary signs are required by NREA so that damaged signs can be replaced.

7. Keep Trail Systems Passable for Foot, Bicycle, or Rescue Vehicles. The 150 miles of woodland trails are to be inspected regularly to remove down trees and limbs. Severe ruts and drainage problems are referred to FMS for heavy equipment repairs. NREA personnel require properly maintained chain saw equipment and requisite safety gear to conduct this project.

8. Maintain Hunting Blinds and Adaptive Equipment. Waterfowl hunting blinds are inspected pre-hunting season to post them with up-to-date licenses and to apply fresh camouflage material. They must be inspected after the last freeze in late winter to evaluate structural damage from ice/high water and to schedule repair work to prepare the blinds for the following hunting season. Deer hunting blinds require regular inspection and maintenance; this includes maintenance and upkeep of wheelchair accessible facilities. Battery replacement is a primary maintenance expense for the Huntmaster and Action Trackchair equipment.

9. Maintain Dams, Spillways and Access to Small Water Bodies. Control woody vegetation around small water bodies to ensure the proper protection and operation of dams and spillways. Conduct mowing to maintain access for shoreline fishing. At Secon Pool, ensure the access road, latrine, signs and parking areas are inspected prior to "kids" fishing days or other special events. Other small water bodies that may require attention include Buffalo Pond, Upshur Pond, Barrett Pond, Middle Branch Pond, R-6 Pond, and South Branch Pond.

10. Update and Replace Damaged Signs. Information and education signs for fishing areas, hunter checkout, deer/vehicle collision warning, and all public use areas need to be kept current and be replaced when damaged.

11. Conduct Law Enforcement Patrols and Criminal Investigations. MCBQ, Virginia and federal fish, game, historic preservation and environmental laws must be enforced. A year-round patrol by

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properly trained and equipped CLEOs must be maintained.

12. Convert Contract Support Positions to Civil Service Billets. FWA is not currently staffed to adequately cover GCS activities in addition to the other mission duties of that section. As a result, NREA has been forced to obtain personnel/services through contracts, CVP, interns and other methods to execute many of the INRMP projects, including operation of the GCS. MCBQ should move to convert contract support positions to permanent civil service hires. Cost analysis suggests this could be cost-effective due to reduction in cost for contract support.

13. Provide Conservation Education Displays for On and Off-Base Community Outreach Events. Educational programs should be enhanced by the development of professional graphic art and taxidermy displays to provide Marine Corps visitors with an appreciation for the diversity of natural resources found on the installation. When the GCS (Building 5-9) is replaced, the new building should include a classroom and natural resources visitor center that serves as a natural history and environmental education center.

14. Conduct Administrative Functions. NREA program administrators must maintain liaison with numerous land management, research, law enforcement and administrative officials within and outside the Base. Additional administrative functions include, but are not limited to: personnel management, Equal Employment Opportunity requirements, land management planning, environmental assessment, property inventory, budget setting, procurement, safety, issuing awards, CVP administration, directives updates, and guest visits.

15. Update and Improve use of Webpage/Social Media for Natural Resources Program Communication. The NREA web-page (outdoor recreation information) requires daily updates during hunting seasons and frequent updates outside hunting season.

16. Procure and Maintain Conservation Equipment. Provide for acquisition, maintenance and repair of NREA owned and operated conservation equipment to continue in-house capability to conduct land and water conservation, biological surveys, habitat management, outdoor recreation, and environmental restoration projects.

17. Replace the Outdated Hunter Tracking System at the Game Checking Station. Replace automated tracking and database system required to manage license sales and provide check-in and -out of personnel utilizing MCBQ lands and waterways for authorized recreational activities.

18. Maintain Small Water Bodies. Provide brush cutting and mowing to control encroaching woody vegetation at small



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waterbodies such as Upshur Pond, Buffalo Pond, Middle Branch Pond and South Branch Pond. Ensure spillways and dams and kept clear of woody growth.

19. Conduct risk assessments and monitoring of bird species, such as bald eagle, that pose greatest BASH risk at MCAF.

9011. WORK PLAN. The five-year work plan for NREA facilities and services is provided at Table 9-2. Cost estimates are provided for materials, supplies, and equipment, but not for labor provided by staff members or volunteers.

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a. Wheelchair accessible hunting blind



b. Successful hunt.



c. Tracked Chair



d. Hydraulic lift hunting stand

Figure 9-1.--Accessible hunting blind and adaptive equipment.

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Figure 9-2.--Examples of signage requirements.



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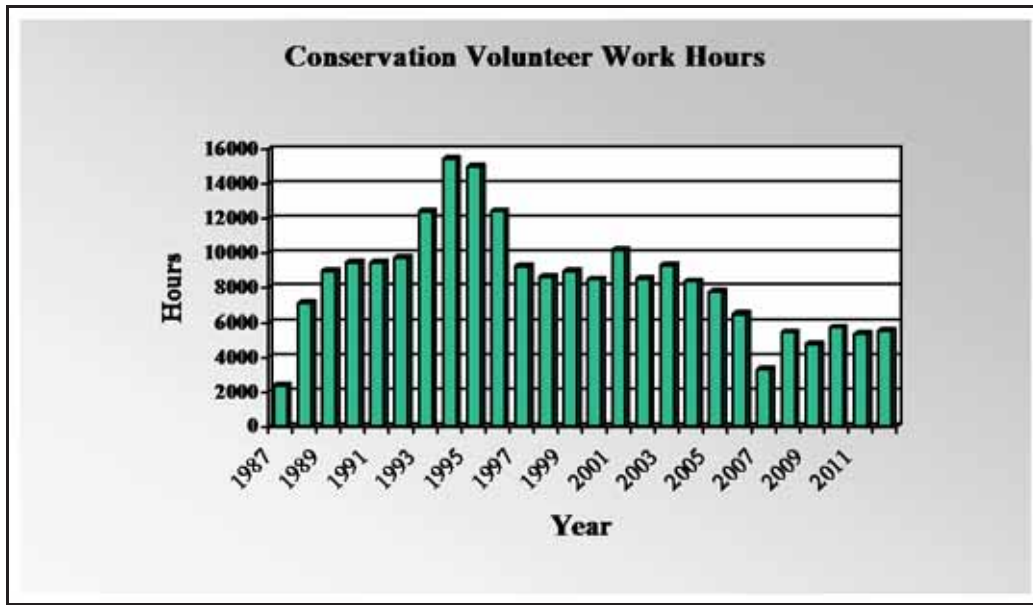


Figure 9-3.—Conservation Volunteer Program work hours (above) and work efforts to construct the archery site.

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Table 9-1. Land management properties of the MCBQ Training Areas.						
Training Area Name	Total Acres	Acres Open to Hunting	Boundary Length (miles)	Trail Length (miles)	Stream Length (miles)	
					Perennial	Intermittent
Mainside	4392	977	17.2	16.8	6.60	5.5
2	1224	568	7.4	Unk	1.24	3.14
3	1162	993	6.4	Unk	2.24	4.06
4&ETA	1213	1015	6.7	Unk	0.40	1.28
5A	1552	1304	7.3	1.70	5.78	3.52
5B	1684	1452	10.1	3.16	0.99	5.47
5C	818	700	8.3	0.37	0.00	0.12
6B	2211	1874	9.0	4.41	5.43	6.39
6C	1531	1517	7.3	2.50	2.74	4.24
7A	1780	1780	8.1	2.29	3.30	4.16
7B	1628	1231	7.9	9.00	3.78	6.76
7C	771	653	8.7	3.37	6.17	1.78
8A	1316	1267	6.2	6.30	2.80	4.50
8B	629	564	4.5	3.00	1.00	0.75
9A	2819	0	9.8	0.00	4.16	8.69
9B	1161	1161	7.3	0.78	2.44	3.22
9C	791	791	5.5	0.45	2.01	2.95
9D	1574	1573	7.2	3.19	1.60	4.10
10A	1978	1977	7.4	3.81	1.70	4.90
10B	968	972	12.9	3.73	0.00	0.00
10C	2030	1673	15	9.82	3.25	3.95
11A	2287	2287	8.9	11.59	4.56	6.65
11B	4352	3980	16.2	9.52	6.10	5.85
12A	434	435	3.9	4.40	1.20	1.60
12B	380	381	3.4	3.20	1.20	1.10
13	1123	1123	6.4	1.08	0.80	3.50

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Table 9-1. Land management properties of the MCBQ Training Areas.						
Training Area Name	Total Acres	Acres Open to Hunting	Boundary Length (miles)	Trail Length (miles)	Stream Length (miles)	
					Perennial	Intermittent
14A	888	902	5.8	3.45	2.14	2.54
14B	1340	1006	6.2	3.93	0.92	5.83
15A	1233	1235	6.6	3.91	3.35	3.99
15B	1325	1325	6.1	2.28	0.60	4.84
15C	874	874	5.8	4.83	1.30	1.80
16A	833	833	5.2	3.87	2.60	1.60
16B	1773	1772	6.7	6.09	1.50	5.20
16C	787	787	5.5	3.64	1.20	1.85
16D	596	596	4.1	0.95	0.70	2.55
16E	1091	1090	5.7	2.08	0.10	3.00
16F	1168	1168	7.2	2.23	1.80	2.10
16G	1869	1868	8.0	5.40	4.23	1.15
17A	555	554	4.5	5.67	5.20	1.05
17B	1148	1148	6.5	4.32	4.25	3.30
17C	191	191	2.6	0.80	0.90	0.30
17 Upshur	336	229	3.1	0.60	0.10	0.90
*TOTAL	57738	47896	306.8	148.48	104.41	133.86

\* Total Area does not include reservoir acres, FBI Academy, and Marine Corps Heritage Center.



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Table 9-2. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVERS, GOALS and PROJECTS	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
DRIVER II: TO SUPPORT AND ENHANCE THE PRESERVATION OF ALL PLANT LIFE ENDEMIC TO THE INSTALLATION						
1. Goal: To provide for the stewardship of fish and wildlife resources by managing the soil, water, vegetation and other natural features to sustain and ensure for future uses quality habitats and diversified biological communities.						
11.Conservation Equipment: procure, maintain, lease, and operate chain saws, boats, tractors/tractor attachments, heavy equipment, adaptive equipment, tools, parts and safety gear necessary to carry out INRMP projects done by staff personnel.	A	30	30	30	30	30
3. Goal: To promote the proper use and protection of fish and wildlife resources through aggressive law enforcement, hunter safety and environmental protection training.						
1. Procure equipment and gear to enforce all Virginia, MCBQ and federal fish, game and environmental laws and issue citations and/or suspensions to violators of those regulations.	A	20	20	20	20	20
2. Operate MCBQ hunter orientation program and support on-Base classes of the Virginia Hunter Safety course.	A	*	*	*	*	*
DRIVER III: TO PRESERVE AND DEVELOP AN OUTDOOR RECREATIONAL PROGRAM.						
1. Goal: To emphasize and develop outdoor recreational programs within the constraints of the military mission.						
14.Procure signage. Post 300 miles of boundaries to identify recreation and training areas and lands having restricted access. Post interpretive & regulatory signage about fishing, boating, trails, natural history, and wildlife hazards.	A	10	10	10	10	10
15.Maintain 150 miles of trails for recreational access, search and rescue, resource inventory, and management.	A	5	5	5	5	5

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Table 9-2. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.						
DRIVERS, GOALS and PROJECTS	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
2. Goal: To promote the morale and welfare of personnel assigned to the installation and the public by providing for their recreational needs related to hunting, fishing, wildlife viewing and natural history study.						
13.Maintain Secon Pool for special youth fishing program.	A	*	*	*	*	*
14.Maintain and license waterfowl blinds for public access.	A	4	4	4	4	4
15.Maintain dams and spillways of impounded waters (brush cutting and mowing).	A	*	*	*	*	*
16.Operate the CVP to augment NREA personnel in the accomplishment of INRMP projects. Provide newsletter, recognition and low-cost service awards.	A	3	3	3	3	3
17.Update license issuance and recreation management software and hardware at GCS for dispersed recreation.	A	0	150	40	20	20
18.Convert contractor positions to GS billets to maintain continuity of operations at the GCS as well as during field seasons.	A	-	-	-	-	-
3. Goal: To promote public relations and education through information management, housekeeping and display of natural resources.						
1. Replace GCS (Building 5-9) with new building that has adequate space for interpretive displays of natural and cultural resources and an environmental training classroom. Not an INRMP funding requirement.	A	-	-	-	-	-
2. Replace roofing/siding and provide electrical supply and lighting at bldg. 27132.	A	5	40	0	0	0
3. Provide flooring and utility upgrades to bldg. 27009.	B	0	15	15	0	0
4. Grounds keeping: ensure adequate staffing/equipment or contracts in place to maintain improved and semi-improved grounds at NREA facilities.	A	1	1	1	1	1
5. Maintain litter collection at public fishing, hunting, hiking and wildlife viewing areas.	A	1	1	1	1	1

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Table 9-2. Summary list of INRMP Drivers, Goals and Projects. "A" priority (PRTY) indicates compliance level and continuation of existing projects. "B" and "C" projects provide a more comprehensive approach to natural resources and environmental management.

DRIVERS, GOALS and PROJECTS	PRTY	Estimated annual cost in \$1,000 increments				
		2015	2016	2017	2018	2019
6. Develop/improve social media, web-sites and telephone answering systems concerning programs, events, seasons, and license sales locations.	A	*	*	*	*	*
7. Promote establishment of wildlife/butterfly gardens in cooperation with science programs at Dependent Schools and VDGIF's Project Wild.	C	2	2	2	1	1
8. Sponsor live raptor programs by Wildlife Center of Virginia to provide on-site wildlife education programs at Dependents Schools.	C	3	3	3	3	3
9. Participate in career day, garden club, or other civic group programs to provide information about MCBQ natural resources programs.	A	*	*	*	*	*
10. Prepare taxidermy mounts, posters, and other conservation education materials.	B	1	1	1	1	1
11. Install rain garden, and tree/shrub hedgerow behind building 27007.	B	10	1	0	0	0
<b>Subtotal for "A" Projects</b>		<b>79</b>	<b>264</b>	<b>114</b>	<b>94</b>	<b>94</b>
<b>Subtotal for "B" Projects</b>		<b>11</b>	<b>17</b>	<b>16</b>	<b>1</b>	<b>1</b>
<b>Subtotal for "C" Projects</b>		<b>5</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>4</b>
<b>TOTAL</b>		<b>95</b>	<b>286</b>	<b>135</b>	<b>99</b>	<b>99</b>

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CHAPTER 10

BUDGET SUMMARY

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

CHAPTER 10

BUDGET SUMMARY

10000. SUMMARY. Chapters 3-9 provided lists of recommended projects and estimated budget requirements to execute this INRMP. The budget requirements for each goal are summarized in Table 10-1.

10001. Natural resources and environmental program funding requirements are programmed into a Standardized Environmental Program (STEP) as well as into the MCBQ local budget process.

TABLE 10-1. BUDGET SUMMARY (Estimated cost in \$1,000 increments)						
DRIVER AND GOAL	PRTY	2015	2016	2017	2018	2019
DRIVER I: MANAGE LAND AND WATER RESOURCES						
Goal 1: Protect Water Quality	A	50	50	50	50	50
	B	67	69	71	73	75
	C	100	100	100	100	100
Goal 2: Integrated Pest Management	A	10	10	35	10	10
Goal 3: Land and Resource Planning	A	0	0	0	0	50
	B	10	10	10	10	10
	C	0	0	0	135	0
Goal 4: GIS and GPS Technology Applications	A	40	40	45	45	50
DRIVER II: ECOSYSTEM MANAGEMENT						
Goal 1: Fish and Wildlife Stewardship	A	85	85	85	85	85
	B	75	75	75	75	75
	C	151	151	151	151	151
Goal 2: Threatened and Endangered Species	A	51	82	86	90	90
	B	15	15	15	15	15
Goal 3: Conservation Law Enforcement	A	20	20	20	20	20

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

TABLE 10-1. BUDGET SUMMARY (Estimated cost in \$1,000 increments)						
Goal 4: Population Surveys & Ecosystem Monitoring	A	146	151	152	158	159
	B	31	36	36	36	36
Goal 5: Plant and Animal Damage Control	A	31	31	31	31	31
	C	50	50	50	50	50
Goal 6: Manage Forest Resources	A	353	407	426	465	484
	B	104	29	4	4	4
Goal 7: Manage and Control Wildfires	A	50	52	45	49	53
	B	25	22	27	32	37
Goal 8: Manage Prescribed Burning	A	36	38	40	43	45
DRIVER III: PROMOTE OUTDOOR RECREATION PROGRAM						
Goal 1: Outdoor Recreation Infrastructure	A	27	67	17	17	17
Goal 2: Implement Dispersed Recreation Programs	A	131	283	178	163	168
	B	36	37	38	39	40
Goal 3: Facilities, Information and Education	A	7	42	2	2	2
	B	11	17	16	1	1
	C	5	5	5	4	4
DRIVER IV: POLLUTION ABATEMENT & ENVIRONMENTAL RESTORATION						
Goal 1: Pollution Prevention, Control, and Countermeasures	A	55	60	60	65	65
TOTAL A PRIORITY						
		1037	1358	1212	1228	1314
TOTAL B PRIORITY						
		374	310	292	285	293
TOTAL C PRIORITY						
		306	306	306	305	305
TOTAL A + B + C PRIORITY						
		1717	1974	1810	1818	1912

APPENDIX A: LAND AND RESOURCE MANAGEMENT AGREEMENTS

Memorandum Of Understanding Between  
Prince William Forest Park and  
Marine Corps Base, Quantico

Watershed Management Plan for Chopawamsic Creek

Watershed Management Plan for Quantico Creek

Merrimac Farm Wildlife Management Area Restrictive Easement

Navy Real Estate Agreements Applicable to  
Marine Corps Base, Quantico

**MEMORANDUM OF UNDERSTANDING  
BETWEEN  
PRINCE WILLIAM FOREST PARK  
AND  
MARINE CORPS BASE, QUANTICO**

This Memorandum of Understanding is made and entered into between the Marine Corps Base, Quantico, Virginia, (hereinafter called MCB) and Prince William Forest Park (hereinafter called PWFP).

*WHEREAS*, the Prince William Forest Park and Marine Corps Base, Quantico, Virginia, represent separate Federal agencies with distinct missions;

*WHEREAS*, these entities own and manage contiguously located land parcels that affect several different watersheds within the Commonwealth of Virginia;

*WHEREAS*, these entities are currently Parties to several separate agreements including the Special Use Permit of 16 March 1972, as amended, and the Watershed Management Plan for the South Fork of the Quantico Creek;

**NOW THEREFORE**, these entities, acting as Parties under the terms of this Memorandum Of Understanding (Memorandum), hereby resolve as follows:

To pursue with all deliberate speed and commitment the mutual goals set forth in this Memorandum; and

To abide by the conditions set forth in this Memorandum unless formal written direction to the contrary is received from their higher headquarters.

**PART ONE: MUTUAL GOALS**

1. Maintain and protect the mission needs of the United States Marine Corps (USMC) Base at MCB Quantico and the mission needs of the National Park Service (NPS) at PWFP.
2. Establish a "green corridor" along the federally owned portion of Route 619 to enhance its integrity as a scenic, two-lane, low speed roadway, which serves as the partial drainage divide between two federally protected watersheds.
3. Establish a mutual plan, which will require higher agency approval and legislation to implement, to revise, and redefine the border between MCB and PWFP in a manner that is designed to better facilitate the autonomous utility of each agency's lands.

4. To abide in the spirit of Public Law 80-736 in proposing legislation and effecting changes to meet the overall goals of this Memorandum.

5. To prepare and sponsor jointly proposed legislation required to implement the Parties' intent and goals to revise the designated border between the Parties' land, to pursue reversionary rights in the land so designated, to substitute this Agreement and implementing legislation as compliance/fulfillment with PL 80-736 and to address jurisdictional and any other remaining issues necessary for successful implementation of this Agreement.

## PART TWO: ACTIONS

1. MCB will designate in its Master Land Use Management Plan (MLUMP) those USMC-owned parcels along route 619 as "no development" and make such other Amendments as are consistent with this Agreement.

2. MCB and PWFP will establish a green corridor zone 300 feet wide on each side of Route 619 along their parcels to ensure integrity of the greenway corridor. The green corridor zone shall not require demolition or revision of existing structures along the current agency-owned corridor nor shall it prohibit either agency from constructing access roads in support of identified mission requirements to ingress and egress internal parcels. Every effort will be made to limit the number of access roads constructed through coordination of planning and review of access road proposals by both agencies.

3. MCB will pursue alternative actions in lieu of construction of an on-site landfill west of I-95 in the northern training areas.

4. MCB/PWFP will individually and jointly pursue, through their chain of command, a land plan designed to round out the borders of each agency's property according to the map set forth in Attachment A hereto and to eliminate special use permitted land in favor of single agency land ownership and use. Recognizing that successful pursuit of such actions requires higher level agency approval and legislation, the Parties agree to coordinate and communicate their collective and individual progress in pursuing higher level approvals.

5. PWFP will amend its General Management Plan (GMP) to reflect a new course of action premised upon pursuit and completion of this Memorandum. The GMP process will serve as the Park's forum for presenting this Agreement to the public.

6. MCB/PWFP will develop jointly a Watershed Management Plan for those portions of the Chopawamsic Creek Watershed flowing through lands under the jurisdiction of PWFP.

7. MCB/PWFP will develop a Joint Recreation Plan for use of Breckenridge Reservoir and address issues of visitor access to Breckenridge.



8. MCB/PWFP will update and amend the Watershed Management Plan for the South Fork of the Quantico Creek as set forth in Part IV of this Agreement.

### PART THREE: CONDITIONS

1. Any legislative recommendation for a land plan to round out the borders of each agency's property must include the use of reversion clauses such that if either agency no longer has a need for the land it secures from the other as part of this process for "rounding out of borders," and such land becomes excess to the needs of the gaining party/agency, that such land shall revert to the prior owner-agency at no cost for its use in meeting its agency mission requirements. Only if that agency then declares the land "excess" to its needs may sale, disposal, or use of same under federal property disposal rules proceed.
2. To ensure adequate, timely notification at the local level for all joint issues and to ensure coordination of actions to resolve issues at the local level, whenever possible, the Parties have agreed that no proposal for the land plan set forth in Attachment A to round out each agency's borders through transfer, new survey, or any other means shall be presented through the agency's chain of command or to personnel in other agencies, organizations, or the public unless the Parties to this Agreement have discussed the substance and boundaries of such proposal and either agreed upon same or defined the points on which they have "agreed to disagree" in advance and in writing.
3. NPS and USMC personnel will work together in preparing and approving joint interpretive items and conducting research of key archaeological sites.
4. The current Watershed Management Plan, as proposed for revision, shall serve as the model for format and substance of the plan to be established for the Chopawamsic Creek Watershed Management Plan.

### PART FOUR: REVISIONS TO CURRENT WATERSHED MANAGEMENT PLAN

Recognizing the protected nature of the Quantico Creek Watershed, the Parties have resolved to make the following changes to the language in their current Quantico Creek Watershed Management Plan :

1. Amend Part II, D., page 2, by substituting the following for the current language:

Forest Management will be carried out in accordance with the Virginia Best Management Practices and fulfillment of Marine Corps Order P5090.2. The Secretary of Interior, or his designee, shall be notified in advance of any proposed logging operations. The intent of forest management within the watershed shall be to protect and maintain water quality and to maintain the forest cover in this watershed to the maximum extent practicable. When forest



clearing/logging operations are proposed within the watershed, the management restrictions outlined below will be followed to minimize resource damage:

a. Hardwood silviculture will employ a wide variety of even and uneven aged management systems. The use of clear-cutting will be minimized except in cases involving insect, disease, or weather-related damage. Reforestation may be supplemented by planting, especially where necessary for erosion control, but will normally be accomplished by natural regeneration.

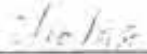
b. Even-aged management, specifically, clear-cutting for final harvest, will be used to manage pine stands. Special care will be taken concerning spatial distribution and size of units, with any clear-cutting limited to 25 acre units or less and 20% of the total pine acreage per forest compartment at each ten year entry interval within the watershed absent any catastrophic event. Reforestation will normally be accomplished by replanting.


c. Forest clearing may be employed where necessary to enhance military training (e.g., for areas like landing zones) but BMPs will be used to stabilize any cleared areas. These areas will be returned to forest cover as soon as practicable when they are no longer required for such training use.

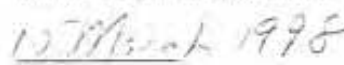
2. Amend Part II, H., page 2, by substituting the following for the current language:

Construction of permanent structures and roads in the South Fork Quantico Creek Watershed area will be limited to that which directly supports field training operations specifically conducted by the Marine Corps and authorized by the Commanding General, Marine Corps Base, Quantico. The Secretary of the Interior or his designated representative shall be notified in advance of any proposed logging operations or projects that will result in forest clearing within the Quantico Creek Watershed and invited to participate in appropriate scoping, environmental planning, and Environmental Impact Review Board meetings. Construction will be conducted in accordance with applicable federal and state guidelines. Clearing of wooded areas for construction will be kept to a minimum.

  
ROBERT HICKMAN  
Superintendent  
Prince William Forest Park

  
Date

  
F. C. WILSON BGen USMC  
Commanding General  
Marine Corps Base, Quantico

  
Date

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**WATERSHED MANAGEMENT PLAN  
FOR  
THE CHOPAWAMSIK CREEK AREA OF PRINCE WILLIAM FOREST PARK**

This Watershed Management Plan for Chopawamsic Creek is applicable to the lands and waters of the Chopawamsic Creek watershed that occur within the defined land area of Prince William Forest Park (PRWI). For purposes of this Management Plan, the affected watershed shall be defined and limited to those watershed areas on lands being retained by or transferred to the Department of the Interior as referenced by Public Law 107-314 (Dec. 2, 2002). This area is delineated on the attached map titled "Chopawamsic Creek Watershed-PRWI". The boundaries of Prince William Forest Park within this watershed encompass an area of approximately 1700 acres that lie south of State Route 619.

I. Objective

The Departments of Navy and Interior share a common concern for the quality of the water resources of the Chopawamsic Creek area flowing through PRWI through mutual recognition of the Creek's value as a federally protected resource as well as its use as a drinking water source when it flows into the Breckenridge Reservoir. The objective of the Watershed Management Plan is to protect the water resources of the Chopawamsic Creek Watershed.

II. Provisions

The Piedmont soils in this area of the Chopawamsic Creek watershed tend to be erodible and are vulnerable to sedimentation. In order to reduce the likelihood of sedimentation and/or other forms of pollution to Chopawamsic Creek while providing a suitable environment for the respective missions of the PRWI and the Marine Corps Base, Quantico (MCBQ), the following provisions for the management of the watershed are hereby established:

A. Water quality, including the level of sedimentation, nutrients, heavy metals, and fecal bacterial analyses will be monitored by both agencies when conditions indicate cause for concern or it is mutually agreed that sampling is needed. MCBQ will monitor water flowing onto park land and PRWI will monitor water at the outflow into Breckenridge Reservoir. The two agencies will work together to effect an immediate solution to any water quality problems that may occur. Water quantity shall not be impeded for either ground or surface water flows which could adversely impact terrestrial or aquatic resources except for dam maintenance and repairs which shall be done to minimize impacts on terrestrial or aquatic resources.

B. The use of pesticides and other chemicals by PRWI will be evaluated through the National Environmental Policy Act (NEPA) process and MCBQ will be included in such NEPA processes and determinations. The types of products used and methods of



application shall be in accordance with applicable Department of the Interior, Environmental Protection Agency (EPA) and State standards, laws, and regulations. The list of products which may be applied will be updated at the semi-annual meetings held pursuant to this Management Plan.

C. The release of petroleum products or other chemical or regulated wastes into the Chopawamsic Creek Watershed shall be prohibited. Accidental spillage of any significant amount of chemicals and/or fuel will be cleaned up immediately and MCBQ will be notified. Reasonable measures will be taken to prevent unauthorized dumping and littering.

D. Vegetative management, tree clearing, and other land disturbing activities will be carried out in accordance with NEPA and Virginia Best Management Practices (BMPs). The intent of vegetation management within the watershed shall be to maintain native forest communities to the maximum extent practicable.

E. No agricultural out-leasing will be permitted in the watershed.

F. Special precautions will be taken to monitor the area for wildfires during the fire seasons and during drought or other high risk fire danger periods. PRWI will notify MCBQ immediately upon the discovery of a wildfire and at least 48 hours in advance of any prescribed or controlled burn. Wildfires will be suppressed immediately using appropriate fire fighting methods that protect water resources and minimize erosion and sedimentation.

G. PRWI shall notify MCBQ of planned facilities and construction and/or the development of new recreational activities and shall invite MCBQ representatives to attend subsequent NEPA scoping meetings. Construction will be conducted in accordance with applicable federal and state guidelines. Clearing of wooded areas for construction will be kept to a minimum.

H. Subject to the availability of funding, existing paved roads and roads with graded improved surfaces will be maintained in accordance with the State Highway Standards. Unimproved dirt roads, paths, and trails over which vehicles travel will be maintained in accordance with the BMPs for Forestry as outlined in Virginia's Forestry Best Management Practices for Water Quality, (VA Dept. of Forestry, 4th ed. 2002). Vehicle travel through wooded areas not containing a road, path, or trail will be prohibited, except for emergency use as required for fire fighting, ambulance services or law enforcement. Where vehicle use has detrimental effects on water quality, immediate corrective action will be taken and MCBQ will be notified of the action.

I. Significant cultural and/or natural resources known to exist or later discovered in the area herein defined shall be protected and maintained for possible future study.

J. The Secretary of the Navy or his designated representative will be notified in advance of the proposed establishment of any utility corridor.

K. PRWI shall take necessary actions to maintain the 300 foot "green corridor" as set forth in the PRWI/MCB Quantico Memorandum of Understanding dated 10 March 1998.

L. Extirpated native fish and other species may be considered for restoration to the watershed if all of the following conditions are satisfied:

1. Adequate habitat to support the species either exists or can reasonably be restored in the park and, if necessary, also on adjacent public lands and waters and, once a natural population level is achieved, the population can be self-perpetuating.
2. The species does not, based on an effective management plan, pose a serious threat to the safety of people in parks, park resources or persons or property outside park boundaries.
3. The genetic type used for restoration most nearly approximates the extirpated genetic type.
4. The species disappeared, or was substantially diminished, as a direct or indirect result of human-induced change to the species population or the ecosystem.
5. PRWI and MCBQ officials are notified prior to the restoration of fish species.

M. Waters in the entire Chopawamsic Creek watershed will be considered for continued traditional stocking with hatchery-reared trout for put-and-take recreational purposes on MCBQ property only if stocked fish are contained in the portion of the watershed under the control of MCBQ and the species stocked does not, based on an effective management plan, pose a serious threat to the safety of resources within MCBQ, PRWI, or property outside MCBQ and PRWI jurisdictional boundaries. PRWI and MCBQ officials will notify each other prior to the stocking of fish.

### III. Administration

A. It is understood and agreed that the Superintendent of PRWI is the designated representative of PRWI and the Commander, Marine Corps Base, Quantico is the representative of MCBQ.

B. An authorized representative of the Commander, MCB, Quantico will be allowed access for routine inspection of the watershed. Requests for joint research studies and projects with outside partners within the watershed will be given appropriate consideration on a case by case basis. Access/admittance from or through MCBQ will be coordinated with the MCBQ, principally, the Range Management Branch.

C. PRWI and MCBQ will hold semiannual meetings to exchange information and address any concerns relative to this Management Plan. PRWI and MCBQ will maintain a continuing dialogue concerning significant environmental problems that may occur, including wildfires, forest pests, etc., within the watershed. In addition;

1. Semiannual meetings will be conducted in April and October.
2. PRWI and MCBQ shall be NEPA scoping partners for proposed federal actions



of either party affecting the watershed.

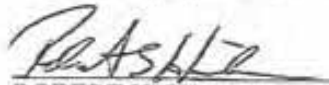
3. At the semiannual meetings held in April and October, PRWI and MCBQ shall exchange information identifying approved pesticides, herbicides, and other chemical products that may be applied in the watershed management area.

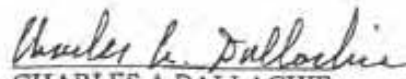
D. In accordance with Public Law 107-314, § 2835(c)(1) and the Agreement to Transfer Administrative Jurisdiction of Land dated 22 September 2003, should the Department of Interior at any time determine that there is no longer a need for the acreage within the Chopawamsic Creek watershed for its purposes, and should such acreage be determined excess, it will be offered to the Department of Navy/United States Marine Corps.

E. The Superintendent of PRWI, acting on behalf of the Department of the Interior and the Commander, Marine Corps Base, Quantico, acting on behalf of the Department of Navy, by their signatures below, approve the provisions of this Management Plan, to be effective as of the date of the last signature affixed hereto. The signatories represent that they have full authority to execute this Management Plan on behalf of their respective Departments. This Management Plan will be reviewed at least every five years. If, upon such review, the parties mutually agree to amend this Management Plan, any such amendment will be reduced to writing and signed by both parties. This Management Plan has no expiration date and shall continue in effect until the parties mutually agree otherwise, as evidenced in writing.

F. This Management Plan is subject to the availability of appropriated funds.

G. This Management Plan may be signed in one or more identical counterparts, whether transmitted by telecopier or otherwise. Each counterpart shall be deemed an original for purposes of this Management Plan.

  
ROBERT HICKMAN  
Superintendent  
Prince William Forest Park

  
CHARLES A DALLACHIE  
Colonel, U.S. Marine Corps  
Commander  
Marine Corps Base, Quantico

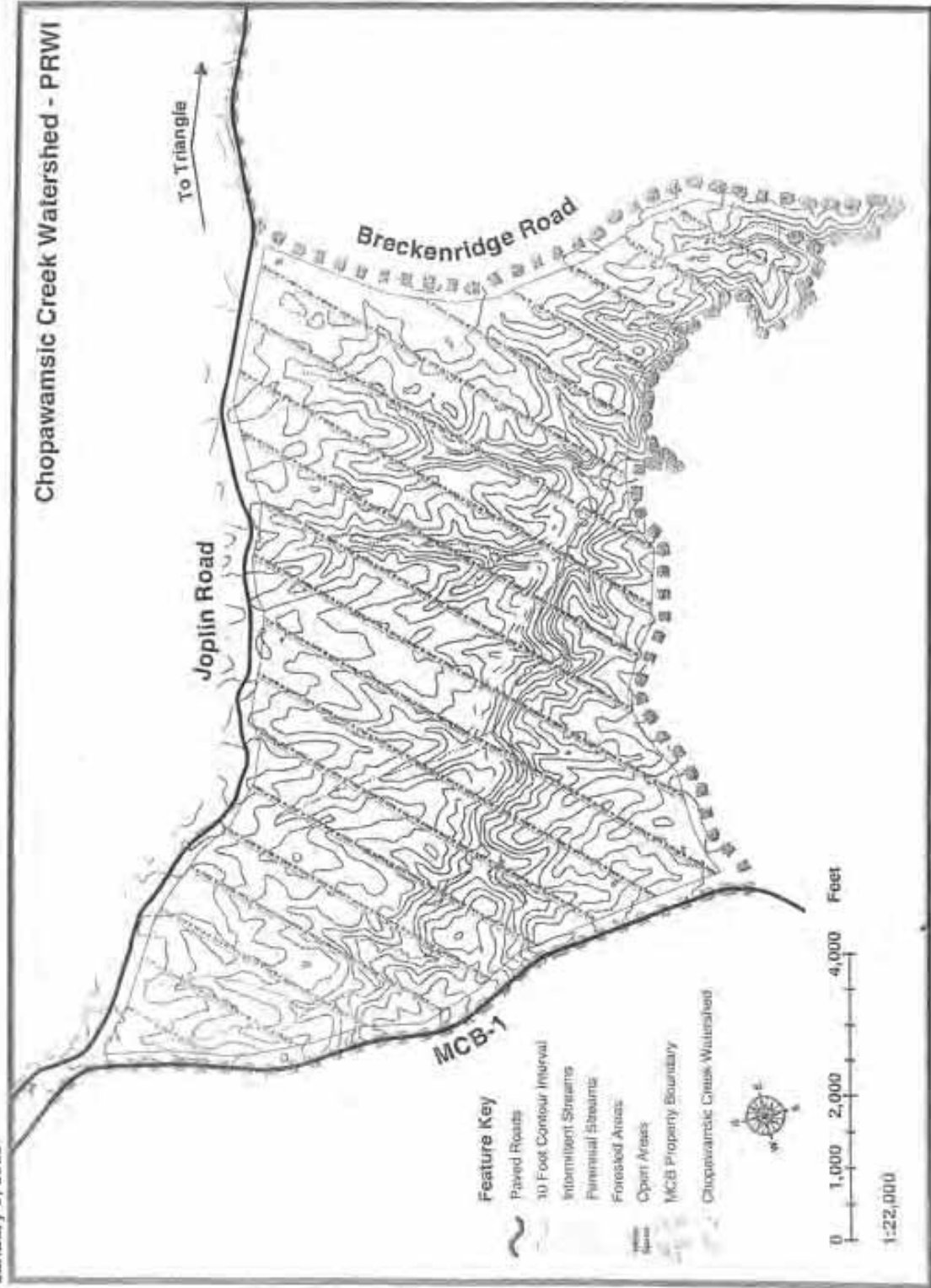
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January 6, 2005

# Chopawamsic Creek Watershed - PRWI



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**WATERSHED MANAGEMENT PLAN  
FOR  
SOUTH FORK QUANTICO CREEK AT THE  
MARINE CORPS BASE, QUANTICO, VIRGINIA**

The Quantico Creek watershed is defined as including those areas of drainage as outlined by the 1983 U. S. Geologic Survey Mylar. Approximately fifty-seven percent of the Quantico Creek watershed lies within the boundaries of Prince William Forest Park (PRWI). Approximately thirty percent (3,500+ acres) of the Quantico Creek watershed lies within the Marine Corps Base, Quantico (MCBQ) on land adjacent and west of the park. The area of the Quantico Creek watershed on MCBQ property is primarily the South Fork Quantico Creek watershed ("South Fork watershed").

Public Law 107-314, dated 2 December 2002, directed the transfer over jurisdiction land areas within the South Fork watershed from PRWI to the MCBQ. This transfer has occurred, and, for purposes of this Management Plan, the South Fork watershed is delineated on the attached map titled "South Fork Watershed." Although the headwaters of South Fork Quantico Creek are on privately owned land outside of federal government jurisdictional control, the watershed of the South Fork runs through land under the jurisdictional control of MCBQ. Activities by MCBQ in the South Fork watershed can directly affect the water quality of Quantico Creek as it enters PRWI.

The Department of Interior is mandated to protect the resources of PRWI in order to provide recreational opportunities in a natural setting. PRWI represents a prime example of a protected watershed in a Piedmont Hardwood Forest that is utilized by educational institutions and scientists for the study of a natural stream ecosystem.

**I. Objective**

The objective of this Management Plan is to set forth requirements to ensure the protection of the Quantico Creek watershed, with emphasis on the South Fork watershed.

**II. Provisions**

Quantico Creek is surrounded by land with Piedmont soils. These soils are highly erodible, fragile, and vulnerable to sedimentation. In order to reduce the likelihood of damage to Quantico Creek, primarily the South Fork watershed, while providing a suitable military training environment, the following provisions for the management of the Quantico Creek watershed are hereby established:

- A. Water quality, including the level of sedimentation, nutrients, heavy metals, and fecal bacterial analysis, will be monitored where Quantico Creek crosses Route 619 by both agencies when conditions indicate cause for concern or it is mutually agreed that sampling is needed. The two agencies will work together to affect an immediate



solution to any water quality problems that may occur. Water quantity shall not be impeded for ground and/surface water flows which could adversely impact terrestrial or aquatic resources.

B. Activities conducted within the Quantico Creek watershed shall be consistent with the Department of Navy policy regarding implementation of the Chesapeake Bay Protection Act, the National Environmental Policy Act (NEPA), and all other applicable federal and state laws and regulations.

C. The use of pesticides and other chemicals within the South Fork watershed will be evaluated through the NEPA process and PWRI will be included in such NEPA projects and determinations. The types of products used and methods of application shall be in accordance with applicable Department of Defense (DoD), Environmental Protection Agency (EPA), and State standards and regulations. The list of products, which may be applied, will be updated at the semi-annual meetings held pursuant to this Management Plan.

D. The release of petroleum products or other chemical or regulated wastes into the Quantico Creek watershed shall be prohibited. Accidental spillage of any significant amount of chemicals and/or fuel within the watershed will be cleaned up immediately and PRWI officials will be notified within 48 hours of the release. Reasonable measures will be taken to prevent unauthorized dumping and littering.

E. Forest Management in the South Fork watershed will be carried out in accordance with the Virginia Best Management Practices (BMPs) and fulfillment of Marine Corps Order P5090.2A. The Secretary of the Interior, or his designee, shall be notified in advance of any proposed logging operations. The intent of forest management within the watershed shall be to protect and maintain water quality and to maintain the forest cover in this watershed to the maximum extent practicable. When forest clearing/logging operations are proposed within the watershed, the management restrictions outlined below will be followed to minimize resource damage:

- (1) Hardwood silviculture will employ a wide variety of even and uneven aged management systems. The use of clear-cutting will be minimized except in cases involving insect, disease, or weather-related damage. Reforestation may be supplemented by planting, especially where necessary for erosion control, but will normally be accomplished by natural regeneration.
- (2) Even-aged management, specifically, clear-cutting for final harvest, will be used to manage pine stands. Special care will be taken concerning spatial distribution and size of units, with any clear-cutting limited to 25 acre units or less and 20% of the total pine acreage per forest compartment

at each ten year entry interval within the watershed absent any catastrophic event. Reforestation will normally be accomplished by replanting.

Forest clearing may be employed where necessary to enhance military training (e.g., for areas such as landing zones) but BMPs will be used to stabilize any cleared areas. These areas will be returned to forest cover as soon as practicable when they are no longer required for such training use.

F. No agricultural out-leasing will be permitted in the watershed.

G. Special precautions will be taken to monitor the South Fork watershed area for wildfires during the fire season and during drought or other high-risk fire danger periods, as well as during training exercises in which flares or other incendiaries are utilized. Wildfires will be suppressed immediately using appropriate firefighting methods that protect the water resources and minimize erosion and sedimentation. PRWI will be notified immediately upon the discovery of a wildfire. MCBQ will notify PRWI at least 48 hours in advance of any controlled burns in the watershed.

H. No ordnance destructive to the water resources will be used in the South Fork watershed. Deliberate use of forest resources as targets within the South Fork watershed will be limited to specified areas of specialized training such as the Combat Village area. Flares (training pyrotechnics) and tear gas may be used as required for Marine Corps training purposes.

I. Construction of permanent structures and roads in the South Fork watershed will be limited to that which directly supports field training operations specifically conducted by the Marine Corps and authorized by the Commander, MCB, Quantico. The Secretary of the Interior or his designated representative shall be notified in advance of any proposed logging operations or projects that will result in forest clearing within the South Fork watershed and invited to participate in appropriate scoping, environmental planning, and Environmental Impact Review Board meetings. Construction will be conducted in accordance with applicable federal and state guidelines. Clearing of wooded areas for construction will be kept to a minimum.

J. Subject to the availability of funding, existing paved roads and roads with graded improved surfaces within the South Fork watershed will be maintained in accordance with the State Highway Standards. Unimproved dirt roads, paths, and trails over which vehicles travel will be maintained in accordance with the BMPs for Forestry as outlined in Virginia's Forestry Best Management Practices for Water Quality, (VA Dept. of Forestry, 4th ed. 2002). Vehicle travel through wooded areas within the South Fork watershed not containing a road, path, or trail will be kept at the minimum level necessary for Marine Corps training purposes. Where vehicle use has detrimental effects on water quality, immediate corrective action will be taken.

K. The Secretary of the Interior or his designated representative will be notified in



advance of the establishment of any utility corridors in the watershed.

L. Extirpated native fish and other species may be considered for restoration to the watershed if all of the following conditions are satisfied:

1. Adequate habitat to support the species either exists or can reasonably be restored on MCBQ land, in PRWI, and, if necessary, also on adjacent public lands and waters and, once a natural population level is achieved, the population can be self-perpetuating.

2. The species does not, based on an effective management plan, pose a serious threat to the safety of people in parks, park resources or persons or property outside park boundaries;

3. The genetic type used for restoration most nearly approximates the extirpated genetic type.

4. The species disappeared, or was substantially diminished, as a direct or indirect result of human-induced change to the species population or the ecosystem.

5. PRWI and MCBQ officials will notify each other prior to the stocking of fish species.

M. Settling ponds to contain sediments resulting from military use of the South Fork watershed will be provided as necessary according to specifications outlined in the Virginia Erosion and Sediment Control Handbook.

N. MCBQ shall take the necessary actions to maintain the 300 foot "green corridor" as set forth in the PRWI/MCB Quantico Memorandum of Understanding dated 10 March 1998.

### III. Administration

A. It is understood and agreed that the Superintendent of PRWI is the designated representative of the Secretary of the Interior as referred to in the above provisions. The Commander, MCB, Quantico is the representative of the Secretary of the Navy.

B. Subject to any reasonable safety and security concerns, the Secretary of Interior, or his authorized representative, will be allowed access for routine inspection of the watershed. Access/admittance will be coordinated with the MCBQ, principally via the Range Management Branch.

C. An exchange of information shall be maintained between MCBQ and PWRI. PRWI and MCBQ will hold semiannual meetings to exchange information and address any concerns relative to this Management Plan. PRWI and MCBQ will maintain a continuing dialogue concerning significant environmental problems that may occur, including wildfires, forest pests, etc., within the watershed. Requests for joint research studies and projects between the parties and/or with outside partners involving the watershed will be given appropriate consideration on a case-by-case



basis. In addition;

1. Semiannual meetings will be conducted in April and October.
2. PRWI and MCBQ shall be NEPA scoping partners for proposed federal actions of either party affecting the South Fork watershed.
3. At the semiannual meetings held in April and October, PRWI and MCBQ shall exchange information identifying approved pesticides, and other chemical products that may be applied in the watershed management area.

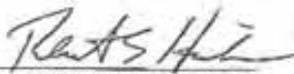
D. In accordance with Public Law 107-314, § 2835(c)(2) and the Agreement to Transfer Administrative Jurisdiction of Land dated 22 September 03, should the Department of Navy at any time determine that there is no longer a need for the approximately 3,500 acres in the watershed of Quantico Creek for its purposes, and it is declared excess, it will be offered to the Department of Interior.

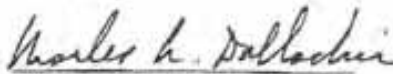
E. Cultural resources known to exist in the South Fork watershed shall be protected in accordance with all applicable federal laws.

F. The Superintendent of PRWI, acting on behalf of the Department of the Interior and the Commander, MCB, Quantico, acting on behalf of the Department of Navy, by their signatures below, approve the provisions of this Management Plan, to be effective as of the date of the last signature affixed hereto. The signatories below represent that they have the full authority to execute this Management Plan on behalf of their respective departments. The Management Plan will be reviewed at least every five years. If, upon such review, the parties mutually agree to amend this Management Plan, any such amendment will be reduced to writing and signed by both parties. This Management Plan has no expiration date and shall continue in effect until the parties mutually agree otherwise, as evidenced in writing.

G. This Management Plan is subject to the availability of appropriated funds.

H. This Management Plan may be signed in one or more identical counterparts, whether transmitted by telecopier or otherwise. Each such counterpart shall be deemed an original for purposes of this Management Plan.

  
ROBERT HICKMAN  
Superintendent  
Prince William Forest Park

  
CHARLES A DALLACHIE  
Colonel, U.S. Marine Corps  
Commander  
Marine Corps Base, Quantico

3 October 06  
Date

3 October 06  
Date

South Fork Watershed

January 6, 2006



**RESTRICTIVE EASEMENT**

**THIS GRANT OF EASEMENT**, made this 16<sup>th</sup> day of January, 2008, by and between The Commonwealth of Virginia, acting by and through the Virginia Department of Game and Inland Fisheries (hereinafter referred to as "Grantor") and The United States of America, acting by and through the Department of the Navy (hereinafter referred to as "Government").

**WITNESSETH:**

**WHEREAS**, Grantor is owner of certain real property located in Prince William County, Virginia and more particularly described in Exhibit "A" attached hereto and incorporated by this reference (the "Property"); and

**WHEREAS**, the Property is adjacent to or in the vicinity of the Marine Corps Base (MCB) Quantico, VA (the "Installation"); and

**WHEREAS**, Government seeks to limit development and use of property that could be incompatible with the mission of the Installation, and to preserve certain habitat, including, but not limited to, wetlands; and

**WHEREAS**, the Government and the Grantor entered into an agreement pursuant to 10 U.S.C. Section 2684a to acquire interests in property in the vicinity of the Installation in order to limit encroachment on military training, testing, and operations and otherwise meet the objectives of the Government and the Grantor.

**NOW THEREFORE**, in consideration of One Million Four Hundred Twenty Nine Thousand Seven Hundred Fifty Dollars (\$1,429,750.00) and the mutual covenants, terms, conditions and restrictions contained herein, Grantor hereby grants and conveys to the Government a conservation and restrictive easement (the "Easement") in perpetuity over the Property described in Exhibit "A", of the nature and character and to the extent set forth herein.

**1. Purpose.** It is the purpose of this Easement to prevent any improvement, development or use of the Property except as otherwise set forth herein, and to allow the Government to preserve, restore, enhance and/or create wetlands and to place such wetlands into an approved mitigation bank for the benefit of the Government, all in order to limit encroachment or negative impacts on military training, testing, and operations.

**2. Rights of Government.** To accomplish the purpose of this Easement, the following rights are conveyed to the Government by this Easement:

- a. To prohibit any development or use of the Property that would encumber, impede, limit or otherwise be incompatible with the purpose of this Easement, and to require



the restoration of such areas or features of the Property that may be damaged by any inconsistent activity or use, pursuant to Section 6.

- b. To enter upon the Property on an annual basis in order to monitor Grantor's compliance with terms of this Easement or at any time upon an event of non-compliance with the terms of this Easement to enforce the terms of this Easement; provided that Government will provide at least ten (10) days notice of such entry to Grantor, except when there is a threat of imminent harm of personal injury or property damage. Government shall not unreasonably interfere with Grantor's use and quiet enjoyment of the Property;
- c. To erect and maintain a sign or other appropriate marker in a prominent location on the Property, at a location agreeable to Grantor and Government, visible from a public road, bearing information indicating the Property is protected by Government. Grantor and Government shall determine the wording of the sign or marker jointly. The Property will be posted to indicate that it is protected by Government under this Restrictive Easement. Government shall be responsible for the costs of erecting and maintaining such sign or marker. If the sign or marker is not properly maintained in good condition, Grantor will notify Government. If the condition is not restored within ninety (90) days after notice, Grantor may remove the sign.
- d. To preserve, restore, or create wetlands, and to participate in wetland mitigation banking pursuant to applicable federal and state standards, including the rights to cause the preservation, restoration, or creation of wetlands, or to obtain, transfer, or assign wetland mitigation banking debits or credits to non-commercial federal purposes only, and reasonable access to and occupancy of the property for these purposes. This right shall pertain to 115 acres identified in the drawing Proposed MCB Wetland Mitigation Bank Land Parcels of Merrimac Farm dated March 2007 attached hereto and made a part hereof, and to additional areas as may be agreed to in writing by the Grantor and the Government.

**3. Restricted Uses and Development Rights.** Any activity or use of the Property by Grantor or Government inconsistent with the purpose of this Easement is prohibited. Without limiting the generality of the foregoing, the following activities and uses are expressly prohibited:

- a. Land Use Activities EXCEPT agriculture and farming, passive recreational uses, hunting and fishing and Silviculture, Grazing, and Use of Natural Resources (as these terms are defined below).
  - i. Agriculture and Farming. "Agriculture and farming" means all methods designed to produce and manage crops, and the farming activities of feeding and housing reasonable numbers of farm animals, such as cattle, goats, and horses, including, without limitation, the construction of new (and maintenance and restoration of existing) structures for the housing of farm animals or storage of farm equipment and not inconsistent with the restrictions contained in this paragraph (i.e. setbacks, height limits, lighting, etc.) or the purposes of this

Easement. Notwithstanding the right to construct such buildings, Grantor is subject to the notice of construction provisions set forth herein.

ii. Hunting and Fishing. Public hunting and fishing conducted in accordance with rules and regulations as prescribed by the Virginia Department of Game and Inland Fisheries is permissible on the Property. Virginia Department of Game and Inland Fisheries hereby agrees that they will not implement any hunting and fishing rules and regulations for the property that may affect military training at Marine Corps Base Quantico without first consulting with and receiving the concurrence of the Base Commander.

iii. Passive Recreational Use. "Passive recreational use" means all public recreational activities (such as but not limited to hiking, bird watching, fishing, hunting and camping limited to the public use by the Grantor), that require no surface alteration or other development of the land, and not inconsistent with the restrictions contained in this paragraph or the purposes of this Easement.

iv. Silviculture, Grazing, and Use of Natural Resources. "Silviculture, Grazing, and Use of Natural Resources" means all silvicultural, grazing, and other exploitation of the Property's natural resources, including but not limited to, timber harvesting, mechanical and chemical site preparation, reforestation, and all other activities associated therewith provided such uses are not inconsistent with the restrictions contained in this paragraph or the purposes of this Easement.

- b. Human Habitation. The Property may not be used for human habitation, including but not limited to temporary accommodations such as cabins, trailers, RVs, tents, etc., EXCEPT for those structures and improvements existing on the date this Easement is executed, all as described in Exhibit "B" attached hereto and incorporated herein. In any event, Grantor may repair, remodel and maintain the existing structures on the Premises listed on Exhibit "B", and any others that are approved under the terms of this Easement. Under this provision, Grantor may rebuild, remodel or repair the home or any structure authorized herein if damaged or destroyed as a result of any cause, provided that the rebuilt structure does not violate the setback, height and lighting restrictions herein and complies with all local and state permitting and zoning requirements and is otherwise consistent with the purpose and intent of this Easement. In the case of the home and the guest residence, such structures are intended and limited to use as a single-family residence or for agency or cooperator related office use. Grantor also reserves the right to construct and pave the driveway(s) to these pre-existing structures. Notwithstanding any provisions to the contrary contained herein, the Property may be used for occasional, short-term non-commercial overnight camping for educational and youth groups.
- c. Height Restrictions. The erection, construction, installation, alteration or growing, whether public or private, of any structure, building, antenna, tower, wire, tree or other obstruction, whatever its nature, extending more than 120 feet above ground level (AGL) is prohibited. At Government's cost and expense, and upon prior notice



to Grantor, the Government reserves the right to enter upon the Property to cut down, top or trim all trees, plants, vines, and like obstructions not in conformance with this Easement. At Grantor's cost and expense, and free from any consequential damages, Government may enter upon the Property to alter or remove all structures, buildings, antennas, towers, or other non-vegetative obstructions, whatever their nature, extending more than 120 feet AGL, which shall be erected, constructed or installed on the Property by or on behalf of Grantor from and after the date of this Easement.

- d. Lighting. All lighting equipment, to include floodlights and searchlights, and all protective lighting, such as streetlights, shall have positive optical control so that no direct light is emitted above the horizontal plane and located so that lighting does not interfere with military training activities on the Installation.
- e. Other Operational & Training Hazards. No operations of any type are permitted that produce smoke, glare or other visual hazards, or encourage concentrations of birds such as feeding stations or mature crops left un-harvested, that may pose a danger to aircraft operating from the Installation. Controlled burns for agricultural purposes, habitat improvement and mitigation of fire hazards must be agreed to in writing by all parties to this Easement prior to commencing said activities. The burning of reasonable amounts of yard debris is permitted without prior notification.
- f. Construction. New construction of any structure or edifice, and any other additions to, or alterations of the Property are prohibited except for those improvements or alterations deemed to be reasonably necessary to the allowed uses of the Property (including the rebuilding of structures after loss or damage by casualty) defined within this paragraph, and excepting the pre-authorized improvements described in Exhibit "B". Grantor shall provide Government written notice of the intention to undertake any construction, together with information on its size, function, capacity and location, not less than ninety days (90) prior to the commencement thereto in accordance with paragraph 5 below.
- g. Subdivision. The division, subdivision or de facto subdivision of the Property is prohibited, provided, however, that a lease of a portion of the Property for an authorized use under this Easement shall not be prohibited as long as such lease is consistent with the terms of this Easement..
- h. Motorized Vehicles. The use of motorized vehicles is prohibited, except for such use in support of the authorized uses of this paragraph to include property management and maintenance, use for disabled personnel, and for motorized emergency vehicles as needed. Any use of motorized vehicles off roadways is prohibited except when reasonably deemed necessary for official use only and to support the authorized purposes.

All authorized uses shall not result in significant soil degradation or significant pollution or degradation of any surface or subsurface waters; and all uses and activities shall be consistent



with applicable laws and shall be exercised so as to prevent or minimize damage to the natural resources associated with the Property.

**4. Reserved Rights.** Grantor reserves to himself, successors and assigns, all rights accruing from its ownership of the Property that is not expressly prohibited herein and is not inconsistent with the purposes of this Easement, including but not limited to:

- a. Controlling predatory and problem animals by the use of selective control techniques.
- b. Managing and harvesting of all forests on the Property consistent with Virginia State Forestry Department Guidelines, as they may be amended from time to time.
- c. Construction of fencing reasonably necessary for the uses permitted herein.

**5. Notification and Approval Provisions**

- a. Notice of Intent to Undertake New Uses or Construction. Whenever Grantor or Government plans to undertake a new use or perform new construction on the Property, including those new improvements pre-authorized through their inclusion in Exhibit "B", Grantor or Government shall notify the other in writing by certified mail not less than ninety days (90) prior to the date that such party intends to undertake the activity in question. The notice shall describe the nature, scope, design, location, timetable, and any other material aspect of the proposed activity in sufficient detail to permit the Government or Grantor, as the case may be, to make an informed judgment as to its consistency with the purpose of this Easement. Failure of any party to give such notice shall be deemed a breach of the terms of this Agreement.
- b. Approval of Planned Use or Construction. Within sixty (60) days of receipt of the notice, the Government or Grantor, as the case may be, may withhold approval in writing. A lack of written response within sixty (60) days of receipt of the notice shall be deemed approval. Approval may be withheld only upon a reasonable determination by such party that the action proposed would be inconsistent with the purpose of this Easement and the restrictions on the use of the Property included herein.

**6. Enforcement and Remedies.** In the event of breach by Grantor of any terms, conditions, or obligations created by this Easement, Grantor shall be afforded ninety (90) days from the receipt of Government's notice of non-compliance to cure the subject breach, except where irreparable harm may result from any delay in curing a breach. The Government may grant a reasonable extension of time to complete the cure if it is determined by the Government to be necessary. In the event that the non-compliance is not cured within the ninety (90) day time frame, or extension of time if granted by the Government, the Government may:

- a. take necessary actions to correct the non-compliance and upon request by Government, Grantor shall reimburse Government for its reasonable costs incurred to correct the non-compliance; and/or

- b. institute mediation or other alternative dispute resolution strategy that is agreed to by the parties; or
- c. institute suit to enjoin any breach or enforce any term by injunction.

The Government's remedies shall be cumulative and shall be in addition to any other rights and remedies available to the Government at law or equity. Enforcement of the terms of this Easement shall be at the discretion of the Government. No failure on the part of the Government to enforce any term hereof shall discharge or invalidate such term or any other term hereof or affect the right of the Government to enforce the same in the event of a subsequent breach or default.

**7. Costs and Liabilities.** Grantor retains all responsibilities and shall bear all costs and liabilities of any kind related to the ownership and maintenance of the Property.

**8. Noise and Other Effects of Air Operations.** Grantor does hereby fully waive, remise, and release any right or cause of action which Grantor, or its successors and assigns, may have due to such noise, noise vibrations, fumes, dust, fuel particles and all other effects that may be caused by the operation of aircraft from the Installation. Grantor specifically does not waive but retains all rights to causes of action, claims and rights to damages for any aircraft accident affecting the Property or persons thereon, including physical damages such as window breakage, contamination from fuel dumping, damage from falling aircraft components etc. Furthermore, this waiver is with respect to operation of aircraft by or for purposes of the Installation. If the Installation is closed, and the base is converted to private, non-military use, this waiver shall terminate.

- i. As used herein, the term "aircraft" shall mean any and all types of aircraft, manned and unmanned, to include, but not limited to, jet aircraft, propeller driven aircraft, civil aircraft, military aircraft, commercial aircraft, helicopters and all types of aircraft or vehicles now in existence or hereafter developed, regardless of existing or future noise levels, for the purpose of military training, and/or transporting persons or property through the air by whomsoever owned or operated.

**9. Noise and Other Effects from Training Operations.** Grantor does hereby fully waive, remise, and release any right or cause of action which Grantor, or its successors and assigns, may have due to such noise and noise vibrations that may be caused by Military Training Activities on the Installation. Such activities include, but are not limited to, noise and vibrations from arms, aircraft, ammunition and explosives.

**10. Subsequent Transfers.** Grantor agrees to incorporate the terms of this Easement in any deed or other legal instrument by which it divests itself of any interest in the Property, including a leasehold interest. Grantor further agrees to give written notice to the Government of the transfer at least 30 days prior to the date of transfer.

**11. Notices.** Any notice, approval or communication that either party is required to give in writing may be served personally or mailed to:

**To Government:** Naval Facilities Engineering Command Washington  
Attention: Real Estate Services  
1314 Harwood St., SE  
Washington Navy Yard, DC 20374

With a copy to: (1) Commander  
Marine Corps Base Quantico  
Attn: Public Works Officer  
3250 Catlin Avenue  
Quantico, VA 22134-5000

And

(2) Headquarters, U.S. Marine Corps  
Attn: Real Estate Section  
Code LFL-3, Room 3113  
2 Navy Annex  
Washington DC 20380-1775

**To Grantor:** Attn: Real Property Manager  
Department of Game and Inland Fisheries  
4010 West Broad Street  
Richmond, VA 23230

**12. Authority of Grantor:** [AS REQUIRED]











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**MARINE CORPS BASE QUANTICO REAL ESTATE DATA BASE/LATEST REVISION 10-29-12**

Outgrants NAVFAC FILE #	NAVFAC CONTRACT #	GRANTOR/GRANTEE	REAL ESTATE INSTRUMENT	EXECUTION DATE	EXPIRATION DATE	REMARKS
AO-0024	NF(R) 26320	Def. Property Disp. Region	HTREA	2/17/1976	INDEFINITE	3.1 acres of land
AO-0025	95RP00031	DOT FAA	UA	12/29/1994	TERMINATED	Terminated by NAVFAC letter Ser/AM1 (NF)-332 of July 14, 2009
AO-0026	N62477-97-RP-00010	DEA	UA	12/20/1996	CONSOLIDATED	132.716 acres of Justice Training Center, Consolidated into Real Estate use Agreement NF(R) 14455
AO-0027	82RP00018	VA	UA	3/1/1982	INDEFINITE	Access Roads to Quantico National Cemetery
AO-0038	01RP00045	George Mason University	Coop/Agree	8/1/2001	EXPIRED	Feeding habit study (Expired on 12/31/03 under its own terms upon completion of study)
AO-0043	02RP00028	VA DCR	Coop/Agree	3/1/2002	EXPIRED	Endangered Plant Survey (Expired on 12/31/03 under its own terms upon completion of the survey)
AO-0054	NF(R) 14455	DOJ	UA	12/14/2001	INDEFINITE	Consolidation of N62477-97-RP-00010 and NF(R)14455 (Includes Modifications No. 1 & No. 2)
AO-0055	03-RP-00030	VA Dept of Conservation and Recreation	Agreement	4/1/2003	EXPIRED	Dwarf wedge mussel endangered species survey (Expired on 3/31/08 under its own terms upon completion of survey)
AO-0056	03-RP-00031	VA Dept of Conservation and Recreation	Agreement	4/1/2003	EXPIRED	Harperella plant survey (endangered species) (Expired on 3/31/08 under its own terms upon completion of survey)
AO-0067	04-RP-00025	College of Wm and Mary	Agreement	4/19/2004	EXPIRED	Bird Survey (Expired under its own terms upon completion of survey)
AO10083	N40080-09-RP-00034	HQ USAF/A2C	HTREA	6/1/2009	5/31/2019	10' ROW, approx 1.525 LF for const. ,installation, operation, maint., repair & replacement of underground fiber optic cable
EO-0116	01RP00038	Prince William County, VA	Easement	1/7/2002	1/6/2052	Storm Drainage Improvements
EO-0133	00RP00054	VDOT	Easement	9/7/2000	9/6/2050	Sight Distance Improvements
EO-0134	N6247787RP00078	Northern VA Electric Coop	Easement	1/21/1988	1/20/2038	Overhead Electric Line
EO-0135	90RP00011	Contel of Virginia	Easement	11/27/1989	Perpetual	Remote switchmini central office
EO-0136	N6247780RP00016	Town of Quantico	Easement	9/23/1981	Perpetual	Maintenance of Fifth Ave.
EO-0137	N6247786RP00013	Plantation Pipeline	Easement	2/10/1986	Perpetual	Petroleum Products Pipeline
EO-0139	NOY(R) 55894	Stafford County, VA	Easement	10/12/1995	10/11/2045	Water Impoundment - Smith Lake
EO-0140	N6247790RP00101	Commonwealth of Virginia	Easement	1/17/1980	Perpetual	I-95 easement dated Dec. 4, 1959 incl 1960 amend No.1 for ROW expansion & 2010 Amend No.2 for VDOT access to Russell Rd tra
EO-0141	N6247792RP00012	Northern VA Electric Coop	Easement	9/20/1990	9/19/2040	Retouring of Rt. 611 & wetland mitigation area
EO-0142	93RP00007	GTE Virginia	Easement	11/26/1991	11/25/2041	Power line
EO-0143	N6247793RP00001	VDOT	Easement	12/10/1992	Perpetual	Communication lines
EO-0144	NOY(R) 89124	Prince William County	Easement	12/10/1992	Perpetual	Improvements to Rt. 619 at Fuller Heights
EO-0145	N6247793RP00008	VEPCO	Easement	3/29/1966	Perpetual	8" water main
EO-0146	N6247793RP00049	Virginia Power	Easement	12/10/1992	Abandoned	Electric Power Lines (easement relinquished to Government 12-31-09 IAW easement EO-10135)
EO-0147	96RP00025	VDOT	Easement	5/27/1993	5/26/2018	7.6 kv Electric Power Line
EO-0148	NOY(R) 98428	VEPCO	Easement	5/13/1996	5/12/2046	Sight Distance - Rts. 612 & 610 (Fauquier County)
EO-0149	NOY(R) 57529	VEPCO	Easement	2/20/1969	2/19/2019	Electric Power Lines
EO-0150	N6247791RP00008	Commonwealth Gas Services	Easement	6/5/1961	EXPIRED 6/4/2011, renewal pending @ NAVFAC	Electric Power Lines-includes Amendment No.1
EO-0151	N6247792RP00006	Commonwealth Gas Services	Easement	12/10/1990	12/9/2040	Natural Gas Pipeline
EO-0152	NOY(R) 85386	Commonwealth of Virginia	Easement	1/16/1992	1/15/2042	Natural Gas Pipeline
EO-0153	N40080-08-RP-00008	VEPCO	Easement	3/3/1958	Perpetual	Widening of Rt. 1
EO-0155	NF(R) 10207	Commonwealth of Virginia	Easement	12/13/2007	12/12/2057	Electric Power Lines - Noy (R) 65200 superceded by N40080-08-RP-00008
EO-0156	N6247783RP00045	Mr. & Mrs. Kenneth Tharp	Easement	2/2/1971	Perpetual	Widening & realignment of Rt. 611 (Midway Housing)
EO-0157	N6247784RP00003	LeAnn Strang	Easement	10/14/1983	Perpetual	Sewer line
EO-0158	N40080-10-RP-00006	Columbia Gas of Virginia	Easement	5/14/1984	5/13/2034	Driveway Ramp
EO-0159	NF(R) 34476	Continental Telephone Co. of VA	Easement	4/23/2010	4/22/2060	Gas Pipeline
EO-0160	84RP00042	Multiple Parties	Easement	4/23/1976	4/22/2026	Communications lines
EO-0161	N6247780RP00052	VDOT	Easement	1/12/1984	Perpetual	Access Road
EO-0162	NOY(R) 55834	VEPCO	Easement	9/9/1980	Perpetual	Widening of Rt. 646
			Easement	5/1/1959	Perpetual	Electric lines



LIC-O-10503	N40080-09-RP-00046	Quantico Shooting Club Inc.	License	9/1/2009	8/30/2014	(Private Organization) Use of space in gov bldgs and use of rifle & pistol ranges at the WTBN Calvin A. Lloyd Range on a space available
LIC-O-10511	N40080-10-RP-00016	Girl Scout Service Unit 80-3	License	12/21/2009	12/20/2014	(Private Organization) Non-exclusive use of Building 3199 (approx. 803 SF) in as-is condition to support the activities of Girl Scout SU
LIC-O-10512	N40080-10-RP-00017	Boy Scout Troop 176	License	12/21/2009	12/20/2014	(Private Organization) Non-exclusive use of Building 3305 (approx. 2,250 SF) and adjacent field to support the activities of Boy Scout Troop 176
LIC-O-10520	N40080-09-RP-00056	Prince William County	License	9/15/2009	EXPIRED	Temp const Lic to install duct bank for VEPCO. Expired under its own terms. VEPCO esmt N40080-10-RP-00003/EO-10135 allows PVI
LIC-O-10530	N40080-10-RP-000080	Boy Scout Troop 121	License	12/21/2009	12/20/2014	(Private Organization) Non-exclusive use of Building 3198 (approx. 1020 SF) in as-is condition to support the activities of Boy Scout Troop 121
LIC-O-10531	N40080-10-RP-00009	American Red Cross	License	1/25/2010	1/24/2015	(Private Organization) Non-exclusive use of approx. 425 SF of space in Bldg. 2034
LIC-O-10544	N40080-10-RP-00020	Quantico Yacht Club	License	4/26/2010	4/25/2015	(Private Organization) Approximately 3210 SF of land in the Quantico Marina boardwalk for an 1800 SF trailer; 810 SF wooden deck, 60
LIC-O-10545	N40080-10-RP-00021	United States Secret Service	License	3/1/2010	2/28/2015	License for 24x60' USSS owned trailer on C-DEMO range for classroom use and 266 square feet of space in ASP for explosives storage
LIC-O-10589	N40080-10-RP-00062	Marine Federal Credit Union	License	11/1/2011	SUPERCEDED	2 ATMs in MDIA Bldg. 27130, Superseded by LIC-O-10627/N40080-11-RP-00022
LIC-O-10627	N40080-11-RP-00022	Marine Federal Credit Union	License	5/1/2012	12/31/2015	Master License covers 10 existing ATMs and the Branch Office in O'Bannon Hall, Building 24165
LIC-O-10828	N40080-12-RP-00004	Dominion Virginia Power	License	4/1/2012	3/31/2017	License for temporary (5 yr) span guy pole until negotiations can be completed with Prince William County to relocate existing line
LIC-O-10888	N40080-12-RP-00038	Dominion Virginia Power	License	8/1/2012	7/31/2013	Temporary no-cost construction license for Dominion VA Power Fuller Rd. substation to allow early construction prior to long term easement waiting for them to grant an extension.
LIC-O-10900	N40080-12-RP-00073	Prince William Health District (PWHHD), Women Infants & Children (WIC) program	License	8/1/2012	7/31/2017	Non-exclusive use of space in B-2034 (Little Hall) basement, Sections 20 & 77, for 2 days per week in the New Parent Support Program for use by the Prince William Health District (PWHHD)/Women Infants & Children (WIC) program
LO-0021	N40080-11-RP-00033	Marine Corps Association	Lease	4/1/2011	6/30/2026	(Private Organization)-1.4 ac. (Includes Amendments 1 through 6 & 6, 000 SF no-cost lease for MCBQ BPO & WWR)
LO-0022	85RP00008	US Postal Service	Lease	1/1/1986	EXPIRED	Land for construction of post office, Post Office Services to be provided under an ISSA JAW NAVFAC P-73 Chapter 20
LO-0023	N62477-98-RP-00033	Marine Federal Credit Union	Lease	3/25/1998	3/24/2023	2.94 acres of land for Credit Union Building on Russell Rd.
LO-0024	N40080-08-RP-00019	Bank of America	Lease	3/1/2008	Lease will be allowed to expire under its own terms on 2-28-13	1,575 SF of space in Bldg. 3500 Marine Corps Exchange/Per BOA ltr of 7-23-12 all banking services at MCBQ will end effective 1-25-28-13.
LO-10009	N40080-07-RP-00030	T-Mobile	Lease	9/26/2007	EXPIRED 9-26-12, Succeeding lease pending @ NAVFAC	Placement of commercial cellular communications equipment-various sites, includes Supplemental Lease Agreement No. 001 for CO MCB, Quantico letter 11011, B 042 of Dec 15, 2011
LO-10026	N40080-07-RP-00008	Verizon Wireless	Lease	8/1/2007	EXPIRED 7/31/2012 Succeeding lease will be requested from NAVFAC	Placement of commercial cellular communications equipment on Argonne Hills Lattice Tower Bldg 2690.
LO-10036	N40080-08-RP-00007	New Cingular wireless, PCS, LLC	Lease	12/15/2007	12/14/2012	Placement of commercial cellular communications equipment on Argonne Hills Lattice Tower Bldg 2690.
LO-10053	N40080-07-RP-00018	Marine Federal Credit Union	Lease	6/1/2007	SUPERCEDED	ATM at Borden Street car wash, Superseded by LIC-O-10627/N40080-11-RP-00022, Mod #002
LO-10163	N40080-10-RP-00001	Verizon Wireless	Lease	4/12/2010	4/11/2015	Space on water tower (Facility No. 27923) at el 96' located on Range Road plus ground space for 11'7"x 20' equipment shelter, generator
LO-10358	Pending	AT&T (New Cingular Wireless PCS, LLC c/o Bechtel Communications Inc.)	Lease	(See Remarks)	(See Remarks)	Lease tentatively awarded on 11-10-11 at WTBN water tower at 27203 MCB-4 pending final approval by SPAWAR, NCPD and specs for
PO-0012	NOY(R) 46892	Commissioner of Education	Permit	2/26/1952	INDEFINITE	Approx. 17.4 Ac. of Land - Russell Elementary
PO-0013	NOY(R) 57526	Commissioner of Education	Permit	11/25/1960	INDEFINITE	Quantico High School
PO-0014	NOY(R) 59874	Commissioner of Education	Permit	10/20/1961	INDEFINITE	3 parcels totaling 23.649Ac of land for Ashurst & Burrows Elementary Schools
PI-10131	872-09-01	Grantor: Dept of Veterans Affairs	Permit	4/14/9009	4/13/2014	Install, operate & maintain a 50' AGL repeater pole on Quantico National Cemetery property

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APPENDIX B: MARINE CORPS BASE ORDER 11015.2B  
FISH AND WILDLIFE MANAGEMENT PROCEDURAL MANUAL



**UNITED STATES MARINE CORPS**  
MARINE CORPS BASE  
3250 CATLIN AVENUE QUANTICO,  
VIRGINIA 22134-5001

MCBO 11015.2B  
B 046  
1 Oct 13

MARINE CORPS BASE ORDER 11015.2B

From: Commander  
To: Distribution List

Subj: FISH AND WILDLIFE MANAGEMENT PROCEDURAL MANUAL

Ref: (a) 16 U.S.C. 670, et seq.  
(b) MCO P5090.2A  
(c) DFAS-CL NAVSO P-1000.3-M, paragraph 032114  
(d) MCO 7301.116  
(e) 10 U.S.C. 2671  
(f) 10 U.S.C. 1588  
(g) MCBO 11015.3A, Conservation Volunteer Program  
(h) MCO 5090.4A  
(i) MCBO 5090.4  
(j) MCBO 8000.1A, Privately Owned Weapons, Ammunitions  
and Explosives

Encl: (1) FISH AND WILDLIFE MANAGEMENT PROCEDURAL MANUAL

1. Situation. To provide policy and procedural guidance for fish and wildlife management programs at Marine Corps Base, Quantico (MCBQ), to include fishing, hunting, trapping, conservation law enforcement, wildlife viewing, and animal damage control.

2. Cancellation. MCBO P11015.2A.

3. Mission. It is the policy of the Commander MCBQ to promote a wildlife conservation program that shall be consistent with federal, Virginia (VA), and local laws and will support, as its foremost priority, the highest feasible quality of military training. The program will enhance to the extent feasible resource-related recreational opportunities subject to appropriate safety restrictions, regional ecosystem management initiatives, and regional and local needs to control animal damage.

DISTRIBUTION STATEMENT A: Approved for public release;  
distribution is unlimited.

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#### 4. Execution

##### a. Commander's Intent and Concept of Operations

###### (1) Commander's Intent

(a) The conservation program shall be managed in accordance with applicable federal, VA, and Marine Corps regulations, and directives.

(b) Reference (a), "Conservation Programs on Military Installation," Sikes Act Improvement Act, as amended, requires that MCBQ implement an Integrated Natural Resources Management Plan (INRMP). Consistent with the military mission, the INRMP shall provide for:

1. the conservation and rehabilitation of natural resources on the installation;

2. the sustainable multipurpose use of the resources, which shall include fishing, hunting, trapping, and nonconsumptive uses;

3. and, subject to safety requirements and military security, public access to facilitate the use of the resources.

(c) This Order shall serve as an integral component of the INRMP since the enclosure establishes the policy and procedures for allowing public access and participation in fish and wildlife related recreation programs aboard MCBQ.

###### (2) Concept of Operations

###### (a) Collection and Use of Fees

1. Reference (a) permits MCBQ to collect user fees from persons who fish, hunt, and trap aboard MCBQ, so long as those activities are conducted pursuant to the INRMP. Fees collected at MCBQ shall only be used by MCBQ for the protection, conservation, and management of fish and wildlife, including habitat improvements and related actions.

2. MCBQ licenses for fishing, hunting, and trapping will be sold only by "Collection Agents" appointed in writing on DD Form 577 per DOD 7000.14-R, Volume V, paragraph 05020702.

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3. The value of these licenses will be specified either in enclosure (1) of this directive or in a supplemental annual Bulletin.

4. Reference (b) requires that all collected funds shall be deposited to fund receipt account 17R5095.27FY. At the time of turn-in to the MCBQ Finance Office, DD Form 1131, Cash Collection Voucher, shall be completed.

5. References (c) and (d) provide additional accounting procedures for the collection and expenditure of funds relating to the management and harvesting of fish and wildlife.

(b) Compliance with Virginia Regulations. Reference (e), "Military Reservation and Facilities—Hunting, Fishing, and Trapping," requires that all hunting, fishing, and trapping on MCBQ property will be done pursuant to VA laws, except that MCBQ can be more restrictive, but not less restrictive, than applicable VA regulations. Hunting, fishing and trapping regulations for MCBQ are provided at the enclosure in Chapters 1, 2 and 3, respectively.

(c) Conservation Volunteer Program. The Natural Resources and Environmental Affairs (NREA) Branch may utilize volunteers in keeping with the implementing instructions provided in references (f) and (g).

(d) Conservation Law Enforcement. Violations of federal, Virginia or local laws and regulations will be investigated and enforced by Conservation Law Enforcement Officers (CLEO), NREA Branch, consistent with the guidelines provided at reference (h) and at Chapter 4 of the enclosure.

(e) Sportsman Advisory Council (SAC). The SAC will be operated pursuant to reference (i) to provide customer feedback concerning implementation of the fish and wildlife management programs at the enclosure.

(f) Wildlife Viewing. The Chopawamsic Creek Wildlife Viewing Area on Russell Road is part of the Prince William Loop of the Virginia Birding and Wildlife Trail. Visitor access is authorized daily during daylight hours.

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(g) Animal Damage Control. Problem wildlife will be handled in keeping with the MCBQ Integrated Pest Management Plan and protocols provided at Chapter 5 of the enclosure.

b. Subordinate Element Missions

(1) Assistant Chief of Staff (AC/S) G-3 shall:

(a) Maintain daily communication with NREA Branch and provide daily schedules for recreational access to Training Areas.

(b) Maintain liaison with NREA Branch to ensure mission assurance requirements are coordinated with the public access provisions of this Order.

(2) AC/S G-5 shall:

(a) Be responsible for the administration of this Manual.

(b) Implement an INRMP that provides for fish and wildlife related dispersed outdoor recreation and the management and conservation of rare, threatened, and endangered species.

(c) Implement and annually update the procedures provided at the enclosure as a required component of the MCBQ INRMP.

(d) Ensure fees involving the sales of negotiable licenses for fishing, hunting, and trapping are collected, deposited, and used for wildlife conservation in accordance with guidance found in references (a), (b), and (c).

(e) Convene meetings of the MCBQ Sportsman Advisory Council a minimum of twice annually.

(f) Ensure outdoor recreation activities are accessible and in compliance with the Disabled Sportsman Act provisions of reference (a).

(g) Pursuant to references (a), (f), and (g), utilize volunteer services and partnerships to optimize outdoor recreational opportunities.

(3) Director, Comptroller Division

(a) Review funds collected from the sale of fishing, hunting, and trapping permits to ensure compliance with established directives.

(b) Ensure fish and wildlife fee account authorizations (17X5095) are managed as "no year" funds and remain available for fish and wildlife conservation program expenditure until exhausted.

5. Administration and Logistics

a. Administration. Recommendations concerning the contents of this Manual may be forwarded to the Commander MCBQ (B 046) via the appropriate chain of command.

b. Logistics. None

6. Command and Signal.

a. Command. This Order is applicable to all Commands, tenants, and personnel aboard MCBQ.

b. Signal. This Order is effective the date signed.

/s/  
DAVID W. MAXWELL

DISTRIBUTION: A



LOCATOR SHEET

Subj: FISH AND WILDLIFE MANAGEMENT PROCEDURAL MANUAL

Location:

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(Indicate the location(s) of the copy(ies) of this  
Manual.)



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CHAPTER 1

FISHING REGULATIONS

1. License Requirements

a. State License. Everyone who fishes aboard MCBQ must have a valid Virginia (VA) fishing license. Valid Potomac River Fisheries Commission and Maryland Bay sport licenses will be honored in lieu of the VA fishing license for the Potomac River and the tidal freshwater tributaries adjacent to Quantico.

These tidal tributaries include the waters of Quantico and Chopawamsic Creeks up to U.S. Route 1. This applies to both boat and bank anglers.

b. Designated Trout Waters. Portions of Chopawamsic Creek included in the VA Trout Stocking Plan are considered designated stocked trout waters from 1 October through 15 June.

During that period, dates inclusive, the VA license to fish in "designated stocked trout waters" is required in addition to the VA license to fish. A trout license is not required from 16 June through 30 September.

c. Sales Locations. VA fishing licenses can be obtained online at <http://www.dgif.virginia.gov/licenses/> and at most retail sporting goods vendors, including the Marine Corps Exchange.

d. MCBQ Fishing License

(1) Everyone who enters the installation for the purpose of fishing or using MCBQ boat ramps must have a MCBQ fishing license. This is applicable to all persons within the installation boundary lines, to include all persons using MCBQ boat ramps for access to public waters, and to anglers fishing from the MCBQ shoreline or any structure attached to the shoreline (piers, docks, etc.).

(2) Exemptions. Persons less than 16 years of age, persons 65 and over, persons who possess a VA "totally and permanently disabled resident license to freshwater fish" or "service-connected totally and permanently disabled veteran resident lifetime license to hunt and freshwater fish", and certain veterans covered under a special event permit per Code of Virginia 29.1-312 are exempt from the MCBQ fishing



license fee. In most cases, these individuals must still complete and submit a license application and waiver of liability. However, exempt individuals who are participating in a group event that is covered by another agreement are not required to submit a MCBQ fishing license application and waiver of liability. An example would be a Marine Corps Community Services sponsored summer camp for youth. The MCBQ fishing license will not be required during Virginia Free Fishing Days but all requirements for access to the installation will still be in effect.

(3) License Cost. The MCBQ annual fishing license costs \$10 and is valid for one year from the date of purchase. The 5-day (consecutive days) MCBQ fishing license costs \$2. MCBQ licenses may be purchased at the following locations:

(a) NREA Branch Game Checking Station at Building 5-9. Open during MCBQ hunting seasons. Call for hours and availability at 703-784-5523 or check the Quantico Sportsman website: <https://www.quantico.usmc.mil/activities/?Section=QSM>

(b) Marine Corps Exchange (MCX). The sporting goods counter is open year round for the sale of VA fishing licenses and the MCBQ fishing license. Civilians may purchase the MCBQ fishing license but are not entitled to shop in the MCX. For hours of sale, call 703-432-8800.

(c) Lunga General Store. Currently closed. Call for hours and availability at 703-784-5270.

(4) Lost License. All anglers are encouraged to make a legible photocopy of their MCBQ fishing license. If the original license is lost, the legible copy of the license will serve as a valid replacement license. The place of sale may be able to produce a photocopy of the original license if they have record of the original sale. However, there is no guarantee that the place of sale will be open or have record of the purchase. Individuals who lose their MCBQ license will have to purchase another one if the original receipt or copy cannot be found. The place of sale is not responsible for the lost license.

2. Authorization to Fish. Military and civilian personnel who have completed the Application to Fish at Appendix A and the appropriate waiver of liability at either Appendix B or C, and who have obtained the MCBQ fishing license, are authorized to use Base fishing facilities pursuant to the instructions in this chapter. Access to MCBQ to fish also requires display of

appropriate identification in accordance with MCBO 5530.1, Access Control Policy.

### 3. Closure of Fishing Areas

a. Military training exercises may cause portions or all of a fishing area to be closed at a specific time. The Range Management Branch (RMB) is responsible for Training Areas west of Interstate 95. Officers Candidate School (OCS) has responsibility for the training area where Buffalo Pond and the OCS boat ramp are located. The RMB Range Control Office and OCS S-3 will coordinate with the appropriate military Officer in Charge (OIC) to ensure there are no conflicts, and coordinate with NREA to issue notices when access to fishing areas is not authorized. However, the OIC has final authority to allow joint use, or may lock range gates, post guards, or set barricades to close fishing access.

b. Anglers are prohibited from bypassing any kind of road obstruction or warning buoy except when specifically authorized.

c. Storm events may cause the temporary closure of certain fishing areas due to flooding, ice, or other hazardous conditions.

d. Munitions Response Program activities may require the closure of designated fishing areas during unexploded ordnance clean-up.

4. Fishing Hours. Fishing is allowed 365 days a year, seven days a week, except as posted due to curfews or other restrictions issued subsequent to this Order. Legal fishing hours are one hour before sunrise to one hour after sunset unless otherwise stated in paragraph 6.

5. Use of Boats. Privately owned boats less than 20 feet in length may be used for recreational fishing in the inland MCBQ water bodies in accordance with the motor restrictions stated in paragraph 6. Personal watercrafts (known as jet-skis) are not authorized in MCBQ impounded waters. All state boating regulations, including registration, personal flotation devices, lighting, and the VA boating safety education requirement are in effect at MCBQ. Details of the education requirement can be found at [www.dgif.virginia.gov/boating/education](http://www.dgif.virginia.gov/boating/education).

6. Instructions for Fishing Areas. Fishing areas aboard and adjacent to MCBQ are shown at figure 1-1.

a. Cedar Run (3.5 miles). This is a small stream suitable for wading and canoeing; the stream is too small to support motors and is difficult for canoeing during low water conditions. It is accessible by parking off-Base at the Merrimac Farm Wildlife Management Area. On-Base access is allowed along Camp Upshur Road near Cedar Run Bridge. Large and smallmouth bass and sunfish can be caught. Access from MCBQ does not authorize anglers to trespass on private lands adjacent to Cedar Run.

b. Camp Upshur Pond (1.4 acres). This small pond is located within Training Area (TA) 17A. Anglers may drive on the gravel road along Landing Zone Toucan to access the pond if there are no military training exercises ongoing. Bluegill and largemouth bass may be present in the pond.

c. Dalton Pond (16.4 acres). This pond has a maximum depth of about nine feet and supports largemouth bass, bluegill, redear, and bullheads. Electric motors are authorized; **gasoline motors may not be operated.**

d. Chopawamsic Creek Designated Trout Waters (1.8 miles). The stream is managed as a put-and-take fishery with hatchery reared trout being stocked from February - May. The upper portion of the area, known as Secon Pool, is reserved for children 12 years of age and younger. **Anyone over the age of 12 caught fishing in Secon Pool will be subject to loss of MCBQ fishing privileges and possible debarment from the installation unless exempted as follows:** In specific cases, permission to fish at Secon Pool may be granted by NREA Branch for special wounded warrior events, paralyzed veterans, or persons who are physically unable to access other trout stocked waters. In designated trout waters, fishing access is allowed from 0500 until 1 hour after sunset. The daily creel limit is six trout. It is unlawful to continue fishing after the daily creel limit has been obtained. It is also unlawful to use seines, nets or more than one rod and one hook in these waters, although it shall be lawful to use a hand-held landing net to land legally hooked trout.

e. Breckinridge Reservoir (47 acres). Largemouth bass, chain pickerel, crappie, bluegill, and catfish are present.

Fishing access is allowed at New Breckinridge Road boat launch (see figure 2-1). Electric motors are authorized; **gasoline motors may not be operated.** Boating access can be difficult due to low water, especially during summer drought periods. Shallow draft and lightweight boats such as canoes are appropriate.

f. Lunga Reservoir (477 acres). Lunga Reservoir is currently closed due to a Munition Response Program investigation. Guidelines for fishing and boating will be published prior to the lake re-opening.

g. R-6 Pond (6.6 acres). The pond is located in TA 9C, downrange from a permanently locked gate. There is a 1-mile walk along a gravel road from the gate to the pond. **Anglers must check-in to TA 9C at the Game Checking Station (GCS) to gain permission to walk to R-6 Pond. R-6 Pond can only be fished when TA 9C is open for recreational access.** The R-6 Pond log sheet and daily open/closed status will be posted outside the GCS at the deer weigh shed when the GCS is closed. R-6 Pond supports largemouth bass and bluegill.

h. Smith Lake (295 acres). Stafford County manages Smith Lake for the production of drinking water. Largemouth bass, walleye, crappie, bluegill, redear, and catfish are the primary game fish. Electric motors are authorized; **gasoline motors may not be operated.** Fishing access is allowed at two MCBQ launch sites on Smith Lake Road and the MCBQ fishing license is required to use these launch sites. The fishing docks at both sites are wheelchair accessible. Shoreline fishing is authorized within 200 meters of these launch sites.

i. Barrett Pond (1.0 acre). This pond has largemouth bass and bluegill and is located behind Ramer Hall and the asphalt parade deck at The Basic School (TBS). Fishing will be catch and release only unless otherwise posted for special events.

j. Buffalo Pond (5.5 acres). Fishing access is allowed on days that OCS roads are open for public use. Anglers may drive Engineer Road and Buffalo Road to get to Buffalo Pond. Closure notices will be posted at the OCS boat launch and GCS to alert the public. Largemouth bass, bluegill, and crappie are present. Electric motors are authorized; **gasoline motors may not be operated.**

k. Potomac River and Tidal Chopawamsic and Quantico Creeks

(1) Fishing in the tidal waters adjacent to Marine Corps property is authorized 24 hours per day except in the permanent restricted area (PRA) shown at (figure 2-2). Pursuant to 33 C.F.R. Part 334.235, all persons, vessels, or other craft are prohibited from entering, transiting, drifting, dredging, or anchoring within the PRA without permission of the Commander MCBQ or his/her designated representatives.

(2) Catfish, largemouth bass, white and yellow perch, bluegill, shad, herring, northern snakehead, and striped bass can be found in these waters. The snakehead is an invasive exotic species and must be killed to be possessed.

(3) Boating access to the tidal waters from MCBQ is provided by concrete boat ramps located at Hospital Point and the OCS area. The Wildlife Viewing Area has a launch site for small boats (canoes and kayaks). Boaters should be aware that during low tide, and especially during sustained northwest winds, Chopawamsic and Quantico Creeks become extremely shallow and boaters can easily run aground. Boaters at the OCS ramp will not have access to the Potomac River; the channel is blocked to enforce the PRA.

(4) Fishing from the shoreline of the Potomac River or other tidal waters adjacent to the Marine Corps Air Facility (MCAF) is prohibited except at the Joe Foxx fishing area. The Joe Foxx wheelchair accessible fishing site is located at the mouth of Chopawamsic Creek at the MCAF. Personnel must pass through a guard checkpoint and display acceptable Department of Defense (DoD) Identification (ID) cards. This includes DoD Common Access Card, DoD Uniformed Services Identification and Privileges Card, any authenticated U.S. Government issued credentials, and Transportation Worker Identification Credentials. Family members may accompany their sponsor.

7. Fish Consumption Advisory. Tidal Chopawamsic and Quantico Creeks and Quantico embayment are included in a VA Department of Health advisory recommending that fish caught in these waters may be contaminated with polychlorinated biphenyl (PCB). Consult [www.vdh.virginia.gov](http://www.vdh.virginia.gov) for details.

8. Protection of Environmental Quality. Water bodies and the associated natural resources are important to MCBQ and the Nation. All users must take measures to prevent environmental degradation such as littering, chemical, oil or gas spillage, and shoreline erosion. The dumping of litter,

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trash, or other substances upon the grounds or waters of this Installation are violations punishable through judicial proceedings. Persons observing such violations should report these observations immediately to the CLEO at 703-432-6793/6794/6795. Anglers should use non-toxic sinkers to the extent available; lead released into the environment from hunting and fishing activities is of growing concern for ecosystem health.

9. Nuisance Wildlife. Leave wildlife alone! Do not feed or handle any wild animal. Feeding wildlife can actually be harmful to the animals and may lead to nuisance situations that become a severe safety concern (i.e., large flock of geese at air facilities). Handling wildlife can be dangerous and is often illegal. Wildlife can harbor diseases and parasites which have the potential to cause serious illness in humans and can be fatal. Ticks can transmit several diseases, including Lyme disease, and are abundant on the grounds around fishing areas. Avoidance and use of appropriate repellents and clothing is recommended to reduce risk of being bitten by ticks and other insects.

10. Fish, Reptile, Amphibian and Aquatic Invertebrate Regulations

a. Creel and Length Limits. VA regulations concerning the possession of game and nongame fish, reptiles, amphibians, and aquatic invertebrates are applicable and enforced at MCBQ. Consult VA freshwater fishing regulations for creel and length limits (available at:

<http://www.dgif.virginia.gov/fishing/regulations/creelandlengthlimits.pdf>). Consult Potomac River Fisheries Commission regulations for legal sizes, limits, and other restrictions (e.g., closed seasons) applicable in the Potomac River (available at: [http://prfc.us/sports/BLUE\\_SHEET-2013.pdf](http://prfc.us/sports/BLUE_SHEET-2013.pdf)).

b. Snakehead Fish. The Virginia Department of Game and Inland Fisheries (VDGIF) has established a snakehead hotline at 804-367-2925 that anglers can use to report snakehead fish. Anglers are not required to report snakeheads nor are they required to kill them if caught, but the Department asks that the fish be reported and killed if possible. However, if an angler wishes to keep a legally caught northern snakehead, the fish must be killed to be in possession, and the angler must call the hotline and report the angler's last name, date of catch, location of catch and size. Kill the fish by: removing



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the head, separating the gill arches from the body, or removing the internal organs and put it on ice as quickly as possible.

c. Bullfrogs and Snapping Turtles. The daily limit for bullfrogs and snapping turtles is 15; these species may not be taken from designated trout waters. Taking bullfrogs with a gig or bow and arrow is permitted subject to compliance with other regulations concerning access to MCBQ waters. Frog gigging requires a hunting license. Taking turtles by hook and line requires a fishing license.

d. Fish Bait. "Fish bait" possessed in compliance with VA regulations may be used in MCBQ waters. There are no restrictions on the use of earthworms and crickets.

e. Trotlines. The use of trotlines in MCBQ impounded waters is prohibited.

f. Commercial Fishing. Commercial fishing is not allowed in MCBQ impounded waters.

g. Seines. Seines may not be used in MCBQ waters except as authorized for scientific study. The non-native snakehead fish is present in tidal streams. Seining and transport of fish from tidal streams is prohibited to prevent spread of the snakehead to inland waters.

h. Bow Fishing. Game fish may not be taken by bow and arrow. Common carp, catfish, gar, and northern snakehead may be taken by bow and arrow in the tidal area of Chopawamsic Creek. Spearguns and poisoned arrows are prohibited. Archers are authorized to use the Quantico Archery Site for practice if they possess either a valid MCBQ hunting or fishing license. Archers must sign in and out at a log book at the Archery Site to obtain a daily quiver pass.

i. Dip Netting. Dip nets may be used to take carp, shad, and herring in the tidal Chopawamsic Creek in accordance with VA regulations. An MCBQ fishing license is required. The user and all helpers (regardless of age) must have either county dipnet permits or a valid VA fishing license.

11. Violations. Violations of these regulations shall be immediately reported to the CLEO, NREA Branch, G-5, at 703-432-6793/6794/6395. Violators of fishing regulations, safety regulations, or principles of good sportsmanship are subject to administrative curtailment of fishing privileges, possible

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judicial proceedings in state or federal courts, and military disciplinary action for military personnel.

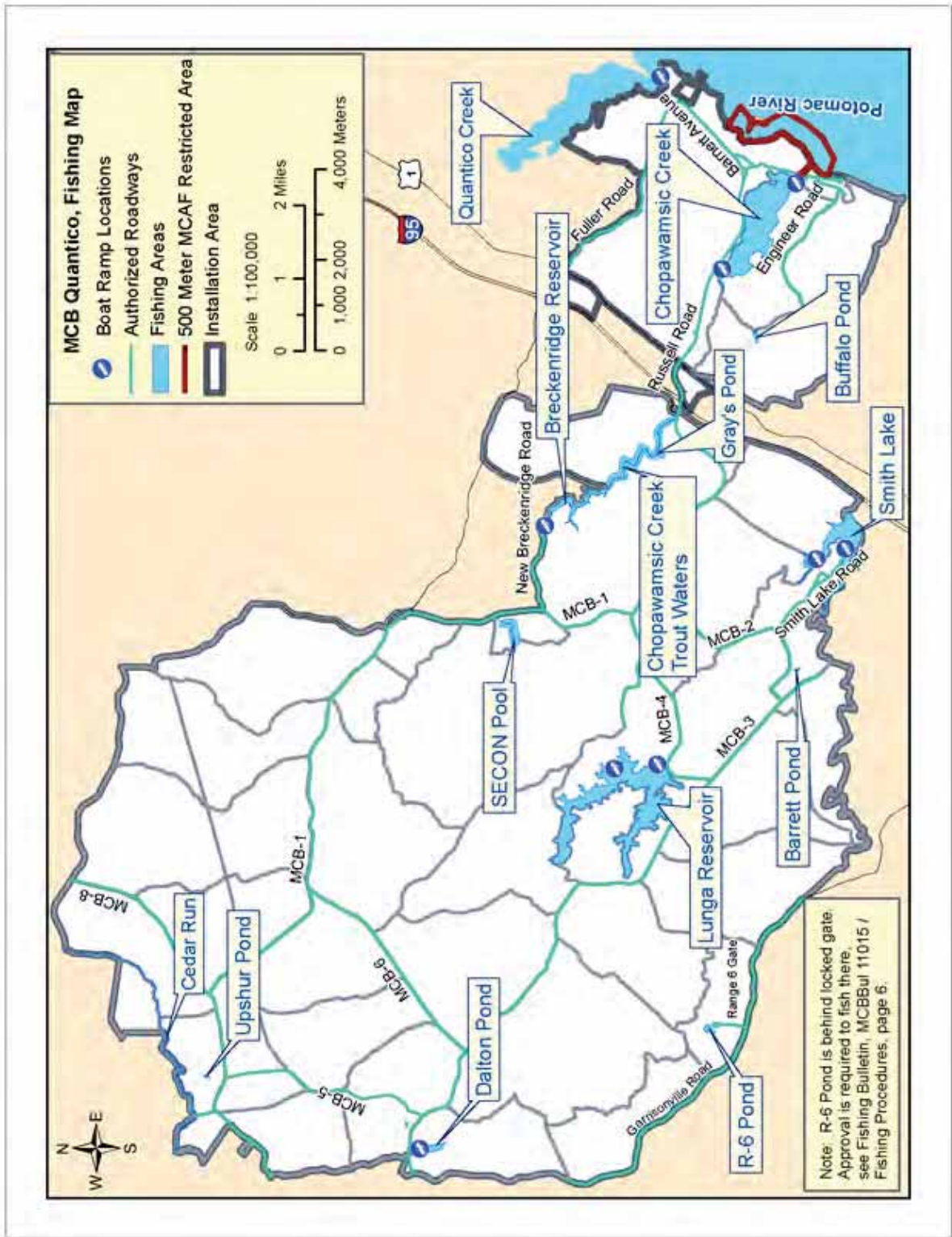


Figure 1-1. Map of MCBQ Fishing Areas

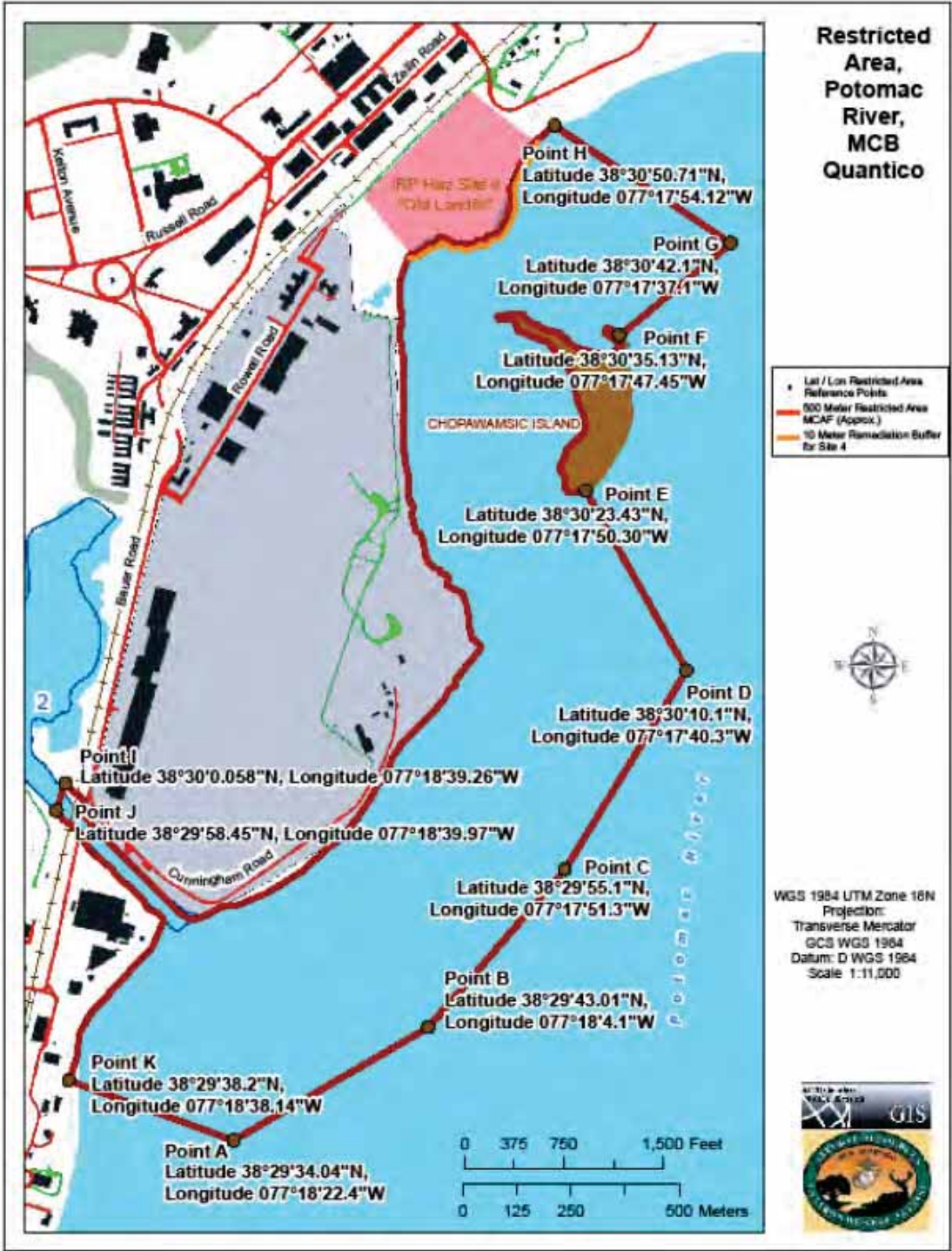


Figure 1-2. Map of MCBQ/MCAF Restricted Area (33CFR Part334.235)



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## CHAPTER 2

## HUNTING REGULATIONS

1. Authorization to Hunt. To be eligible to participate in recreational hunting on MCBQ, persons must complete the following:

a. Obtain all VA and federal licenses and stamps required for the game to be hunted. Possession of the proper VA licenses is a prerequisite to purchase the Base hunting license. VA licenses are not sold at the Game Checking Station (GCS); they are available at most sporting goods retailers and online at <http://www.dgif.virginia.gov/licenses/>.

b. Application and Waiver of Liability. All persons who want to participate in hunting recreation must complete the waiver of liability shown at either Appendix B or C and the MCBQ hunting application at Appendix D. This includes individuals who do not hunt (non-hunters). Parents or guardians will complete the waiver of liability on the behalf of minors. The falsification of any information in the application may result in the suspension of privileges.

c. Background Screening

(1) MCBQ will conduct a background screening of hunting applicants prior to the issuance of a Base hunting license in accordance with the Letter of Instruction for the implementation of hunter background checks dated 24 February 2011. The applicants must provide an approved source of identity and biographical data to include full name, address, birth date, and full social security number.

(2) A background check will be conducted by authorized personnel aboard MCBQ. The retrieved data will be reviewed for compliance with the Base access control policy and VA and federal firearms requirements. A waiting period may be required to allow for processing of the application.

(3) Persons denied a MCBQ hunting license due to failure to meet screening criteria may submit a written request for a waiver to the Commander, MCBQ. Waivers shall be routed through the Conservation Law Enforcement Section, NREA Branch.

(4) Exemptions. The following personnel will not be subject to screening requirements:

Enclosure (1)

(a) Minors (under the age of 18 years), but they must be accompanied by a licensed adult.

(b) Personnel who have a valid and current form of identification listed at Appendix E.

d. Virginia Hunter Education Course (VHEC). Hunters under the age of 12 must present either a VHEC card/completion certificate or a Virginia Apprentice Hunter License (VAHL) in order to obtain a MCBQ hunting license. Hunters over the age of 12 must meet VA hunter education requirements necessary to purchase a VA hunting license or else possess a VAHL. Hunters who need to attend a VHEC are advised to contact The Quantico Rod and Gun Club at [www.qrgc.org](http://www.qrgc.org) or the Virginia Department of Game and Inland Fisheries (VDGIF) at [www.dgif.virginia.gov](http://www.dgif.virginia.gov) for a listing of course offerings. Hunters who possess a VAHL must hunt within arm's reach and under the immediate control and direction of the adult escort.

e. MCBQ Hunter Orientation Safety Class. This class provides instruction concerning Base hunting procedures, regulations and safety requirements. The class takes about 30 minutes and is given at the GCS, Building 5-9. Interpretation is not available for non-English speakers. Scheduled class times and dates will be published in an annual hunting bulletin. All hunters and non-hunting companions 8 years of age or older must attend the class; those persons licensed at MCBQ during the previous hunting license year may not be required to attend if there have been no significant changes to the hunting regulations. The annual hunting bulletin will specify class attendance requirements. Children under the age of eight do not have to watch the video, but their parent or guardian must complete a waiver of liability on their behalf and must keep the child under their direct and immediate control and within arm's length at all times.

f. Minimum Age Guidelines and Parental Consent Form. Minors (under 18 years of age) who are not active duty military members must be accompanied and directly supervised by a parent, legal guardian or an adult (designated in writing by the parent or legal guardian) when hunting. Parents or legal guardians shall complete the parental consent form at Appendix E to authorize another adult (21 years or older) to take their minor child hunting at MCBQ. The supervising adult must possess a valid VA hunting license and MCBQ hunting license.



g. All hunters are responsible for knowing current federal, state, and MCBQ hunting regulations.

## 2. MCBQ Hunting License

a. Hunters must obtain a MCBQ hunting license. All hunting licenses will be processed at the GCS and all sales are final. The fee schedule and hours of sales will be published in the annual MCBQ hunting bulletin.

b. Non-hunters will be issued a non-hunter privilege card in lieu of a license. Non-hunters are typically spouses or children who want to enjoy outdoor recreation with a family member but do not hunt and do not possess a VA hunting license. Non-hunters may not carry a weapon, call game, or in any way participate in the hunt. They must stay within arm's reach and under the direct supervision of their escort.

c. License Color Code. At the time of sales, licenses will be color-coded to facilitate the reservation of daily hunting permits. All licenses will be coded GREEN, BLUE or BROWN, as follows:

(1) Licenses issued to active duty Marines and their dependents will be coded GREEN.

(2) Licenses issued to all other persons having valid military identification cards and Marine Corps Civilian Common Access Cards will be coded BLUE.

(3) All other licenses will be coded BROWN.

3. Hunting Seasons and Limits. Annual hunting seasons and limits will be published in the annual MCBQ hunting bulletin in the 11015 series.

## 4. Daily Check-In And Check-Out Procedures

### a. Definitions

(1) Hunting Areas. Designated training areas, parking areas, tree stands, or waterfowl blinds where hunting may be authorized. A map of these areas will be provided at the GCS.

(2) Check-in. The process of reserving a hunting pass, followed by picking up a daily hunting permit at the GCS.

(3) Check-out. The process of notifying the GCS at the completion of the hunting trip.

(4) Daily Hunting Permit. A laminated card or a printed receipt obtained at the GCS that provides authorization to enter a specific hunting area on a specific day.

(5) Daily Hunting Permit Quota. During the fall/winter hunting seasons, the GCS may issue approximately 1 daily hunting permit per 75 acres of available hunting land. During the spring gobbler season, the GCS may issue approximately 1 daily permit per 225 acres of available hunting land.

(6) Hunter Tracking System (HTS). The HTS is a telephone based system for reserving hunting passes and checking -in and -out of training areas. Hunters will use the HTS to reserve and print daily permits. Instructions for use of HTS will be provided at the GCS.

(7) Buddy Hunt. In special cases during spring gobbler season, two hunters may be allowed to hunt together under one daily hunting permit. This will be known as a "buddy" hunt. Both members of the party may carry a weapon but must travel to and from the hunting area in the same vehicle and must stay within 20 meters of one another. This is a typical arrangement where one hunter is the primary caller and the other hunter is the primary shooter.

(8) Scouting. Any hunt related activity that does not involve the actual pursuit of game with a weapon is considered scouting. This includes learning terrain features, looking for animal sign, installing tree stands, and placing game cameras.

b. Daily Hunting Access. Hunters and their companions may not enter a hunting area or blind until they have either been issued a daily hunting permit or been checked-in as described below.

c. Non-Hunters. They will be logged in under the daily permit of their adult companion and will not count against the daily quota within a hunting area, except that they do count against the occupancy quota within waterfowl hunting blinds.

d. Minors. Minors must be checked-in by a parent, legal guardian or adult designated in writing. Minors will be issued a daily hunting permit and must be escorted by an adult, 21

years of age or older. An authorized adult can escort no more than two youth hunters (under the age of 18) or non-hunting companions. The underage hunters must stay within sight and voice contact and no more than 100 meters away from the adult escort. During spring gobbler season, in designated dove fields, or if hunting under the VA apprentice license, underage hunters must be within arms reach and under the immediate control of the adult escort.

e. Waterfowl Blinds. Each waterfowl blind has a maximum capacity of three persons, with the exception of "wounded warrior" blinds which are built larger to accommodate wheelchairs and up to 4 persons. The first hunter to reserve the blind can invite up to two persons to share the blind. Non-hunters count towards that quota. Each person in the blind must have in his/her possession a daily pass.

f. Spring Gobbler Season Callers. During the spring gobbler season, a hunter may take along a companion. The companion will be checked-in under the daily permit of the hunter they accompany and will not be issued a separate daily permit. The companion may not carry any weapon but may participate in the hunt as a caller or videographer. A caller must be a properly licensed hunter. The companion must stay in the immediate vicinity of the actual hunter at all times.

g. Vehicle Information. Hunters must provide the GCS with current data on telephone numbers and vehicles being used on the hunt day if different than the vehicle on file.

h. Early Reservation Period

(1) Reservations. MCBQ licensed hunters may attempt to reserve a daily MCBQ hunting permit on the GCS business day prior to a hunting day per the schedules provided in the MCBQ annual hunting bulletin. Hunting reservations will either be made in person, by calling the GCS at 703-784-5523/5329, or by calling the HTS at 703-784-6704, depending upon the season. Callers must know their MCBQ hunting license and PIN number and reservations must be made during the time period appropriate for each licensed hunter. Early reservations are held until 30 minutes following opening time on the hunting day.

(2) House Guests of Active Duty Military Personnel. An active duty host may complete an information form that provides the name, address, and period of stay of the house guest. That

form will be used to temporarily upgrade the house guest into the same check-in category as the host. A bonafide house guest is defined as an out-of-the-commuting-area (i.e., outside a 100 mile radius of the base) visitor whose stay is temporary and non-recurring; e.g., a relative making a holiday visit. Due to space limitations during spring gobbler season, the host can take the house guest along as a "buddy" hunter.

(3) Conservation Volunteer Program. Hunters who perform voluntary service per MCBO 11015.3A, Conservation Volunteer Program, may be eligible for the following benefits.

(a) Conservation volunteers will be issued one chit per each 10 hours of service performed during the 12-month period (1 October to 30 September) prior to the fall hunting season. A maximum of 4 chits (40 hours service) will be issued. Each chit may be used for one hunting event to upgrade the volunteer to the next highest check-in category. Only the volunteer issued the chit may utilize the chit.

(b) Conservation volunteers 18 years of age or older contributing 50 or more hours of service will be able to make hunting reservations in the next highest check-in category for the entire fall, winter, and spring hunting seasons. These personnel will not receive chits.

(c) Conservation Volunteer Program Guest (CVPG) Card. Conservation volunteers 18 years of age or older contributing 100 or more hours will earn a CVPG card which may be used by the conservation volunteer to make hunting reservations for a hunting partner per the same procedures used for their CVP card. Daily permits reserved by a CVPG card will only be issued to the responsible conservation volunteer to whom the CVPG card belongs. The purpose of the CVPG card is to enhance the opportunity of the volunteer to hunt with a partner; therefore, it is only to be used by a guest who is hunting in the same area with the host volunteer. Occasionally, the host volunteer may be required to leave the base before the hunting day is over. In these cases, the guest hunter may continue to hunt. Due to limited space during spring gobbler season, a volunteer utilizing their CVPG card may take a companion hunting per the "buddy" hunt program. Failure to use the CVP card and CVPG card as described may result in forfeiture of the card and termination of the CVP contract.

(4) Early Reservation Priority. Approximately 85 percent of daily permits will be reserved for priority issue to personnel with DoD issued ID cards and USMC issued Common Access Cards (CAC) (GREEN and BLUE). Approximately 15 percent of hunting spaces will be allocated to non-affiliated civilian hunters (BROWN).

i. First-Come First-Served Check-in

(1) On the GCS business day prior to a hunting day, unissued and unreserved daily permits will be issued first-come, first-served, beginning at 1700. These reservations will be held for 30 minutes after GCS opening time the next morning. If unclaimed after 30 minutes, these reservations will be cancelled and the permits will be released on a first-come, first-served basis.

(2) On the hunting day, all unissued and unreserved permits will be issued first-come first-served. Daily permit reservations made by telephone on the hunting day will auto-cancel after two hours. Most civilians find the first-come first-served periods the most efficient time to obtain daily hunting permits.

j. Daily Permit. Hunters issued a daily permit are authorized to only enter the hunting area specified on the permit on the valid date for the permit.

(1) The hunter will be issued two passes for the daily permit. The hunting pass must be carried on the hunters' person and the parking pass must be displayed face up on the left side of the dashboard of the hunters' vehicle so it is clearly visible. A pass for each hunter in a vehicle must be clearly displayed. Vehicles not displaying parking passes may be towed away at the owner's expense.

(2) A third pass is printed by the Hunter Tracking System and it is a receipt to be left at the GCS. Hunters should always verify it contains the correct vehicle make, model, license plate and cell phone number.

k. Legal Hunting Hours. Time restrictions for arrival at MCBQ hunting areas, legal hunting hours, and check-out deadlines will be published in the annual MCBQ hunting bulletin. Failure of a hunter to check-out results in a search for the hunter based on the presumption that the hunter is either lost or

injured. Failure to check-out on time may result in curtailment of hunting privileges.

l. Coordination of Assignment to Training Areas

(1) Hunters will only be assigned to training areas where there will be no conflicts with other scheduled land use activities. The Director, Range Management Branch (RMB), G-3 (Operations Division) will submit a daily schedule to the GCS which designates open/closed hunting areas. On hunting days, at approximately one and one-half hours after sunset, the GCS will notify RMB when all hunters have returned. GCS and RMB personnel will be aggressive in their monitoring of area status and will make frequent coordination calls. This will ensure safe, effective, and controlled use of the training areas.

(2) Assignment of hunters to TA 2, 3, and 4 will only be made after written approval has been received from the OCS S-3.

(3) Assignment of hunters to Transportation Demonstration Support Area (TDSA), formerly Engineer Test Area (ETA) and duck blind "C" will only be made after coordination with the Site Manager, TDSA.

(4) Assignment of hunters to blinds within the Permanent Restricted Area (PRA) at the Marine Corps Airfield (MCAF) will only be made after coordination with the MCAF Airfield Manager/Operations Officer. Watercraft shall not be used within the PRA; hunters must have means, such as dogs capable of retrieving waterfowl, to recover game.

m. Access to Scout Hunting Areas

(1) When the GCS is open during hunting seasons, permission to enter the training areas for hunting and trapping activities, to include scouting and hunting dog training, must be obtained at the GCS.

(2) Patrons must obtain daily permits through the HTS during normal GCS operating hours published in the annual hunting bulletin.

(3) East of Interstate 95



(a) Areas east of Interstate 95 will be open for scouting only for personnel who have completed the Mainside (Eastside) Archery Qualification Class.

(b) This does not prohibit Mainside housing residents from utilizing trails and exploring their own backyards.

(4) Access when the GCS is closed

(a) Patrons must sign in and out of a Range Access Authorization log book at the Big Game Shed, GCS. Authorized scouting times are 0730-1600. Patrons must be logged back in no later than 1600. No firearms or archery tackle should be on the person or in the vehicle when scouting. However, military personnel who must store their equipment in the vehicle may scout hunting areas as long as the equipment is encased and stowed such that it is not readily available for hunting.

(b) Patrons should leave a trip plan with someone at home who can alert the Base in case of failure to return after the scouting trip. A call to Range Control at 703-784-5321 will initiate search and rescue operations.

(c) A daily schedule of areas that have been pre-approved for recreational access will be posted at the GCS. Patrons may sign into any area on the open list. All other areas are off-limits!

(d) The log-in process requires the patron to print his/her MCBQ hunting license number, name, training area number, two telephone numbers (preferably cell and home), and vehicle description in the ledger book. Patrons are to place their MCBQ license on the left hand side of the dash board so that it is readable from outside the vehicle.

n. Parking at the GCS. Hunter parking is authorized on hardened road shoulders along Telegraph Road, south and east of Building 5-9, GCS. Overflow parking will be permitted in the grassy field across the street. All parking along Building 5-9 and inside the fencing is reserved for employees and government owned vehicles, unless otherwise approved. Unauthorized parking may result in loss of hunting privileges aboard the Base.

5. Security. MCBQ is likely to be under an increased force protection condition during the hunting season, which requires observation of security requirements and reporting of any suspicious activity. Hunters should report any suspicious activity to the GCS in person or by calling 703-784-5523/5329.

6. Physically Challenged Hunting Program

a. To optimize opportunities for recreation and rehabilitation therapy for persons with severe injuries (e.g., loss of limb, paralysis, etc.), personnel are invited to participate in the guest hunting program in accordance with Appendix G. The spirit and intent of this program is to support those service members who are in a therapeutic or rehabilitation status and may need assistance to enjoy outdoor recreation.

b. The GCS will maintain waterfowl hunting blinds and deer stands that are accessible by wheelchair. Priority use of these facilities will be given to paralyzed veterans and to wounded warriors who are recovering from traumatic injuries and need assistance to hunt. Deer hunters assigned to the hydraulic lift stands will be authorized to take antlerless deer during any designated deer hunting season. A qualifying hunter is authorized to reserve one of these hunting blinds or stands and, if deer hunting, an adjacent stand for an invited hunting partner/escort of his/her choice by calling 703-432-6782/6776/6777 in advance of the desired hunting date. A hunter may reserve only one hunting date at any given time.

c. Physically challenged hunters may be authorized, on a case-by-case basis, to use firearms for hunting in areas where hunting is normally restricted to archery tackle. To do so, the following conditions must be met:

(1) Hunting may only be conducted from locations where terrain features and management of the hunt will prevent any projectile from impinging upon buildings, roads, or occupied training areas;

(2) The hunt locations and access to the Ranges and Training Areas (RTA) west of Interstate 95 have been previously approved by the RMB;

(3) At least one guest hunt coordinator has been assigned to escort each hunter and a single NREA Point of Contact has been assigned to manage the hunt to ensure compliance with safety standards, all VA and MCBQ hunting regulations, and the MCBQ Standard Operating Procedures for the RTA.

d. The Guest Hunting Office, GCS, shall coordinate hunts with the RMB; S-3, Weapons Training Battalion; S-3, The Basic School; Site Manager, Transportation Demonstration Support Area; Area Commander for Camp Upshur; and S-3, OCS, as appropriate, to optimize these hunting opportunities.

7. Waterfowl Hunting. Waterfowl Hunting has some of the most stringent regulations. Hunters are responsible to know all regulations pertaining to the waterfowl being hunted and should be able to identify the various species of waterfowl that may be in the area. The following rules apply to the hunting of all ducks, geese and swans (waterfowl):

a. East of Interstate 95, waterfowl hunting is only permitted from licensed blinds that are maintained and operated by this Base for public hunting. West of Interstate 95, waterfowl hunting is permitted in open hunting areas. Open fields where planted grain crops have been mowed or manipulated to attract migratory birds may not be used for waterfowl hunting. Hunting is allowed at Lunga Reservoir, Smith Reservoir, and Dalton Pond from the designated blinds/stakes shown on the Base hunting map. Breckinridge Reservoir is closed to waterfowl hunting.

b. Hunters in hunting areas west of Interstate 95 may not construct permanent waterfowl hunting blinds but may use temporary brush blinds for concealment. During the deer firearms season, waterfowl hunters who are checked out to general hunting areas must wear the required blaze orange clothing.

c. Nontoxic shot authorized by the U.S. Fish and Wildlife Service is mandatory for all waterfowl hunting. Lead shot may not be possessed while hunting waterfowl.

d. Plugged Shotguns. Shotguns must not be capable of holding more than three shells.

e. Managed hunting blinds have a maximum capacity of three persons. The hunter who reserves a blind may invite up to two other MCBQ licensed hunters to share the blind but is not required to allow additional persons in the blind. Every person occupying the blind must be checked -in at the GCS. Managed waterfowl blinds are for waterfowl hunting only; no other species may be taken while hunting in the blinds. Shooting from boats while in transit to or from the blinds is not allowed. Hunters must have means such as a boat or dog to safely retrieve down or crippled waterfowl.

f. Due to the limited number of waterfowl blinds, a hunter may reserve only one waterfowl blind. Therefore, if a hunter has picked up or reserved a waterfowl blind permit for himself/herself, then he/she may not reserve or pick up a separate blind for a friend. Waterfowl hunting blinds are reserved as follows:

(1) A calendar will be posted at the GCS prior to the waterfowl hunting season that designates which waterfowl blinds will fulfill the GREEN, BLUE and BROWN permit quotas for each scheduled waterfowl hunting day. The color designation of the blinds will be rotated daily on a systematic basis. An individual hunter may not reserve the same blind during the early reservation period on two consecutive days. The purpose is to prevent one hunter from having exclusive use of one blind.

(2) The times to reserve a waterfowl hunting blind will be published in the annual hunting bulletin.

g. Waterfowl hunters assigned to public hunting blinds must return to the GCS and check-out no more than 90 minutes after sunset.

h. All stationary waterfowl hunting blinds, to the extent practical, will have an alternate hunting location marked by a designated stake. A hunting party assigned to a blind that has an alternate hunting location will have the choice of hunting at either the permanent blind or at the staked location. A hunting party may not split up and position hunters at both the blind and the stake locations.

(1) At certain stationary hunting blinds, the hunt party can also hunt from a position within 100 foot radius of the blind if they need to adjust for prevailing wind conditions. Instructions will be posted within the blind.

(2) At the staked location, hunters must stay within 100 feet of the stake and can hunt from a shoreline position or may hunt from the boat.

(3) At any of these alternate locations, hunting from a boat that has been altered for the purpose of concealment will require possession of a state floating blind license in addition to the MCBQ hunting blind daily permit.

i. Waterfowl hunters shall clean blinds after use, ensuring that no litter and spent shells are left behind.

#### 8. Quantico Archery Site

a. The Quantico Archery Site is operated by the GCS and is located along MCB #1 about 0.5 miles west of the GCS. Hours of operation are 1100 until 30 minutes past sunset Monday-Friday and 0800 until 30 minutes past sunset Saturday-Sunday. Archery site use is limited to MCBQ hunting and fishing license holders and authorized group sessions. NREA Branch has exclusive use of the site during Archery Qualifications.

b. To use the Quantico Archery Site, patrons must:

(1) Obtain the MCBQ hunting or fishing license.

(2) On a daily basis, obtain a quiver pass at the Archery Site by signing-in on a ledger. Hunters will print their MCBQ hunting license number, name, two telephone numbers (preferably cell and home), and vehicle description.

(3) Display the quiver pass on the bow holding rack on your shooting lane at the archery site.

(4) Return the quiver pass and sign out of the log book.

#### 9. Archery-Only Hunting Areas

a. Due to noise and safety considerations, some hunting areas will be open only for archery hunting. Crossbows, compound bows, recurved and traditional longbows are all considered archery tackle and may be used in these areas.

b. Firearms may not be carried at any time, or during any season, when hunting in these areas. During the firearms deer season, blaze orange clothing will be required when walking to and from the archery-only areas west of Interstate 95. While stationary in a tree stand, archers in these areas may remove the blaze orange. Blaze orange is not required in the hunting areas east of Interstate 95; those specific areas are the Mainside parking areas, TDSA (formerly ETA), and OCS Training Areas 2, 3, and 4.

c. Any legal game species or nuisance species may be taken in archery areas as long as all shots are taken with a downward trajectory from elevated stands where required.

d. Archery Skill Test. Anyone planning to archery hunt east of Interstate 95 and Camp Upshur must attend a specific archery safety lecture and pass an archery skills test administered by GCS personnel at the Quantico Archery Site. This is applicable to hunting at the Mainside parking areas, TDSA (formerly ETA), Training Areas 2, 3, and 4, and Camp Upshur. Details and schedules for the archery skills test will be provided in the annual hunting bulletin.

e. Mainside Area. The following special provisions are applicable to the Mainside area (TA 1), located east of U.S. Highway 1 and north of Chopawamsic Creek. This area is developed with housing, recreational, administrative and educational facilities. Woodlands at Mainside contain trails used by people participating in multiple activities, including mountain biking, hiking, and running. Because there are generally no access controls to these woodlands, hunters must understand that all of these users may be present during hunting hours. Accordingly, it is essential that hunters meet specific qualifications and obey restrictive guidelines to ensure hunting is conducted safely and with minimal impact upon other woodland uses. Policies and procedures for qualified hunters in the Mainside area are as follows:

(1) Hunters must park only in their assigned parking area. From that parking area, hunters will be allowed to hunt in any part of the open hunting area adjacent to their assigned parking area so long as the hunter travels on foot and does not enter any "No Hunting" zones. A maximum quota of 1 hunter per 25 acres of hunting space will be allowed.



(2) All arrows carried to the field must have the hunters' Quantico license number written on the fletching. All shot arrows must be retrieved.

(3) Hunters are required to use portable tree stands and must take them down daily. Hunting from the ground is not permitted; hunters are expected to be elevated at least eight feet off of the ground. Hunters must be in the stand before nocking an arrow.

(4) All harvested deer will be transported directly to the GCS. Handling of game will be done in a manner that avoids offending the non-hunting public and individuals who would prefer not to see dead animals. If a wounded deer leaves the hunting zone, crosses a highway, or enters a residential area, the hunter will immediately notify the GCS and request assistance in retrieving the deer.

(5) Hunters will not hunt within 50 m of trails nor shoot towards or across any trail or road.

(6) A minimum 200-meter no hunting zone is established around developed facilities. This zone will not be marked with signs or paint because there are no roads, trails, or natural features delineating these areas that can be easily posted. Hunters will be responsible for learning the topography of the area in which they intend to hunt and for determining that the placement of their hunting stand is at least 200 meters away from developed areas.

(7) The G-3 (Operations Division), Marine Corps Marathon Office, Marine Corps Community Services, and dependent schools will maintain liaison with the Head, Fish, Wildlife and Agronomy, NREA Branch, G-5, at 703-432-6782/6776, to advise when special (non-routine) events are occurring that would make it preferable to close hunting in the Mainside area.

(8) Mainside hunting is authorized beginning 30 minutes before sunrise and ending 30 minutes after sunset unless closed due to the aforementioned reasons.

(9) Safety is paramount. Any violation of MCBQ regulations while in the Mainside area will result in the suspension of Base hunting privileges for the entire season.

f. Transportation Demonstration Support Area (formerly ETA). This archery area is in the portion of TA 4 now known as the TDSA. The boundaries of this area will be posted with signs, "ETA-Archery Hunting Only." This area is accessible from U.S. Route 1, from County Route 660 near Boswell's Corner, and from Engineer Road, when it is open. All hunters must park in a designated parking area: either adjacent to the TDSA gate, in the marked parking area along Telegraph Road, or near Buffalo Pond (via Engineer Road). No hunting is permitted within 200 meters of TDSA buildings. Hunters are required to use portable tree stands but are not required to put them up and take them down daily. The requirement to use tree stands is waived during the spring gobbler season.

g. TA 2, 3, and 4

(1) The OCS S-3 Office schedules the use of TA 2, 3, and 4, and is responsible for determining the days that hunting can be conducted safely. The OCS S-3 will send written notification to the GCS to designate dates and times that hunting has been approved.

(2) Access to these areas is permitted from the Engineer Road entrance in the OCS area. Hunters are advised that this is a sensitive area, used for military and physical training (particularly jogging) by Base personnel. Like Mainside, hunters must be constantly aware that joggers and other personnel may be in the hunting area.

(3) Hunters will operate vehicles at a safe speed and may only drive on Engineer Road, Buffalo Road, Iwo Jima Trail, Wake Trail, Con Thien Trail, and the portion of Chosin Trail from Brown Field (OCS) to the "eye of needle," defined by pull-up bars co-located with the turn-around loop. The section between the eye of the needle and Iwo Jima Trail is off-limits to non-OCS vehicle traffic. Waterfowl hunters may drive on Chosin Trail for access to parking areas for waterfowl hunting blinds D, 9, and 10, but only when TA 3 is open.

(4) Hunters are required to use portable tree stands but are not required to put them up and take them down daily. The requirement to use tree stands is waived during the spring gobbler season.

h. TA 5B, 5C, 7C, 8A, and 8B. These areas are in close proximity to developed areas: TBS, the Federal Bureau of

Investigation and Drug Enforcement Administration training campuses, and the Russell Knox building. As a result, all of the roads and trails adjacent to and within these areas are frequently utilized for physical fitness training and other activities associated with student training. MCBO 6100.2 identifies fitness trails west of Interstate 95. The following policies and procedures for archery hunting within these areas are as follows:

(1) Hunters are required to use portable tree stands but are not required to put them up and take them down daily. The requirement to use tree stands is waived during the spring gobbler season.

(2) Because joggers will be using the woodland trails, hunters will constantly be alert for this activity. Hunters will not hunt closer than 50 meters to any trail nor shoot towards or across any trail or road. The Endurance Trail portion of TA 8A will not be open for hunting.

(3) Hunting is prohibited within 100 meters of paved and gravel improved roads.

(4) Hunters may park along paved roads, MCB #1, MCB #2, MCB #3, and MCB #4, adjacent to open hunting portions of these training areas. Parking is allowed along Smith Lake Road and Washboard Road when those roads are open to vehicular traffic. Hunter vehicles are not permitted on Application Trail within TA 8A and 8B.

(5) If Washboard Road is closed, there is a designated hunter parking place at the Washboard B gate.

i. TA 6C. TA 6C is located adjacent to Quantico National Cemetery. Hunters may park along either route 619 or the open sections of Breckinridge Road. Hunters may not enter the "No Hunting" buffer zone between the Base and Quantico Cemetery property nor encroach into the landfill section designated for wheelchair accessible hunting. Hunters may not travel through the cemetery to or from the hunting areas.

j. Russell Road Landfill. This area is only available on a limited basis and is restricted for use by hunters in wheelchairs and their hunting partners. They can request use of the area per the guidelines at paragraph 3005.2. No vehicle traffic is allowed on the landfill cover. Hunting will be from

designated stands. Other game such as squirrel, dove, and turkey may be taken during legal seasons. Shotguns and muzzleloading guns may be used during the designated firearms seasons.

k. Camp Upshur Area. This area is located north of Cedar Run. Archery hunting is permitted in the woodland areas that are at least 100 meters away from paved roads and 200 meters from buildings. The authorized archery hunting area is accessible from the designated parking areas shown on the MCBQ hunting map.

l. TA 17C. This hunting area is bordered by S.R. 611 and MCB #8. Hunters must keep a safe distance from the privately owned homes along the densely vegetated western border of this area.

#### 10. Safety Regulations

a. No Hunting Zones. Hunting with firearms is not permitted within 200 meters of ammunition and fuel storage areas, built-up areas, rifle and pistol ranges, dwellings or other occupied structures, and designated recreation areas. Archery hunting is prohibited within 100 meters of these facilities except for the 200 meter buffer designated for Mainside. Hunting is prohibited within 100 meters of paved roads except during the deer firearms season, when the prohibited distance is 200 meters.

b. Buddy System. Hunters are encouraged to hunt with a partner so one person can get help if the other becomes ill, injured or lost.

c. Mandatory Personal Safety Equipment. All persons hunting or scouting **must** carry a compass, flashlight, and whistle as safety measures to help reduce occurrences of late and lost hunters. It is recommended tha hunters also carry mobile telephones to be able to call for assistance. Communication via mobile telephone does not lessen a person's responsibility to return to the GCS on time.

d. Blaze Orange. Every hunter or person accompanying a hunter on MCBQ property during the firearms deer season will wear a solid blaze orange hat and outer body clothing that has at least two square feet of blaze orange visible above the waist and visible from 360 degrees. Camouflage blaze orange body clothing is acceptable. Portable pop-up style blinds must also

be marked with 2 square feet of blaze orange visible from 360 degrees. There are two exemptions from the blaze orange policy: all hunters east of Interstate 95 (in waterfowl blinds and archery only areas) are exempt, and waterfowl hunters in approved blinds west of Interstate 95 are exempt.

e. Keeping a Safe Distance. Hunters need to be mindful of each other's presence in the woods. There are two occasions of particular concern. First is the potential hazard of squirrel hunters to shoot upwards into trees where camouflaged archery hunters are sitting motionless in tree stands. Second is the possibility of spring gobbler hunters shooting towards another camouflaged hunter. Archers and spring gobbler hunters are encouraged to mark their hunting locations with blaze orange bands and to whistle or otherwise signal their presence to approaching hunters. Ethical hunters, when notified of the presence of another hunter, will depart the area immediately to avoid interference with the hunter who is already in position to hunt. This separation distance between hunters should be at least 200 meters.

f. Transportation of Weapons. Per reference (j), weapons transported aboard MCBQ must be transported in the following manner:

(1) Weapons must be in the trunk of the vehicle. In vehicles without a trunk, weapons must be in a carrying case, and placed as far away from the vehicle occupants as the situation permits. If transporting weapons while occupying a motorcycle, the weapon must be cased and may not be carried on the person in any manner. The use of a holster is prohibited. On a motorcycle the use of saddlebags, a back pack or some other carrying device is authorized.

(2) Weapons must be unloaded and on safe.

(3) Magazines and all ammunition must be removed from weapons.

(4) Magazines and all ammunition must be separate and kept as far as possible from the weapon.

g. Concealed Hand Guns Prohibited. Hunters who have concealed firearms carry permits are not authorized to carry concealed handguns on Base.

h. Unexploded Ordnance. All hunting areas may contain unexploded munitions (UXO) which is dangerous and must not be removed or disturbed. Hunters should mark the area of such UXO with rags or other means and **immediately** report their location to the GCS. The GCS will immediately notify RMB for action.

i. Evacuate Hunting Areas. Hunters must immediately leave the assigned hunting area and return to the GCS if:

(1) Continuous siren or horn blasts, signaling emergency or unsafe conditions, are heard.

(2) There is contact with military personnel engaged in military training exercises within the assigned hunting area. It means that either the hunters or the military personnel are in the wrong area. For safety of all personnel, hunters shall leave the area immediately and report the problem to the GCS. GCS personnel will coordinate with the RMB to determine the cause of the problem. Once the problem has been corrected, the hunter shall either be assigned to another hunting area or will be allowed back into the original assigned area.

11. Tree Stand Use and Safety Guidelines. Permanently installed tree stands are not authorized, with the exception of those installed by NREA Branch for the support of guest and wheelchair accessible hunting programs. Portable stands and temporary installations are permitted. MCBQ hunters use tree stands at their own risk; the Government is neither responsible for accidents and injuries that may occur nor liable for any loss or damage that occurs to stands that are left unattended. Many hunters enjoy hunting from tree stands because the elevated position gives the hunter a better view of the ground area around the tree stand. Shooting downward from the elevated position is safer than flat trajectory (ground) shots because the projectile will impact closer to the shooting position where the hunter has good visibility. Despite the positive benefits of tree stands, some hunters are injured and killed as a result of accidents resulting from the climbing of trees and improper use of tree stands. To help prevent accidents, hunters shall abide by the following guidelines for the use of tree stands while hunting at MCBQ.

a. Persons wanting to enter a training area for the purpose of installing a tree stand must obtain permission from the GCS prior to entering the training area. On hunting days, persons wanting to install tree stands will check-in to an open area at



the GCS. If the quota of hunters has been reached in an area, no further hunt related access will be allowed for that area.

b. Any tree stand left overnight in a MCBQ hunting area must be marked with the name and telephone number of the owner. In the Mainside area (TA 1), they must be taken down on a daily basis and may not be left overnight.

c. Tree stands and all attachment hardware must be removed from MCBQ property no later than 31 January following the close of deer hunting season. No metal objects are to be permanently embedded in trees because damage to chain saws, sawmill blades and equipment operators can occur if saw blades strike steel objects hidden in the timber.

d. Tree stands must be inspected prior to each use to ensure that there are no damaged parts or loose handholds or footholds.

e. Follow the manufacturer's instructions for the assembly and use of the model of tree stand that you use.

f. Climbing tree stands equipped with heel and toe straps must not be altered and the straps must be used while climbing.

g. The proper use of a safety harness is recommended when hunting from the tree stand and while climbing up and down. A safety harness specifically designed for this purpose and equipped with a safety release mechanism should be used. The distance of slack between one's body and the tree should not exceed 18-24 inches.

h. Do not climb with anything in hand. Use an equipment haul line to raise and lower your **unloaded** gun, archery tackle, or other equipment.

## 12. Authorized Weapons

a. Deer will be hunted only with archery tackle, shotguns loaded with slugs (i.e., solid, non-exploding slug cartridges), and muzzle loading rifles .45 caliber or larger. Shotguns with barrels having lands and grooves are allowed at MCBQ for shooting slugs.

b. A hunter who has already met the daily or season bag limit on deer may continue to hunt for other in-season game but

may not carry slugs, a shotgun loaded with slugs or a muzzle loading rifle.

c. Muzzle-loading rifles may only be used during the general firearms season or for special hunts identified in the annual hunt bulletin.

d. Small game, waterfowl, and wild turkeys will be hunted with shotguns loaded with the appropriate shot shells. Wild turkeys may be taken with slugs during the fall season, incidental to deer hunting.

e. Air rifles between .177 and .25 caliber, inclusive, may be used for hunting small game and nuisance species.

f. During the regular firearms hunting seasons, a hunter may carry both archery and authorized firearms equipment in areas open to gun hunting and must abide by all rules and regulations affecting gun hunters.

### 13. Restrictions and Forbidden Practices

a. The use of rifles, revolvers, and pistols is prohibited except for the use of muzzle-loading and air rifles as stated above. This prohibition extends to carrying such weapons on the person or in a vehicle while hunting.

b. No one is allowed to carry a concealed weapon while hunting or while on MCBQ.

c. Buckshot may not be used to hunt any game and may not be possessed on one's person or in one's vehicle while hunting at MCBQ.

d. During spring gobbler season, organized drives, dogs, or electronic calling devices are prohibited. It is unlawful to use or to have in possession any shot larger than number 2 fine shot during spring turkey season.

e. Firearms may not be carried when hunting with archery tackle during the special archery/crossbow seasons or anytime during regular hunting seasons in the archery only areas.

f. It is prohibited to use any type of artificial light for the purpose of spotting, taking, or attempting to take game at anytime during the year.

g. Dogs may not be used for hunting deer and deer dogs may not be trained at MCBQ.

h. Trapping of any animal is prohibited, except as duly authorized by a MCBQ trapping license.

i. Shotguns larger than 10 gauge are prohibited.

j. Hunters may not shoot dogs. Any person shooting or injuring a dog may be subject to criminal prosecution or civil action pursuant to VA Code 3.1-796.127.

k. Organized deer drives are prohibited.

l. Hunters may not place or utilize any bait, salt, minerals, feed or other consumable substance to serve as a lure or attractant for game animals at MCBQ. This prohibition applies year round and includes any hunting activity to include use of trail cameras.

m. Shooting or harming any protected wildlife species is forbidden.

n. Target shooting is prohibited in MCBQ training areas. Target shooting and sighting-in must be done at designated facilities. Contact the Quantico Shooting Club for information at 703-640-6336 or use off-base facilities for firearms training.

o. Any hunter that uses or possesses alcohol or illegal drugs in MCBQ training areas is subject to loss of hunting privileges and prosecution under federal or state law. This prohibition extends to carrying alcohol or illegal drugs in a vehicle while officially checked-in to hunt.

p. It is unlawful to use electronically amplified calls and calling devices, to include applications on cell phones, except for coyotes, bobcats, foxes, and crows.

14. Motor Vehicle Operation. The following regulations apply to the operation of motor vehicles. Violations of these provisions are subject to prosecution:

a. Motorcycles, including mopeds and three and four-wheel all terrain vehicles, may not be used while hunting. Non-motorized bicycles may be used for transportation on trails

authorized for foot travel only for the purpose of access within an assigned hunting area.

b Off-road vehicle travel is prohibited. The only exception is for guest hunting coordinators, guests, and wheelchair hunters in designated guest hunting areas. Vehicles may only be operated on paved and graveled roads open to normal vehicular travel as shown on the MCBQ hunting map available at the GCS. These roads are subject to being closed for military training exercises, inclement weather, etc. At no time are hunters permitted to drive around closed range gates. Violators are subject to prosecution.

c. Hunters operate vehicles at their own risk and are solely responsible for any towage fees they may incur. They must inform the GCS as soon as possible in the event their vehicle breaks down or becomes immovable. Hunters are encouraged to lock their vehicles while hunting. MCBQ is not responsible for damages, theft, or injuries done to one's person or property while aboard the installation. Any damage, theft, or injury done to property or person should be reported to the military police at 703-784-2251 or to the CLEO at 703-432-6793/6794/6795.

d. Vehicles may not be parked in a manner to restrict the operation of range gates or block access to any road or trail. Vehicles must be parked completely off of paved road surfaces. These vehicles may be subject to removal at the owner's expense.

e. Hunters must park adjacent to their assigned open hunting area so that they can access their assigned area without trespassing through any other training areas. There are two exceptions. If the 617A gate is locked, hunters may park on the shoulder of the road on either side of the intersection of Route 617 and MCB 6 and walk Route 617 to access 10C but may not enter training areas 10A or 11A while in route. Hunters may park at the intersection of Route 610 and 644 and walk Route 644 to access 9D but may not enter TA 7A or 9C while in route.

f. Hunters shall not park in or adjacent to restricted "No Hunting" zones.

g. Game wardens will use discretion in determining if a vehicle is reasonably parked in the proper area; road shoulder conditions, etc., may require a hunter to park on the other side of the road from the assigned hunting area.

15. Reports

a. Upon killing a deer, bear, or turkey the hunter must immediately notch the appropriate tab on the big game license before moving the animal from the place of kill. That big game animal must then be taken to the MCBQ GCS for a Base wildlife official to collect data and issue any appropriate big game possession certificates. Note: A hunter who has taken a deer pursuant to the Deer Management Assistance Program (DMAP) does not have to notch his/her license. The hunter has permission to transport the deer to the GCS where an attendant will attach a DMAP tab to the VA Game Check Card. The GCS will provide special reporting instructions if wounded game cannot be recovered during normal GCS working hours.

b. Upon killing a wild turkey in the late fall turkey and spring gobbler seasons, the hunter must call the VA hotline for registering the kill with the VDGIF and then report to the GCS for data collection.

c. All animals taken at this base, to include small game, waterfowl, furbearers, and nuisance species, must be reported at the GCS when checking out at the end of a hunt. Neckband or leg band numbers from all tagged or marked animals or birds must be reported. The removal of unreported game from the base may result in forfeiture of base privileges.

16. Violations of Base Regulations. CLEOs may issue an 1805 pursuant to 18 U.S.C. 1382 for any violation of Base hunting regulations. Along with an 1805 or in lieu of an 1805, the CLEO may suspend hunting privileges for a period of not less than 3 days and not more than 1 year depending on the totality of the circumstances. Chapter 3 provides a summary of common penalties as a reference only.

17. Research Animals. To study factors affecting productivity and survival, some white-tailed deer and wild turkeys aboard MCBQ have been outfitted with tracking devices such as ear tags, leg bands, neck collars, and radio transmitters. These animals are not restricted from the hunt and are considered legal game. When a tagged turkey or deer is brought to the GCS for a big game card, the GCS attendant will record the number on ear tags or leg bands and will remove any radio devices. The radio transmitter will be kept by the GCS and the hunter will receive a certificate for participating.

18. Bobwhite Quail and Ruffed Grouse Seasons Closed.

Bobwhite quail and ruffed grouse may not be harvested on MCBQ. These bird populations have declined to low numbers within the region and aboard MCBQ. All hunters are encouraged to report locations where these birds are observed to the GCS.

19. Nuisance Species. Hunters may take at anytime during legal hunting hours, while checked-in to hunt, animals designated as nuisance species in VA, which include: coyote, feral hog, groundhog, European Starling, and English Sparrow. Hunters are reminded that shooting or harming dogs is illegal.

20. Unscheduled Closures. Recreational access is subject to closure due to inclement weather, elevated force protection conditions, fire hazard, etc. The AC/S G-5 will authorize the closure of hunting season when necessary to limit the take in consonance with good conservation practices, protect public safety, or allow for special operations such as snow removal. Unscheduled closures will be posted at the GCS. Additionally, hunters can call the MCBQ weather hotline at 703-784-3638 for information on weather related Base closures.

21. Guest Hunting. Official command guests may be assigned to hunting areas per the instructions provided at Appendix G. Guests assigned to hunt in a TA, such as TA 11A/B, where a portion of the surface area is impinged upon by a Surface Danger Zone (SDZ), will be accompanied and instructed by either an NREA staff member or a guest hunting coordinator who has been appointed per Appendix H. Per MCO P3570.1B and MCBO P3570.1, no person may enter an active SDZ.

22. Vehicle Collisions With Wild Animals

a. Operators of motor vehicles must notify the military Police at 703-784-2251 in cases of collision with wild animals where either property damage occurs or a deer, bear, turkey or bald eagle is injured or killed. The operator of a privately owned vehicle may be given custody of dead game animals. In cases involving government owned vehicles, or where the operator refuses custody, the animal will be taken to Building 5-9 for disposition. Only CLEO personnel are authorized to give custody of dead game animals to motor vehicle operators or to otherwise dispose of injured or dead game animals.



b. MCBQ organizations may send written requests to the Commander MCBQ (B 046) requesting venison for use at organizational parties. The U.S. Government bears no responsibility for problems associated with the preparation, serving, and consuming of such food sources. Requesters will be required to acknowledge this waiver of liability. Organizational Commanders are hereby notified that venison provided for organizational parties cannot be either offered for sale or transported from MCBQ property.

23. Hunting With Dogs

a. It is unlawful to use dogs to hunt deer at MCBQ. Any hunter or member of a party of hunters who kills a deer while hunting with dogs will be subject to the loss of MCBQ hunting privileges.

b. Dogs may be used to hunt fall turkey, dove, rabbit, woodcock, squirrel, and waterfowl in any open hunting area, except on deer either-sex hunting days during the firearms season. On these days, every effort will be made to have some areas, which are closed to deer hunting, open exclusively for turkey and upland game hunting with dogs.

c. On the day of the hunt, hunters using dogs to hunt small game or wild turkey may reserve up to two hunting areas when space is available. Upland game hunters are advised to equip their dogs with blaze orange collars and bells to help identify the dogs as hunting dogs.

24. Training Hunting Dogs. From 1 September through 31 March, inclusive, MCBQ licensed hunters may train personally owned dogs on rabbits and non-migratory game birds. Trainers will check in and out daily per scouting procedures in paragraph 4m. Waterfowl hunters may train retrieving dogs in open base waters any time of the year. The use of blank pistols or other noise making devices is authorized when done discreetly. Trainers may not use live pen-reared birds for dog training unless the birds are shackled to prevent escape and the CLEO Office has been notified in advance 703-432-6793/6794/6795. Pen-reared game may not be released upon MCBQ property.

25. Wounded Game Policy. Hunters will make every effort to recover wounded game. If wounded game crosses into another

training area, the hunter must contact the GCS to seek authorization to access the training area.

a. Same Day Recovery. A hunter who has shot a game animal late in the day has up to 15 minutes after the end of hunting hours to contact the GCS and request additional time for the recovery of the animal. The hunter may contact the GCS by cell phone to request permission to continue tracking. The hunter will be given a maximum of two hours past legal hunting hours to return and check out from hunting.

b. Next Day Recovery. A hunter who is unable to recover wounded game on the day of hunting may request permission to track and recover the game on the following day. If the requested area is open, the GCS will provide authorization for entry into the area. If tracking is to occur on a non-hunting day (such as Sunday), the request for tracking must be made at the GCS on the preceding hunting day. The GCS operator will provide the hunter with instructions for recovering and reporting the animal.

c. Guest Hunt Recovery. Hunters placed into guest hunt locations are likely to be adjacent to hazardous range activities. Guest hunters may not leave their assigned locations to track any wounded animal unless they are accompanied by their assigned Guest Hunt Coordinator and Range Control has approved departure from the assigned location.

26. Refrigeration Policy. The outdoor refrigeration locker located at the GCS is available for temporary use by Quantico hunters. Permission to store game in the locker will be granted or denied by the CLEO based upon the availability of space. Game stored must be removed within 48 hours, or sooner upon request of the CLEO. A VA Game Check Card must be attached to all stored game. The Government is not responsible for loss of meat due to theft or spoilage. Unless prior arrangements have been made, failure to remove game within 48 hours is punishable by forfeiture of game and suspension of hunting privileges.

27. Skinning Shed Policy. The outdoor skinning shed at the GCS is available for use by Quantico hunters during GCS operating hours. Anyone wanting to use the area must ask for permission at the GCS. The GCS operator will hold the hunter's MCBQ license while the hunter uses the skinning shed. The GCS will provide a hose with running water (weather permitting), trashcans and liners. The hunter is responsible for thoroughly

cleaning the work area and following waste disposal instructions when finished.

28. Lead Hazard. Lead exposure from ingesting harvested animals is a growing environmental and health concern to both humans and wildlife. Hunters are encouraged to utilize non-lead ammunition when feasible.

CHAPTER 3

CONSERVATION LAW ENFORCEMENT PROCEDURES

1. Information. All federal and state laws concerning the harvest of fish and wildlife apply to all persons aboard MCBQ regardless of the purpose of entry onto the Installation. In addition, the Commander MCBQ has prescribed special regulations for persons using government lands and facilities. These regulations are binding orders on all military personnel and are considered lawful regulations in federal court. Civilians who do not abide by these regulations may be restricted from entering MCBQ.

2. Authority. The MCBQ CLEO may detain, issue summons or arrest persons suspected of violating federal or state game laws. They are also authorized to suspend hunting privileges of anyone who violates the regulations prescribed herein or by the annual MCBQ hunt bulletin. Personnel operating the GCS are authorized to take temporary custody of illegal wildlife brought to the GCS until the CLEO can respond.

3. Violations of Federal and State Laws. The CLEO will detain, arrest, or issue a Federal Court Violation Summons (1805) to any persons suspected of violating federal and or state fish and game laws. The summons form will either reflect a collateral fee issued by the U.S. Attorney Office or else have a mandatory court appearance set for more serious crimes. In addition, in these cases, persons are subject to administrative actions.

4. Violations of Base Regulations. CLEOs may issue an 1805 pursuant to 18 U.S.C. 1382 for any violation of Base hunting regulations. Along with an 1805 or in lieu of an 1805, the CLEO may suspend hunting privileges for a period of not less than 3 days and not more than 1 year depending on the totality of the circumstances. Figure 3-1 provides a summary of common penalties as a reference only.

5. Debarment. Any person who has been found to be a repeat offender of laws and or regulations prescribed by this Manual, has committed a crime that would endanger public safety or national security, and or has committed an offense that is detrimental to the stewardship of natural resources at MCBQ may be subject to debarment. Further, any person or persons giving false information to obtain a hunting or fishing permit will/may

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be debarred from MCBQ. In these cases, the CLEO will forward all reports and findings through the Head, NREA Branch, to the Base Inspector's Office for final disposition.

<u>Violations Penalties</u>	<u>Common Administrative</u>	
<u>Offense</u>	<u>1st Offense</u>	<u>2nd</u>
Failure to display parking permit or loss of a hunting or parking permit.	3-7 days	30 days
Failure to park and hunt in assigned area.	7-30 days	1 year
Hunting or parking in a restricted area or "NO HUNTING" zone, or parking to block a range gate.	1 year	N/A
Unauthorized driving around a locked range gate.	1 year	N/A
Failure to check-out on time but is not more than 60 minutes late.	3-7 days	30 days
Failure to check-out on time and is more than 60 minutes late.	30-90 days	1 year
Operating motorized vehicle on unauthorized road without written permission.	30-90 days	1 year
Transporting a loaded weapon vehicle.	1 year	Debarment in a
Use or possess alcohol or drugs.	1 year	Debarment illegal
Failure to wear blaze orange during deer firearms season	1 year	N/A
Failure to obey low wake rule at Lunga Reservoir	90 days	1 year
Unauthorized fishing in Secon Pool	1 year	Debarment

Figure 3-1. Table of recommended penalties for administrative restriction of hunting and fishing privileges. Penalties are determined on a case by case basis depending upon the totality of circumstances.

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CHAPTER 4

TRAPPING REGULATIONS

1. Information. Regulations herein are intended to maintain furbearer populations in balance with other resource management objectives and to diminish serious disease outbreaks associated with overpopulation of some mammalian species.

2. Procedures

a. Eligibility. To be eligible to trap aboard MCBQ, a person must be able to demonstrate knowledge and skill concerning the use of trapping equipment, and complete a background check, if applicable.

b. Age Restriction. While in a training area for the purpose of trapping, persons under 18 years of age must be accompanied by an adult (21 years or older).

c. Application. Persons wanting to trap must submit the application in Appendix D to the Head, Fish, Wildlife and Agronomy (FWA), NREA Branch, G-5 prior to 1200 on the second Monday in November.

d. Issuance of Trapping License

(1) After 1200 on the second Monday in November, trappers will be issued trapping licenses based on the following order of priority:

(a) Active duty military personnel.

(b) All other persons having valid military ID card and civilian personnel issued the MCBQ Common Access Card.

(c) All other civilians.

(2) A maximum of 12 trapping licenses will be issued. They will be issued first to applicants at 2d(1)(a), based on the date of application submittal. Any remaining licenses will be issued to applicants at 2d(1)(b) and then to 2d(1)(c). If the quota of 12 trappers has not been reached at that time, the Head, FWA may issue additional licenses upon receipt of application and fees.

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3. Licenses. Trappers must have a VA trapping license and a MCBQ trapping license in their possession while in MCBQ training areas for the purpose of trapping. The MCBQ trapping license costs \$10 and is valid for the same period as the VA license.

4. Regulations. Limits, seasons, times, and methods of trapping will conform to VA regulations except as otherwise specified below:

a. Authorized trappers will check in and out on a log sheet maintained at the GCS. They may check into any open hunting area. Trappers must clearly display the parking permit on the left side of the dash when parking in a TA for the purpose of trapping.

b. A non-ferrous metal name tag must be affixed to each trap. Traps without tags will be subject to confiscation by CLEOs. The violator will lose their trapping privilege and may also be subject to prosecution in federal and state court.

c. All traps must be checked daily. Trappers shall not set traps in areas that will not be accessible on the following day.

d. Trappers may not have additional persons setting or checking traps. They may allow persons to accompany them on their route. In the case of illness, etc., where a trapper cannot check the traps, the trapper may obtain authorization for a substitute to run the traps. The request shall be submitted by phone to the CLEO at 703-432-6793/94/95.

e. Trappers may routinely operate motor vehicles on the paved and rocked roads designated for hunting access on the annual hunting map. When the use of other roads and trails is required to implement the trapping program, the CLEO will provide written authorization to the appropriate trapper.

f. No trap will be set within 200 meters of an occupied area, mess area, bleachers, or designated recreational area.

g. Body gripping (Conibear type) traps may only be set totally underwater. Any other traps or trapping techniques must comply with regulations published by the VDGIF.

h. Box traps may not be set for rabbits.

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i. Trappers must report their catch daily during the check-out process.

j. Trappers are authorized to carry a .22 caliber pistol for the sole purpose of safely and humanely dispatching trapped animals. Prior to carrying such weapon the CLEO must be advised at 703-432-6793/94/95 and a background check must be completed unless exempt per Appendix F.

k. Trappers must wear at least two square feet of blaze orange above the waist and visible from 360 degrees if entering a training area during the firearms deer season.

l. Dens or houses of furbearers may not be disturbed.

m. Trappers will report any observed violation of trapping regulations to the CLEO.

n. Mainside. On Mainside, trapping will not be done within 200 meters of residences unless specifically requested by command officials for the control of nuisance animals. In such cases, only live-type box traps will be used. Body-gripping traps and snares will not be used in the Mainside trapping area except when authorized for the control of beavers. Leg-hold traps must be padded to prevent serious injury to birds of prey and wading species that frequent the marshes along the tidal shoreline of the Potomac River and Chopawamsic Creek.

o. The trapping program may be changed or terminated during a season to reflect changes in program or mission requirements. Trappers must abide by any special regulations or reporting requirements announced during the season.

5. Violations. Trappers who violate these regulations or VA trapping laws will be subject to termination of MCBQ trapping privileges and prosecution in federal or state court.

CHAPTER 5

NONGAME MANAGEMENT AND ANIMAL DAMAGE CONTROL

1. Introduction

a. Many species of wildlife such as, but not limited to, song birds, birds of prey, reptiles, amphibians, butterflies, and small mammals, have not traditionally been hunted or trapped for sport or commercial purposes, and are often called nongame species. The conservation of all wildlife species is important for ecosystem health. Partnerships with other governmental and private organizations are critical to conserving wildlife populations at the regional scale.

b. Not all human and wildlife interactions are beneficial. For example, the presence of wild animals is usually not desired in living quarters and public buildings. Some diseases may be transmitted through contact with animals or their wastes. Although beavers are invaluable for creating wetlands, they become a nuisance when their dams flood roads, block storm drainage systems, and kill landscape plantings and commercial timber. Canada geese can foul walkways and recreation areas with droppings. Resident and migratory birds pose collision hazards to aircraft. The mitigation or prevention of wildlife related diseases or damage is known as animal damage control.

2. Protection. Most wildlife species are protected; it is unlawful to take, possess, transport, or sell nongame wildlife species unless specifically permitted by law or regulation. European starling, English sparrow, mute swan, pigeon (rock dove), house mouse, Norway rat, black rat, coyote, and groundhog are nongame species that have been designated nuisance species in VA and may be taken at any time except Sundays. The use of firearms or other weapons to take animals at MCBQ must be done in accordance with Base hunting regulations in Chapter 2.

3. Policy

a. Nongame wildlife will only be collected, taken, or possessed aboard MCBQ per state and federal regulations for the collection of nongame animals. Anyone wanting to capture, take or salvage nongame animals under state or federal banding or collection permits shall request permission from the Commander MCBQ (B 046). It is recommended that all living specimens be released at the place of capture at the earliest opportunity.

Animals acquired from off-Base from any source must not be released onto MCBQ property.

b. MCBQ will be aggressive in fostering national, regional, DoD, and Department of the Navy partnerships to inventory, conserve, and enhance public awareness about significant biological resources.

c. The use of MCBQ facilities for the observation of birds and other wildlife is encouraged under the guidelines listed in paragraphs 4e, 4f, and 4g.

d. Animal damage control procedures will be used to protect human health, government facilities, and aircraft. Emphasis will be placed upon using the most efficient and humane techniques available to remedy problem situations.

e. Navy policy prohibits the maintenance of feral cat colonies on Navy/Marine Corps lands. Feeding feral cats is prohibited.

#### 4. Procedures

a. Problems with insects and wild animals in and around Base office buildings should be reported to the Public Works Branch at 703-784-1175. Tenant organizations needing pest control services should contact the Facilities Contract Support Section for more information at 703-784-1175. Housing area residents will report these problems to the Lincoln Military Housing Maintenance Office at 888-578-4141.

b. Problems concerning dogs and cats shall be reported to Security Battalion at 703-784-2251.

c. Problems concerning beaver, deer, bear, or other wild animals in the training areas will be reported to the CLEO or Head, FWA, NREA Branch, at 703-432-6793/94/95 and 703-432-6776/6782.

d. Problems with birds and mammals at the MCAF can be reported to NREA offices at 703-432-6793/94/95 and 703-432-6776/6782.

e. Groups and individuals wanting to observe or photograph wildlife are welcomed to visit the Chopawamsic Creek Watchable Wildlife Area, located on Russell Road. The area is open to the

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public year-round during daylight hours. Visitors may contact the FWA Section, 703-432-6776, for information.

f. Access to the training areas is carefully controlled and scheduled by the AC/S G-3 to support military training. Access to the training areas for wildlife related recreation is done at the GCS during scheduled hunting seasons.

g. Groups that would like assistance from the NREA Branch concerning fish and wildlife education programs should request assistance from the Commander MCBQ (B046). If personnel are available, the Head, NREA Branch will assign a staff professional to provide escort and guidance to the group.

5. Action. Responsibilities for the control of nuisance animals are as follows:

a. AC/S G-5. Has cognizance over all wildlife population control programs and will develop, approve, or implement plans as necessary to achieve desired goals. The Head, NREA Branch shall implement these responsibilities, including:

(1) Maintain an Integrated Pest Management Plan (IPMP) that includes provisions for the removal of nuisance wildlife.

(2) Maintain a migratory bird depredation permit with the U.S. Fish and Wildlife Service in order to lawfully take gulls, vultures, Canada geese, or other species authorized by the permit that are harming government property, posing a human health hazard, or compromising the safe operation of aircraft.

(3) Respond to requests concerning big game animals (deer, bear, turkey), to wildlife related problems in MCBQ training areas, and to bird airstrike hazard issues at MCAF.

(4) If NREA personnel are unavailable to respond in a timely manner, and there is potential for the situation to jeopardize public health, request assistance from the military police. Routine disposition will involve release near the capture site or euthanasia.

(5) Report wildlife pest control efforts to Northern Division, Naval Facilities Engineering Command, for inclusion in the "Pest Control Summary Report" prepared per OPNAVINST 6250.4.

(6) Upon consultation with local health departments, Virginia Department of Game and Inland Fisheries, or the

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Quantico Veterinary Treatment Facility, transport wildlife suspected to be diseased to a recommended testing facility.

b. CO Security Battalion. Respond to requests concerning the removal of stray or abused/neglected domesticated animals (pets) aboard MCBQ. Routine disposition of these animals will be at a local animal shelter.

c. Resident OIC of Construction. Maintain a contract for a licensed pest controller to implement routine building inspections and treatment for continuous pest control in developed areas. The use of toxic chemicals must be coordinated with the Head, NREA Branch, and be included in the MCBQ IPMP. Secondary toxicity to nontarget species is a genuine concern and must be minimized by careful assessment and planning of chemical pest control programs.



APPENDIX A

APPLICATION TO FISH AT MCBQ

Note: This application must be filled out completely. Falsification of any information is a violation of MCBQ regulations and will result in the termination of privileges.

Check one: Annual Fishing  5-day Fishing

Check if Applicable (No fee):

Under 18 years of Age  65 or over  VA Permanently Disabled

Last Name  First  MI  Suffix

Date of Birth  Age

Street Address:

City:  State:  Zip Code

Phone #'s: Home:  Cell:  Work

Email:

Drivers License #  State

**Personnel Category:**

- 1. Active Duty Marine
- 2. Dependent of #1
- 3. Other Military Identification  
Card holder or Marine Corps  
Civilian with Common Access Card.
- 4. All other personnel

**VA Fishing License Number**

**FOR OFFICIAL USE ONLY**

**Entered by:**

**MCBQ Fishing License #:**

**Issue Date:**

**PRIVACY ACT STATEMENT:**

1. AUTHORITY: 5 U.S.C. 301, 44 U.S.C. 3101.
2. PRINCIPLE PURPOSES. The information which is solicited is intended primarily for the following purpose: To determine the status of personnel at the time of their application for permission to hunt, trap, fish or use the archery site aboard MCB, Quantico, VA., in an effort to allow only authorized personnel aboard the federal installation.
3. ROUTINE USES. To maintain accountability of all persons authorized to hunt, trap furbearers, fish, or practice archery skills aboard MCB, Quantico, VA.
4. VOLUNTARY DISCLOSURE, CONSEQUENCES OR REFUSING TO DISCLOSE: Disclosure is voluntary. However, if you not provide the requested information, you may be denied authority to hunt, trap, fish or use the archery site aboard MCB, Quantico, VA.

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

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## APPENDIX B

**ADULT WAIVER OF LIABILITY***For***NATURAL RESOURCES AND ENVIRONMENTAL AFFAIRS BRANCH  
MARINE CORPS BASE, QUANTICO, VIRGINIA (page 1)**

I will be observing/participating in dispersed outdoor recreation activities aboard Marine Corps Base, Quantico (MCBQ), Virginia. The activities include, but are not limited to, hunting, fishing, trapping, archery skill training, and wildlife viewing, and may involve the use of live ammunition, firearms, archery tackle, knives, fishing gear, boats, animal traps, elevated hunting stands, hunting blinds, and other potentially dangerous recreational gear by persons, including me, who have varying levels of proficiency in the use of this gear. **I understand** that these activities may cause injuries association with physical activity like muscle sprains or strains, tendon pulls, dislocation of joints, and broken bones. **I further understand** that these activities may expose me to hazards associated with physical exertion, falls, catastrophic illness, hypothermia, drowning, projectiles, falling debris from trees, toxins and diseases transmitted by plants and animals, and the inherent dangers associated with environmental conditions. **Observation of and/or participation in these activities could result in property damage as well as serious bodily injury or death to me and to others.**

I understand the following three cautions with regard to MCBQ:

1. All water bodies, ranges and training areas, including recreational sites, are designed for and used by the Marine Corps for training its personnel in the deadly art of individual and unit combat. All active weapons ranges have designated but unmarked safety zones known as Surface Danger Zones (SDZs) within which the projectiles from a given weapons system should be contained. I understand that if I leave my assigned activity site, I could enter an active SDZ and expose myself to serious bodily injury or death.
2. Water bodies, ranges and training areas have been subject to countless training exercises that may well have involved the use of ammunition and placement of manmade or natural obstacles which, if triggered or encountered by or during physical presence on the ranges/training areas, could result in serious bodily injury or death to me.
3. Extreme heat, humidity, cold, wind, or wet will increase the likelihood of physical danger and exposure to serious bodily injury, sickness, accident, or death while observing/participating in NREA activities at the water bodies, ranges, and training areas.

---

Initial                  Date

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**ADULT WAIVER OF LIABILITY**  
**For**  
**NATURAL RESOURCES AND ENVIRONMENTAL AFFAIRS BRANCH**  
**MARINE CORPS BASE, QUANTICO, VIRGINIA (page 2)**

**Consent to Observe/Participate and Assumption of Risks:**

As an observer/participant in the activities described above, I agree to obey **all directions and instructions** issued by Marine Corps Base, Quantico, for the protection of myself, instructors, other participants and any observers. I understand that failure to adhere to such directions may result in my immediate and complete removal from these activities.

I understand that I may withdraw my consent to observe/participate in the activities at any time by notifying any member of the NREA Branch staff. I further understand that such withdrawal of consent after having given same will require my exclusion from any and all further NREA Branch activities.

I understand observation of/participation in the activity is voluntary and that by undertaking this activity, I am assuming all of the risks attendant with observation of/participation in an inherently dangerous activity that could result in destruction of my personal property, as well as serious personal injury or death to me, instructors, other observers/participants in that activity.

**I ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS AGREEMENT, THAT I AM FULLY AWARE OF THE RISKS INVOLVED IN THESE ACTIVITIES, AND THAT I VOLUNTARILY ACCEPT AND ASSUME THE RISKS ASSOCIATED WITH SUCH ACTIVITIES.**

I understand that should I decline to execute this Waiver of Liability, I will not be permitted to observe/participate in the NREA activities.

\_\_\_\_\_  
Printed Name of Participant/Observer

\_\_\_\_\_  
Phone number

\_\_\_\_\_  
Signature of Participant/Observer

\_\_\_\_\_  
Date

1 Oct 13

MINORS UNDER THE AGE OF 18 WAIVER OF LIABILITY

*For*

**NATURAL RESOURCES AND ENVIRONMENTAL AFFAIRS BRANCH**

**MARINE CORPS BASE, QUANTICO, VIRGINIA (page 1)**

We hereby request that our child, \_\_\_\_\_, be permitted to take part in dispersed outdoor recreation activities at Marine Corps Base, Quantico, Virginia. The activities include, but are not limited to, hunting, fishing, trapping, archery skill training, and wildlife viewing, and may involve the use of live ammunition, firearms, archery tackle, knives, fishing gear, boats, animal traps, elevated hunting stands, hunting blinds, and other potentially dangerous recreational gear by persons, including my child, who have varying levels of proficiency in the use of this gear. **I understand** that these activities may cause injuries association with physical activity like muscle sprains or strains, tendon pulls, dislocation of joints, and broken bones. **I further understand** that these activities may expose my child to hazards associated with physical exertion, catastrophic illness, hypothermia, drowning, projectiles, falling debris from trees, toxins and diseases transmitted by plants and animals, and the inherent dangers associated with environmental conditions. Observation of and/or participation in these activities could result in property damage as well as serious bodily injury or death to my child and to others.

Nonetheless, and in spite of my full knowledge of the risks involved in these activities, I EXPRESSLY AND KNOWINGLY, FREELY AND VOLUNTARILY, AND INTENDING TO BE LEGALLY BOUND, ACCEPT AND ASSUME ALL RISKS INVOLVED IN AND ASSOCIATED WITH ALL ASPECTS OF THESE ACTIVITIES. I EXPRESSLY AND KNOWINGLY, FREELY AND VOLUNTARILY WAIVE ANY AND ALL RIGHTS I/MY CHILD MAY HAVE TO RECOVER FOR ANY INJURY MY CHILD SUSTAINS, OR FOR THE DEATH OF MY CHILD, AND I AGREE TO HOLD HARMLESS THE UNITED STATES GOVERNMENT, THE DEPARTMENT OF DEFENSE, THE DEPARTMENT OF THE NAVY, THE UNITED STATES MARINE CORPS, THE MARINE CORPS COMBAT DEVELOPMENT COMMAND, AND MARINE CORPS BASE QUANTICO.

Therefore, in consideration of the privilege to participate in the activities to be held aboard MCBQ, I the undersigned person do hereby freely and voluntarily, and intending to be legally bound, accept all risks associated with the activities, and any use I may make of MCBQ or government equipment or facilities in furtherance of my child's participation in the activities, and waive any and all rights to any claims or demands or any other actions whatsoever, including those attributable to negligence, for damages, due to accident, injury, or death, resulting from my child's participation in the activities for myself, my spouse, my parents or guardians, my heirs, executors, administrators, or legal representatives of my estate, or anyone else on my behalf, which I may have against any of the following: the United States of America, the Department of Defense, the Department of the Navy, the United States Marine Corps, Marine Corps Combat Development Command, Marine Corps Base Quantico, or any and all individuals assigned to or employed by the United States, to include but be not limited to, the Secretary of the Navy, the Commandant of the Marine Corps, the Commanding General of the

\_\_\_\_\_  
Initial                      Date

Enclosure (1)

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**MINORS UNDER THE AGE OF 18 WAIVER OF LIABILITY**

*For*

**NATURAL RESOURCES AND ENVIRONMENTAL AFFAIRS BRANCH  
MARINE CORPS BASE, QUANTICO, VIRGINIA (page 2)**

Marine Corps Combat Development Command, or the Commander of Marine Corps Base Quantico, in their official and personal capacities, or any medical personnel assigned thereto, or their representatives, successors, or assigns. I understand that the above language means I have abandoned any rights I may have, or any rights anyone associated with me may have, through legal or friendship or family ties, to sue the Federal Government for any injury my child may sustain because of participation in or attendance at the sponsored activities that results in any damage whatsoever to my/my child's property or in the event of my child's death. By signing this document, I acknowledge that the Federal Government, or any agency or employee thereof, is not liable for any injury my child may sustain, to include death, as a result of my child's participation in the sponsored activities. By signing this document, I effectively and completely assume all risk associated with the sponsored activities. This document shall remain in effect and be held until notice of cancellation is received by the Commander, MCBQ.

**I ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS AGREEMENT, THAT I AM FULLY AWARE OF THE RISKS INVOLVED IN THESE ACTIVITIES, AND THAT I VOLUNTARILY ACCEPT AND ASSUME THE RISKS ASSOCIATED WITH SUCH ACTIVITIES.**

Lastly, I understand that should I decline to execute this Waiver of Liability, my child will not be permitted to participate in the activities to be held aboard MCBQ.

\_\_\_\_\_  
**Printed Name** of Mother/Father/Legal Guardian (circle one)

\_\_\_\_\_  
**Signature** of parent/Legal Guardian Date

On behalf of:

\_\_\_\_\_  
**Printed Name** of Minor Child Date

\_\_\_\_\_  
Emergency Point of Contact: Phone Number

Health Insurance Coverage: Please **initial** the appropriate box.

No, I **do not** have health insurance \_\_\_\_\_

Yes, I **do** have health insurance coverage \_\_\_\_\_

Name of Insurance Provider \_\_\_\_\_ Policy

# \_\_\_\_\_

APPENDIX D

HUNTER APPLICATION (Page 1)

Note: This application must be filled out completely. Falsification of any information is a violation of MCBQ regulations and will result in the termination of privileges.

Check one: Annual Hunting  3-day Hunting  Trapping   
Archery Site Only

Check if Applicable: Under 18  65 or over  VA Permanently Disabled

Last Name  First  MI  Suffix

SSN last 4  Date of Birth  Age

Street Address:

City:  State:  Zip Code:

Phone #'s: Home:  Cell:  Work:

Email:

Drivers License #  State

**Vehicle Data:** Provide information about the primary vehicle you will be using at MCBQ

Make:  Model:  Color:

Tag Number:  State:

Previous MCBQ License Number:

**Personnel Category:**

- 1. Active Duty Marine
- 2. Family member of #1 or #2. Stationed at Quantico or HQMC
- 3. Other Active Duty Military
- 4. Retired Military
- 5. DOD ID bearing or Family member of #4 or #5
- 6. Military Reservist
- 7. Marine Corps issued CAC Civilian employee
- 9. All other personnel

**VA Hunting License Number**

**VA Big Game License Number**

**FOR OFFICIAL USE ONLY**

**Entered by:**

**MCBQ License #:**

**Card Color:**

**Issue Date:**

**Video Date:**



HUNTER APPLICATION (Page 2)

Name of Military Sponsor of Applicant (if family member or House Guest):

Last Name  First Name   
Sponsor's MCBQ Hunting License Number

**PRIVACY ACT STATEMENT:**

1. AUTHORITY: 5 U.S.C. 301, 44 U.S.C. 3101.
2. PRINCIPLE PURPOSES. The information which is solicited is intended primarily for the following purpose: To determine the status of personnel at the time of their application for permission to hunt, trap, or use the archery site aboard MCB, Quantico, VA., in an effort to allow only authorized personnel aboard the federal installation.
3. ROUTINE USES. To maintain accountability of all persons authorized to hunt game, trap furbearers, or practice archery skills aboard MCB, Quantico, VA.
4. VOLUNTARY DISCLOSURE, CONSEQUENCES OR REFUSING TO DISCLOSE: Disclosure is voluntary. However, if you not provide the requested information, you may be denied authority to hunt, trap, or use the archery site aboard MCB, Quantico, VA.

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_



APPENDIX E

**PARENTAL CONSENT FORM FOR HUNTING AT MCB QUANTICO**

I, \_\_\_\_\_ (Print Parent's Name)

Hereby authorize \_\_\_\_\_ (Print Name of Adult  
Escort) to accompany and supervise my child,

\_\_\_\_\_ (Print Name of Child),

While hunting at MCBQ. My child and the adult designated above have  
completed all courses of instruction and obtained all licenses  
necessary to legally hunt in Virginia and at MCBQ.

\_\_\_\_\_  
Signature of parent or legal guardian

\_\_\_\_\_  
Date

APPENDIX F

**HUNTER SCREENING EXEMPTIONS 20 JULY 2011**

Persons presenting the following forms of (valid and current) identification are exempt from the background screening requirement when obtaining a MCBQ hunting permit:

**(1) DOD Common Access Card (CAC)**

- Active/Reserve personnel
- U.S. Civil Service personnel
- Contractors (some)

**(2) DOD Uniformed Services Identification and Privileges Cards**

- **DD Form 2 (reserve retired) recipients:** retired members of the reserves under age 60
- **DD Form 2 (individual ready reserve) recipients:** members of the individual ready reserves and the inactive guard
- **DD Form 2 (retired) recipients:** members entitled to retired pay, members on the temporary disability retired list (TDRL), and members of permanent disability retired list (PDRL)
- **DD Form 1173 (military family member) recipients:** surviving spouse, child under 21, incapacitated child 21 years of age or older, full-time student between 21 and 23, stepchild of active duty members or reservists on active duty in excess of 30 days, dependents of the following: members entitled to retirement pay, DOD civilians, disabled veterans (DAV), DOD contractors, Medal of Honor recipients, other government civilians, eligible non-government personnel, transitional assistance and management program (TAMP) personnel, dependents of retirees, foreign military, DOD beneficiaries, Reserve component members not on active duty in excess of 30 days, Ready Reserve and standby members and gray area retirees as part of the Guard and/or Reserve DEERS enrollment program, and former members when the former member is eligible for retired pay at age 60 but not yet age 60
- **DD Form 1173-1 (Guard personnel and Reserve military family member) recipients:** designated beneficiaries including eligible, remarried, former spouses, other eligible dependents, non-DOD/other government employees, dependents of the guard/reserve/reserve, dependents of former members, dependents (spouse, child under 21, incapacitated child 21 years of age or older, full-time student between 21 and 23, stepchild) or reserve component members not on active duty in excess of 30 days, family members of Ready Reserve and standby members and gray area retirees as part of the Guard and/or the former member is eligible for retired pay at age 60 but not yet age 60

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**HUNTER SCREENING EXEMPTIONS 20 JULY 2011 (page 2)**

- **DD Form 2765 recipients:** TAMP personnel, DAV, former members, DOD beneficiaries, Medal of Honor recipients, non-government personnel, National Oceanic and Atmospheric Administration (NOAA) civilian shipboard officers, other government civil service personnel living in quarters in Guam or Puerto Rico, and contractors on Military Sealift Command (MCC)-owned and operated vessels

- **Armed Forces Exchange Service Identification and Privilege Card (DD Form 2574)**, issued to non-appropriated fund personnel and Army and Air Force Exchange (AAFES) personnel.

- (3) **United States Government issued, authenticated federal PIV credentials**
- (4) **Transportation Workers Identification Credential (TWIC)**
- (5) **Federal, state or local law enforcement credentials**

APPENDIX G

GUEST HUNTING PROCEDURES

1. Background. The popularity of hunting at MCBQ and the close proximity of the Base to a large population area results in the need to regulate numbers of hunters. A guest program has been established to ensure that appropriate protocol and hunting arrangements are made for official guests.

2. Policy

a. Official command guests can make advance hunting reservations, i.e., they are not limited to making a reservation the day prior to a hunting day by contacting the Head, FWA Section at 432-6776/6782.

b. They will often be assigned to hunt in the nonimpact portion of TA 11 or may be assigned to other hunting areas.

c. Guests will obtain all appropriate licenses, attend mandatory classes, and comply with all MCBQ, state, and federal requirements for hunting.

3. Guest Hunting Office (GHO). The GHO is operated as part of the GCS under the guidance of the Head, Natural Resources Section, NREA Branch, G-5. Conservation volunteers may be appointed as Guest Hunting Coordinators (GHC) to assist NREA personnel in the management of the guest hunting program.

4. Authorized Guests. Persons authorized to make advance reservations and checkout from the Guest Hunting Office will consist of the following:

a. Invited officials of local, state, Federal and foreign governments.

b. Active and retired generals and flag officers of the United States armed services and active and retired senior executive service employees of the United States Government.

c. Invited guests of foreign nations.

d. Officials of cooperating natural resources management and law enforcement agencies.

e. Invited guests of the Commanding General, Marine Corps Combat Development Command, and the Commander, MCBQ.

f. Active duty service members (wounded warriors) who are receiving treatment from military hospitals for combat related injuries, paralyzed veterans, and persons who have mobility challenges that would otherwise prevent their enjoyment of the outdoors.

g. NREA personnel responsible for natural resources management in the training areas, to include volunteers assigned to assist with the guest hunting program, are responsible to ensure the safety and convenience of guest hunters. They are authorized access to guest hunting areas and must

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know the terrain features, roads, trails and hunting stand locations to ensure the safe ingress and egress of all personnel.

h. The buddy system is encouraged for all hunting at MCBQ. Each hunter is encouraged to have a companion to get help in case of illness or injury. Therefore, anyone entitled to make a guest reservation may also make a reservation for a companion hunter.

i. The precedence roster used by USMC protocol may be consulted to identify civilian rank and qualification for guest consideration.

#### 5. Guest Hunting Areas

a. The daily quota of hunting permits available at the GCS will not be used for guest hunters. Guests will usually be assigned to a designated tree stand in the nonimpact portion of TA 11 or to another training area where they will incur no safety risk nor will they interfere with military training operations. In no case are any personnel permitted within the surface danger zone (SDZ) of a live firing exercise.

b. When guests are assigned to a training area in which a portion of the surface area is impinged upon by an SDZ, the guest will be escorted by a NREA employee or designated GHC. The escort will select a terrain feature on a Quantico topographic map identifiable on the ground, which is clearly exterior to all SDZs scheduled for the day of the hunting trip. The GHC will ensure that neither the GHC nor the guest crosses the selected terrain feature(s) during the hunting trip.

c. On occasions where a guest hunter has a preference to hunt in an area open for public hunting, the guest office may issue the guest a daily permit for that area that does not count against the daily quota of permits issued to the public. No more than two guest permits can be issued per training area; the use of these permits is discouraged if other areas are available for use. Hunters seeking daily permits through normal checkout procedures shall not be displaced to make room for an official guest.

b. Wounded Game Tracking. Any hunter positioned within an area affected by an active SDZ will not track wounded game unless the Range Management Branch has determined that the SDZ has become inactive.

#### 6. Responsibilities

a. Head, Natural Resources Section, NREA Branch, G-5. Provide guidance to coordinators concerning acceptance of guest reservations from individuals whose guest status is questionable. Route all potentially controversial decisions to the Head, NREA Branch.

#### b. Guest Hunting Coordinators

(1) Coordinate with the GCS, CLEOs, Head, FWA Section, NREA Branch and the Fire Desk at the Range Control Office 703-784-5321 as appropriate to maintain constant awareness of the use of firing ranges and locations of SDZs, military operations and land management activities.

Enclosure (1)



(2) Assign guests to designated hunting areas or tree stands. Escort guests so that they hunt in the specific designated safe location. If the number of guests on a given day requires additional help, the GHCs may request assistance from other active conservation volunteer program members to ensure that all guests are properly **escorted to and from** the guest hunting area.

(3) Maintain check-in and check-out log to ensure that all hunters are safe and accounted for at the end of the day.

(4) Ensure that guest hunters know Base hunting procedures and regulations and have all appropriate state, federal, and Base licenses. Further, ensure that all guests assigned to hunt in any training area into which an SDZ impinges are briefed about the dangers inherent in live fire training exercises, the proximity of live fire SDZs near the hunting area, and agree to hunt only where they have been positioned by the GHC.

(5) Maintain daily awareness of military training operations, live fire SDZs, etc., that may be ongoing in an area used for guest hunting.

(6) Maintain records of hours hunted and game killed. Ensure that big game is properly registered at the GCS.

(7) Maintain a minimum of 30 marked locations for guest deer hunting. Stands may be temporarily or permanently situated but will be constructed to ensure that the safety of users is not jeopardized.

(8) Maintain at least three waterfowl hunting blinds that are wheelchair accessible.

(9) Assist with the deployment and operation of hydraulic lift stands, tracked wheelchairs, and other devices designed to make hunting accessible for persons with mobility challenges.

(10) Assist with special outdoor recreation events for youth or physically challenged anglers and hunters to ensure outdoor recreation is accessible to everyone.

(11) Maintain woodland trails in a condition open to vehicular travel in case of emergency. Off-road vehicle travel is authorized for GHCs and guests in designated guest hunting areas.

(12) Shall limit participation in the guest hunting program to only those authorized by this Manual or as subsequently modified by the Commander MCBQ.

(13) Shall be assigned range gate keys only for the official purpose of opening gates that control access to the guest hunting area on a daily basis. Locked gates may be unlocked to enter safe areas but must be immediately relocked. Assigned keys may not be duplicated. Needs for range access required for other natural resources volunteer work programs will be authorized separately by NREA Branch personnel and will be coordinated with the Range Control Officer.

(14) When personnel are hunting or working in TA 11 series, or any area affected by an SDZ, the Range Control Office will be notified when personnel enter the area and when all personnel have cleared the area.

APPENDIX H

APPOINTMENT LETTER FOR GUEST HUNTING COORDINATOR

11015  
B 046

From: Commander MCBQ  
To:

Subj: APPOINTMENT LETTER FOR GUEST HUNTING COORDINATOR

Ref: (a) MCBO 11015.2B  
(b) MCBO 3570.1

1. Per reference (a), you are hereby appointed to be a Guest Hunting Coordinator. Your appointment is based upon your loyalty and dedication to the Marine Corps and your knowledge, skills, and abilities in the following areas: knowledge of the Base training areas and range safety procedures (reference (b)); knowledge of Marine Corps weapons systems; knowledge of safe hunting practices; and proven courteous and personable handling of all visitors.
2. Most guest hunting will be conducted in the portion of Training Area 11 that is outside of the Weapons Training Battalion and FBI range surface danger zones (SDZ). It is mandatory that all personnel stay clear of SDZs, whether in Training Area 11, or in any other training areas. Therefore, it is essential that you remain cognizant of range firing schedules and strictly comply with the guidelines provided at Appendix F of reference (a).
3. On a daily basis, you may be issued one or more range gate keys that are necessary for access to designated guest hunting areas. You will sign for the keys and will be responsible for the safekeeping, authorized use, and return of the keys at the end of the hunting day.
4. Your acceptance of this appointment must be certified by your endorsement of this letter. Any questions concerning guest hunting procedures not covered in appendix A of reference (a) should be addressed to the Head, Natural Resources Section, NREA Branch, G-5 at 703-432-6774.

Signature

Enclosure (1)

MCBO 11015.2B  
1 Oct 13

11015  
B 046

FIRST ENDORSEMENT on Commander MCBQ ltr 11015/B 046 of

From:

To: Commander MCBQ

Subj: APPOINTMENT LETTER FOR GUEST HUNTING COORDINATOR

1. Returned.
2. I have read and understand the instructions and procedures that apply to the guest hunting program.
3. I hereby accept this appointment as a Guest Hunting Coordinator and I agree to hold myself accountable for assigned keys and for compliance with the procedures in the references of the basic letter.

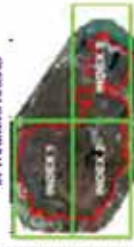
Signature

Enclosure (1)

APPENDIX C  
Maps of Managed Openings in Training Areas

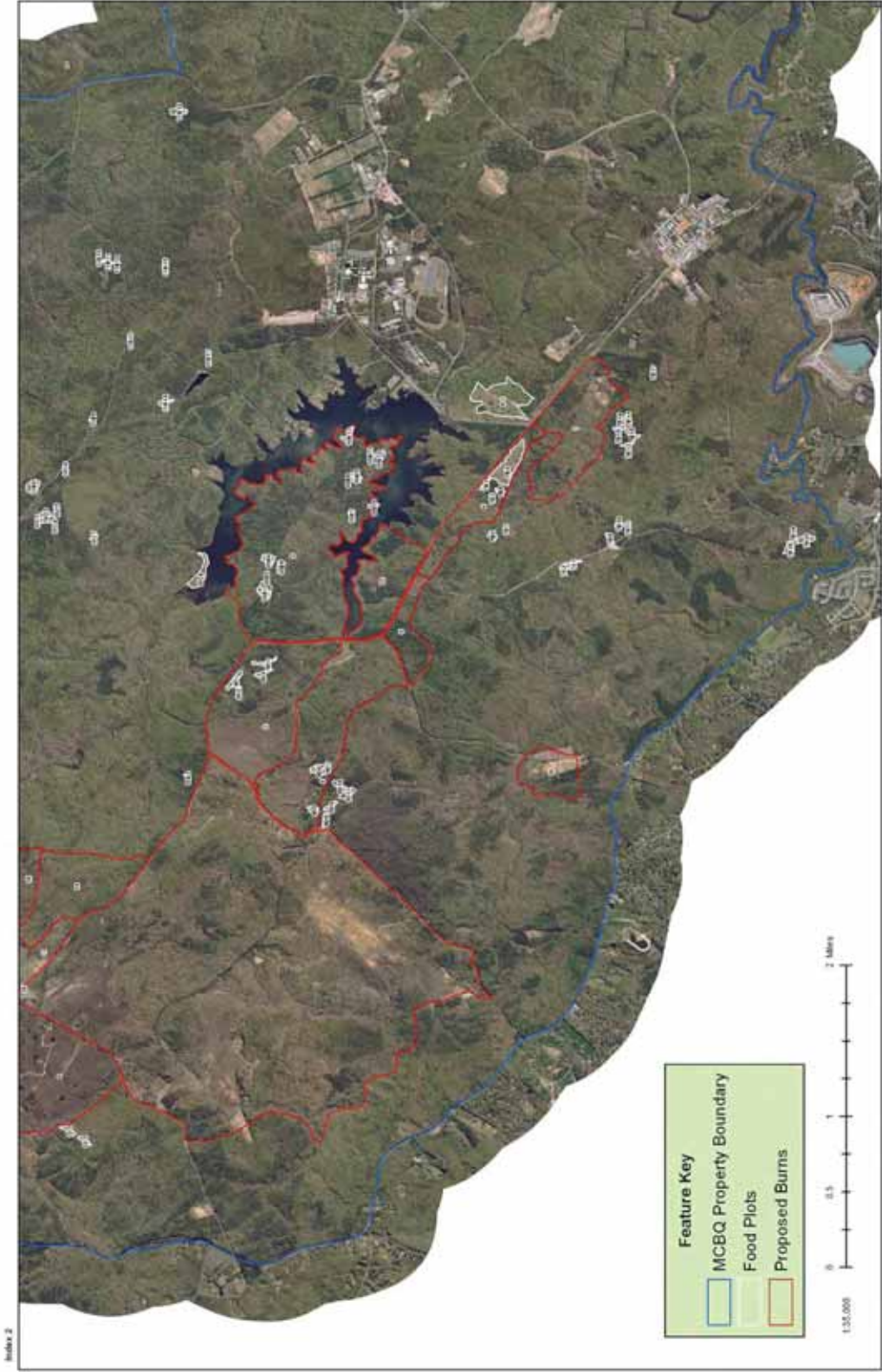
ID	Food Plot Name	Acres	ID	Food Plot Name	Acres	ID	Food Plot Name	Acres	ID	Food Plot Name	Acres	ID	Food Plot Name	Acres	ID	Food Plot Name	Acres	Burn Name	Acres
10A1	LZ CHICKENSTAFFORD SPRINGS	0.54	12A8	LZ BLUEBIRD	0.86	16A4	MA 10 B	0.00	60	WISTERIA/LZ FALCON	3.42	13	GOETTGE DEMO	27.72					
10A2	LITTLE FIELD 10A	0.14	12B1	R12	12.90	16A5	MA 10 C	0.74	601	APPLE TREE	0.30	14	R-15	176.86					
10B1	DOVE FIELD A	2.57	12B2	WAY BACK	1.45	16A6	MA 10 D	0.60	7A1	BURNT DOWN TOWER C	0.57	15	R-11	590.30					
10B10	CROSSROADS B	0.99	13-1	SANDUST B	1.29	16A7	86A	0.50	7A2	BURNT DOWN TOWER B	0.56	16	R-9	7.15					
10B11	HULLUMS STASH D	1.37	13-11	SANDUSTA	1.71	16A8	86A PROPOSED FIELD	3.57	7A3	BURNT DOWN TOWER A	0.94	17	R-9	16.49					
10B12	HULLUMS STASH C	2.27	14A1	DRIT 5A	1.10	16B1	TOPS SECRET A	0.86	7B1	SHORTLEAF-PINE A	0.88	18	R-9	19.35					
10B13	HULLUMS STASH E	1.54	14A10	LZ DRIBBERD	4.19	16B2	TOPS SECRET B	0.25	7B10	R4 C	0.90	19	R-9	14.23					
10B2	DOVE FIELD B	2.28	14A11	DRIT 5 C	0.80	16B3	LZ VULTURE	5.14	7B11	R4 B	0.66	20	R-9	18.30					
10B5	FLDS XEA OTHER B	2.18	14A2	DRIT 5 B	1.23	16B4	LZ CANARY	4.67	7B13	BO DICKLY A	0.77	21	R-9	56.18					
10B6	FLDS XEA OTHER A	2.76	14A3	CEDAR TREE A	7.26	16B1	STUCK TRUCK	2.53	7B14	BO DICKLY C	1.92	22	R-9	28.59					
10B7	CROSSROADS A	0.39	14A4	CEDAR TREE C	4.84	16F-1	HF	3.25	7B14	BO DICKLY E	0.78	23	R-9	28.76					
10B8	HULLUMS STASH A	0.82	14A5	CEDAR TREE B	3.75	16G1	LZ 21	3.02	7B15	BO DICKLY F	2.17	24	DAVIDS DOVE	147.49					
10B9	HULLUMS STASH B	0.94	14A6	POWERLINE	17.29	16G10	LZ HARRER B	0.48	7B15	BO DICKLY D	0.48	25	R-9	50.81					
10C1	ORCHARD	1.54	14A7	GOETTGE ROAD C	0.92	16G12	86G FARM	4.86	7B16	BO DICKLY F	0.36	26	R-9	62.14					
10C2	STUNG C	1.27	14A8	GOETTGE ROAD B	0.59	16G2	HAMILTON TRAILS END A	1.54	7B17	CEDARTRICE STAND	0.17	27	R-14	243.69					
10C3	STUNG D	1.47	14A9	GOETTGE ROAD A	1.07	16G3	HAMILTON TRAILS END B	0.38	7B18	LZ SAWMILL A	2.03	28	TA 14B	536.71					
10C4	STUNG B	1.10	14B4	DAVIDS DOVE	22.85	16G4	HAYFIELD FARM A	1.38	7B19	LZ SAWMILL C	1.08	29	R-9	38.92					
10C5	STUNG A	1.24	14B6	TOMS BOG	6.83	16G5	HAYFIELD FARM B	1.58	7B2	ARRONHEAD A	1.23								
10C6	KYLES FIELD	0.86	15A1	LZ GOOSE A	2.86	16G6	HAYFIELD FARM C	0.23	7B20	LZ SAWMILL B	2.00								
10C7	6 POINT HOUSE SITE	0.54	15A10	BLACKBERRY	3.01	16G7	HAYFIELD FARM D	0.27	7B3	SHORTLEAF/PINE B	0.24								
10C8	HALF MOON	7.12	15A11	LZ BUZZARD	3.39	16G8	HAYFIELD FARM D	0.00	7B4	LZ DOVE	17.40								
11A1	ROCK BOTTOM A	0.51	15A13	DUMPSITER 2	2.46	16G9	LZ HARRER A	0.79	7B5	SHORTLEAF-PINE C	0.37								
11A2	ROCK BOTTOM B	0.73	15A12	TOKYO HUBB	121.68	17A1	AG OUT POWERLINE	4.75	7B5	SHORTLEAF-PINE D	0.69								
11A3	MONICAS MEADOW	0.68	15A3	DUMPSITER B	3.55	17A10	MA-8 POWERLINE	3.12	7B7	ARRONHEAD B	0.89								
11A4	LZ OUMAIL	1.92	15A4	DUMPSITER C	1.84	17A2	TRIP WIRE	4.44	7B8	MA-8	0.80								
11A5	LZ WILLOWMIMS TURKEY B	0.35	15A5	LZ HUMMINGBIRD	3.56	17A3	TRIP WIRE	3.05	8-1	LZ COCKATOO	43.34								
11A6	LZ WILLOWMIMS TURKEY A	0.82	15A6	BISHOPS E	0.87	17A4	MA-8	8.00	901	TURKEY TROT A	2.83								
11A7	COOPS COBBLER	1.31	15A7	BISHOPS DR C	2.69	17A5	BOOMERANG	1.91	9010	RICH REED E	1.77								
11A8	LZ WOODPECKER	0.74	15A9	BISHOPS A	1.23	17A6	LZ OAK A	2.90	9011	RICH REED D	2.69								
11A9	TIMS FOUND	0.45	15B1	KRAMER FIELD	0.92	17A7	PERCHIN NEST	0.87	902	TURKEY TROT B	0.22								
11B1	HELD PAD	1.16	15B10	CASPER	4.19	17A8	BUNKER ABOUT B	6.87	903	TURKEY TROT D	1.92								
11B10	CRABAPPLE C	0.41	15B2	LZ PINE	1.30	17A9	BUNKER ABOUT A	11.48	904	TURKEY TROT C	1.49								
11B11	CRABAPPLE B	0.10	15B3	LONE PINE B	0.55	17B1	SECRET SQUIRREL POWERLINE	5.32	905	RICH REED A	1.25								
11B12	CRABAPPLE A	0.45	15B3	LONE PINE C	0.31	17B2	SECRET SQUIRREL	3.35	906	RICH REED F	2.42								
11B2	DOOSONS CORNER	0.40	15B5	DUST BOWL	6.90	17C1	SOMEGO	1.18	907	RICH REED G	0.96								
11B4	HARRIS FIELD	1.44	15B5	LONE PINE A	0.78	17C2	SOMEGO	6.13	908	RICH REED B	1.81								
11B15	CHIMNEY FIELD	0.37	15B6	TURKEY	1.37	4-1	RACETRACK	3.02	909	RICH REED C	1.16								
11B16	LZ MALLARD	2.58	15B7	LZ DUCK	3.49	5A1	COPPERHEAD	0.45	CU1	UPSHUR DOVES	5.19								
11B17	WRIGHTS HOUSE SITE	0.15	15B8	BISHOPS B	0.72	5A2	HOME SITE	0.34	ID	Burn Name	Acres								
11B2	MACADOCK	0.55	15B8	SKOWER A	2.10	5A3	LZ STARLING	5.72	1	R-3	327.66								
11B3	PEAR & APPLE A	0.74	15B9	SKOWER B	1.78	5A5	SAWTOOTH	2.82	2	90 TURKEY TROT	318.53								
11B4	GENERALS FIELD	0.50	15C1	LZ REDWING	25.34	5A6	SMITH LAKE FOOD PLOT	6.53	3	TA 10B	619.59								
11B5	WOODPILE	0.13	15C2	CEMETARY 2	2.82	5A7	FUEL FARM	0.76	4	90 RICH REED	327.50								
11B6	PEAR & APPLE B	0.47	15C3	CEMETARY 1	1.74	5B1	PONDEROSA	4.03	5	TA 7A	64.48								
11B7	THREE STORY HOUSE	0.43	15C5	TRIFTSALLDAY TRIP A	0.44	5B2	WOODCOCK	0.54	6	TA 7B 20 AC FLD	112.30								
11B8	BRUSHPILE	3.76	15C6	TRIFTSALLDAY TRIP B	0.61	5B3	PAULOWNIA	0.63	7	TA 9A	2500.48								
11B9	TIMS FIELD	0.27	15C7	TRIFTSALLDAY TRIP	0.84	5B4	PALLET STAND	1.12	8	OP-13	318.27								
12A2	HIDDEN TRENCH A	0.95	16A1	MA 10 E	2.65	5C1	SMITH LAKE FIELDS B	0.18	10	R-5	110.13								
12A4	HIDDEN TRENCH B	0.31	16A2	MA 10 A	0.91	5C2	SMITH LAKE FIELDS A	0.36	11	R-15	100.19								
12A7	OKIE BUNNY	0.91	16A3	MA 10 F	1.28	5C3	SMITH LAKE FIELDS C	0.37	12	10B RIGHT SIDE	332.01								

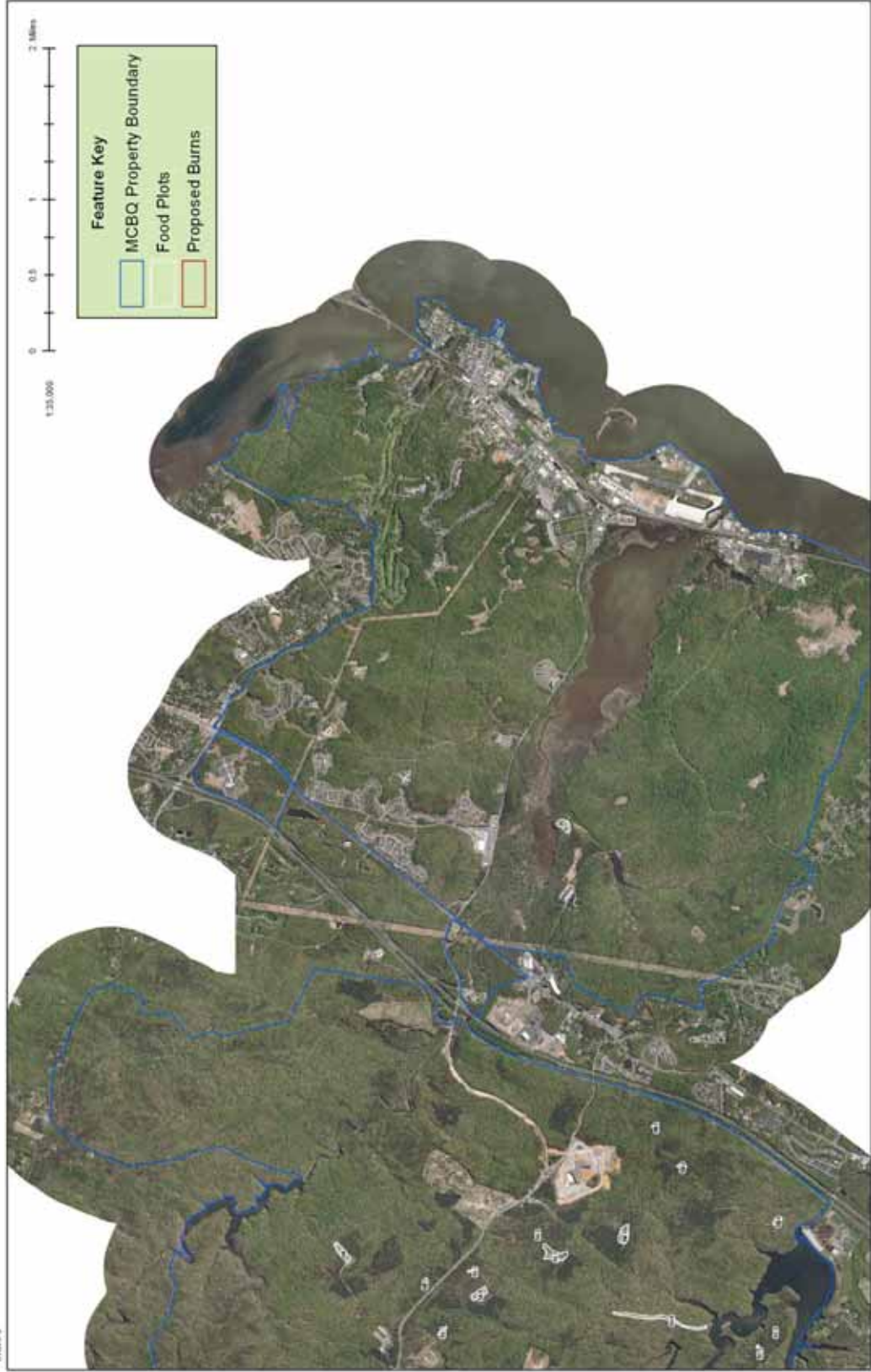
NIEGA MANAGED OPENINGS  
IN TRAINING AREAS











APPENDIX D  
Species Lists for Marine Corps Base, Quantico

- Tables 1-3. Fish
- Table 4. Birds
- Table 5. Amphibians and Reptiles
- Table 6. Mammals
- Table 7. Butterflies
- Table 8. Moths
- Table 9. Flora

Table 1. List of fish species collected from streams at MCB Quantico in 1998 and 1999 (Kelso 2001).

Family	Scientific name	Species abbreviation	Common name	
Petromyzontidae	<i>Lampetra aepyptera</i>	Lam aep	least brook lamprey	
Anguillidae	<i>Anguilla rostrata</i>	Ang ros	American eel	
Cyprinidae	<i>Clinostomus funduloides</i>	Cli fun	rosyside dace	
	<i>Cyprinella analostana</i>	Cyp ana	satinfin shiner	
	<i>Cyprinella spiloptera</i>	Cyp spi	spotfin shiner	
	<i>Exoglossum maxillingua</i>	Exo max	cutlips minnow	
	<i>Luxilus cornutus</i>	Lux cor	common shiner	
	<i>Notemigonus crysoleucas</i>	Not cry	golden shiner	
	<i>Notropis amoenus</i>	Not amo	comely shiner	
	<i>Notropis hudsonius</i>	Not hud	spottail shiner	
	<i>Notropis procne</i>	Not pro	swallowtail shiner	
	<i>Phoxinus oreas</i>	Pho ore	mountain redbelly dace	
	<i>Pimephales notatus</i>	Pim not	bluntnose minnow	
	<i>Pimephales promelas</i>	Pim pro	fathead minnow	
	<i>Rhinichthys atratulus</i>	Rhi atr	blacknose dace	
	<i>Semotilus atromaculatus</i>	Sem atr	creek chub	
	<i>Semotilus corporalis</i>	Sem cor	fallfish	
Catostomidae	<i>Catostomus commersoni</i>	Cat com	white sucker	
	<i>Erimyzon oblongus</i>	Eri obl	creek chubsucker	
	<i>Hypentelium nigricans</i>	Hyp nig	northern hogsucker	
Ictaluridae	<i>Ameiurus melas</i>	Ame mel	black bullhead	
	<i>Ameiurus natalis</i>	Ame nat	yellow bullhead	
	<i>Ameiurus nebulosus</i>	Ame neb	brown bullhead	
	<i>Noturus insignis</i>	Not ins	marginated madtom	
Esocidae	<i>Esox niger</i>	Eso nig	chain pickerel	
Umbridae	<i>Umbra pygmaea</i>	Umb pyg	eastern minnow	
Salmonidae	<i>Salvelinus fontinalis</i>	Sal fon	brook trout	
Poeciliidae	<i>Gambusia holbrooki</i>	Gam hol	eastern mosquitofish	
Centrarchidae	<i>Enneacanthus gloriosus</i>	Enn glo	bluespotted sunfish	
	<i>Lepomis auritus</i>	Lep aur	redbreast sunfish	
	<i>Lepomis cyanellus</i>	Lep cya	green sunfish	
	<i>Lepomis gibbosus</i>	Lep gib	pumpkinseed	
	<i>Lepomis gulosus</i>	Lep gul	warmouth	
	<i>Lepomis macrochirus</i>	Lep mac	bluegill	
	<i>Micropterus dolomieu</i>	Mic dol	smallmouth bass	
	<i>Micropterus salmoides</i>	Mic sal	largemouth bass	
	Percidae	<i>Percina notogramma</i>	Per not	stripeback darter
		<i>Percina peltata</i>	Per pel	shield darter
<i>Etheostoma flabellare</i>		Eth fla	fantail darter	
<i>Etheosoma olmstedii</i>		Eth olm	tessellated darter	

Table 2. Species list of fish captured from impoundments at Marine Corps Base, Quantico, Virginia (USFWS 1985 and 1986) and FWA Section (unpub data).

Common Name	Scientific Name	Occurrence*			
		Lunga Reservoir	Breckingridge Reservoir	Dalton Pond	R-6 Pond
Sunfish Family - Centrarchidae					
Bluegill	<i>Lepomis macrochirus</i>	C	C	C	C
Crappie, black	<i>Pomoxis nigrimaculatus</i>	C	C	-	-
Largemouth bass	<i>Micropterus salmoides</i>	C	C	C	C
Pumpkinseed	<i>Lepomis gibbosus</i>	C	C	C	-
<sup>1</sup> Redear sunfish	<i>Lepomis microlophus</i>	C	-	C	-
Warmouth	<i>Lepomis gulosus</i>	O	R	-	-
Catfish Family - Ictaluridae					
Bullhead, brown	<i>Ictalurus nebulosus</i>	C	R	-	-
Bullhead, yellow	<i>Ictalurus natalis</i>	R	-	-	-
<sup>5</sup> Channel catfish	<i>Ictalurus punctatis</i>	O	O	O	-
Blue catfish	<i>Ictalurus furcatus</i>	-	R	-	-
Temperate Bass Family - Perciclythyidae					
<sup>2</sup> Striped bass	<i>Morone saxatillis</i>	R	-	-	-
White perch	<i>Morone americana</i>	C	-	-	-
Perch Family					
<sup>3</sup> Yellow Perch	<i>Perca flavescens</i>	C			
<sup>4</sup> Walleye	<i>Sander vitreus</i>	O			
Pike Family - Esocidae					
Chain pickerel	<i>Esox niger</i>	O	O	-	-
Minnows and Carp Family - Cyprinidae					
Golden Shiner	<i>Notemigonus crysoleucas</i>	O	-	O	-
Sucker Family - Catostomidae					
Lake chubsucker	<i>Erimyzon sucetta</i>	O	-	O	-
White sucker	<i>Catostomus commersoni</i>	-	O	O	-
Total # of Species		15	10	7	2

\*Based intuitively on the number of individuals of a species captured in any one sampling period.

C - Common                      R - Rare

O - Occasional                - - None captured

<sup>1</sup> Stocking in Lunga began in 1988.

<sup>2</sup> Put-Grow-And-Take Program; discontinued in 1984.

<sup>3</sup> Yellow perch absent in 1985-86 surveys but well established per fall 2005 trapping survey (FWA Section).

<sup>4</sup> Walleye stocking began in 1990.

<sup>5</sup> Channel catfish absent from Lunga in 2011 gill net study.



Table 3. Species list of fish captured from the tidal section of Chopawamsic Creek (from the mouth to the beaverdam) in 1970, and species likely to occur at any one period during the year based intuitively on species recorded from similar areas, e.g. Quantico Creek.

Common name	Scientific name	Collected in 1970	Likely or known to occur
Sunfish Family - Centrarchidae			
Redbreast sunfish	<i>Lepomis auritus</i>		X
Pumpkinseed	<i>Lepomis gibbosus</i>	X	
Bluegill	<i>Lepomis machrochirus</i>	X	
Largemouth bass	<i>Micropterus salmoides</i>	X	
Crappie, black	<i>Pomoxis nigrimaculatus</i>		X
Catfish Family - Ictaluridae			
White catfish	<i>Ictalurus catus</i>		X
Bullhead, brown	<i>Ictalurus nebulosus</i>	X	
Channel catfish	<i>Ictalurus punctatus</i>		X
Catfish	<i>Ictalurus sp.</i>	X	
Temperate Bass Family - Perciclythyidae			
White perch	<i>Morone americana</i>	X	
Striped bass	<i>Morone saxailllis</i>	X	
Pike Family - Esocidae			
Chain pickerel	<i>Esox niger</i>	X	
Perch Family - Percidae			
Tessellated darter	<i>Etheostoma olmstedii</i>	X	
Yellow perch	<i>Perca flavescens</i>	X	
Minnows and Carp Family - Cyprinidae			
Goldfish		X	
Carp		X	
Eastern silvery minnow		X	
Golden shiner		X	
Spottail shiner		X	
Freshwater Eel Family - Anguillidae			
American eel	<i>Anguilla rostrata</i>	X	
Herring Family - Clupeidae			
Blueback herring	<i>Alosa aestivalis</i>		X
Alewife	<i>Alosa pseudoharengus</i>		X
American shad	<i>Alosa sapidissima</i>	X	
Atlantic menhaden	<i>Brevoortia tyrannus</i>		X
Gizzard shad	<i>Dorosoma cepedianum</i>	X	
Herring	<i>Alosa sp.</i>	X	
Gar Family - Lepisosteidae			



Table 3. Species list of fish captured from the tidal section of Chopawamsic Creek (from the mouth to the beaverdam) in 1970, and species likely to occur at any one period during the year based intuitively on species recorded from similar areas, e.g. Quantico Creek.

Common name	Scientific name	Collected in 1970	Likely or known to occur
Longnose Gar	<i>Lepisosteus osseus</i>		X
Killifish Family - Cyprinodontidae			
Banded killifish	<i>Fundulus diaphanus</i>		X
Mummichog	<i>Fundulus heteroclitis</i>		X
Silverside Family - Atherinidae			
Tidewater silverside	<i>Minidia beryllina</i>		x
Anchovy Family - Engraulidae			
Bay anchovy	<i>Anchoa mitchilli</i>		X
Sole Family - Soleidae			
Hogchoker	<i>Trinectes maculatus</i>		X
Drum Family - Sciaenidae			
Spot	<i>Leiostomus xanthurus</i>		X
Atlantic croaker	<i>Micropogonias undulatus</i>		X
Snakehead Family - Channidae			
Northern snakehead	<i>Channa argus</i>		X

Table 4. Bird Checklist for Marine Corps Base, Quantico.

Table 4 (Cont). Bird Checklist for Marine Corps Base, Quantico.

Table 4 (Cont). Bird Checklist for Marine Corps Base, Quantico.

Table 5. Checklist of Amphibians and Reptiles of Marine Corps Base, Quantico (VDCR, DNH, 1992).

**CHECKLIST OF AMPHIBIANS AND REPTILES OF MARINE CORPS BASE QUANTICO**

**CLASS AMPHIBIA**

**Order Anura**

**Frogs and Toads**

Family Bufonidae

Toads

*Bufo americanus americanus* Holbrook\*

Eastern American Toad

*Bufo woodhousii fowleri* Hinckley\*

Fowler's Toad

Family Hylidae

Treefrogs

*Acris crepitans crepitans* Baird\*

Northern Cricket Frog

*Hyla chryoscelis* Cope\*

Cope's Gray Treefrog

*Hyla cinerea* (Schneider)\*\*

Green Treefrog

*Hyla femoralis* Bosc

Pine Woods Treefrog

*Hyla squirella* Bosc in Daudin

Squirrel Treefrog

*Hyla versicolor* Le Conte

Gray Treefrog

*Pseudacris crucifer crucifer* Wied-Neuwied\*

Northern Spring Peeper

*Pseudacris feriarum* (Baird)\*

Upland Chorus Frog

Family Pelobatidae

Spadefoot Toads

*Scaphiopus hobbrookii holbrookii* (Harlan)

Eastern Spadefoot

Family Ranidae

True Frogs

*Lithobates catesbeiana* Shaw\*

Bullfrog

*Lithobates clamitans melanota* (Rafinesque)\*

Green Frog

*Lithobates palustris* Le Conte\*

Pickerel Frog

*Lithobates sylvatica* Le Conte\*

Wood Frog

*Lithobates utricularia* Cope

Southern Leopard Frog

**Order Caudata**

**Salamanders**

Family Ambystomatidae

Mole Salamanders

*Ambystoma maculatum* (Shaw)\*

Spotted Salamander

*Ambystoma opacum* (Gravenhorst)\*

Marbled Salamander

Family Plethodontidae

Lungless Salamanders

*Desmognathus fuscus fuscus* (Green)

Northern Dusky Salamander

*Eurycea bislineata* (Green)\*

Northern Two-lined Salamander

*Eurycea longicauda guttolineata* (Holbrook)\*

Three-lined Salamander

*Hemidactylium scutatum* (Schlegel)

Four-toed salamander

Table 5 (Cont). Checklist of Amphibians and Reptiles of Marine Corps Base, Quantico (VCDR, DNH, 1992).

<i>Plethodon cinereus</i> (Green)*	Eastern Red-backed Salamander
<i>Plethodon cylindraceus</i> (Harlan)*	White-spotted Slimy Salamander
<i>Pseudotriton montanus montanus</i> Baird	Eastern Mud Salamander
<i>Pseudotriton ruber ruber</i> (Latreille <u>in</u> Sonnini and Latreille)	Northern Red Salamander
Family Sirenidae	Sirens
<i>Siren lacertina</i> Linnaeus	Greater Siren
Family Salamandridae	True Salamanders
<i>Notophthalmus viridescens viridescens</i> (Rafinesque)*	Red-spotted Mewt
<b>CLASS REPTILIA</b>	
<b>Order Testudines</b>	<b>Turtles</b>
Family Chelydridae	Snapping Turtles
<i>Chelydra serpentina serpentina</i> (Linnaeus)*	Snapping Turtle
Family Emydidae	Pond Turtles
<i>Chrysemys picta picta</i> (Schneider)*	Eastern Painted Turtle
<i>Clemmys guttata</i> (Schneider)**	Spotted Turtle
<i>Malaclemys terrapin terrapin</i> (Schoepff)	Northern Diamondback Terrapin
<i>Pseudemys concinna concinna</i> (Le Conte)	Eastern River Cooter
<i>Pseudemys rubriventris rubriventris</i> (Le Conte)*	Northern Red-bellied Cooter
<i>Terrapene carolina carolina</i> (Linnaeus)*	Eastern Box Turtle
Family Kinosternidae	Mud and Musk Turtles
<i>Kinosternon subrubrum subrubrum</i> (Lacepede)	Eastern Mud Turtle
<i>Sternotherus odoratus</i> (Latreille <u>in</u> Sonnini and Latreille)*	Eastern Musk Turtle



Table 5 (Cont). Checklist of Amphibians and Reptiles of Marine Corps Base, Quantico (VDCR, DNH, 1992).

Order Squamata	Lizards, Snakes and Amphisbaenians
Suborder Sauria	Lizards
Family Phrynosomatidae	Sceloporine Lizards
<i>Sceloporus undulatus undulatus</i> (Green)*	Northern Fence Lizard
Family Scincidae	Skinks
<i>Plestiodon fasciatus</i> (Linnaeus)*	Five-lined skink
<i>Plestiodon inexpectatus</i> Taylor	Southeastern Five-lined Skink
<i>Plestiodon laticeps</i> (Schneider)*	Broad-headed Skink
<i>Scincella lateralis</i> (Say <u>in</u> James)*	Ground Skink
Family Teiidae	Tegus and Whiptails
<i>Cnemidophorus sexlineatus sexlineatus</i> (Linnaeus)*	Six-lined Racerunner
Suborder Serpentes	Snakes
Family Colubridae	Colubrids
<i>Carphophis amoenus amoenus</i> (Say)*	Eastern Worm Snake
<i>Cemophora coccinea copei</i> Jan	Northern Scarlet Snake
<i>Coluber constrictor constrictor</i> Linnaeus*	Northern Black Racer
<i>Diadophis punctatus edwardsii</i> (Merrem)*	Northern Ring-necked Snake
<i>Pantherophis guttata guttata</i> (Linnaeus)	Corn Snake
<i>Pantherophis alleghaniensis</i> *	Black Rat Snake
<i>Heterodon platirhinos</i> Latreille <u>in</u> Sonnini and Latreille*	Eastern Hog-nosed Snake
<i>Lampropeltis calligaster rhombomaculata</i> (Holbrook)*	Mole Kingsnake
<i>Lampropeltis getula getula</i> (Linnaeus)*	Eastern Kingsnake
<i>Lampropeltis triangulum triangulum</i> (Lacepede)	Eastern Milksnake
<i>Nerodia sipedon sipedon</i> (Linnaeus)*	Northern Water Snake
<i>Ophedrys aestivus aestivus</i> (Linnaeus)*	Rough Green Snake
<i>Regina septemvittata</i> (Say)	Queen Snake

Table 5 (Cont). Checklist of Amphibians and Reptiles of Marine Corps Base, Quantico.

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<i>Storeria dekayi dekayi</i> (Holbrook)*	Northern Brown Snake
<i>Storeria occipitomaculata occipitomaculata</i> (Storer)	Northern Red-bellied Snake
<i>Thamnophis sauritus sauritus</i> (Linnaeus)	Eastern Ribbon Snake
<i>Thamnophis sirtalis sirtalis</i> (Linnaeus)*	Eastern Garter Snake
<i>Virginia valeriae valeriae</i> Baird and Girard**	Smooth Earth Snake

Family Viperidae

<i>Agkistrodon contortrix mokeson</i> (Daudin)*	Northern Copperhead
<i>Crotalus horridus horridus</i> (Linnaeus)***	Timber Rattlesnake

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\*indicates species confirmed during the 1990-1991 inventory

\*\*indicates species confirmed by FWA Section staff.

\*\*\*indicates one individual found on Base, believed to be a release from captivity.

Table 6. 1994 Checklist of mammals for Marine Corps Base, Quantico.<sup>1</sup>

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<b>Order Marsupalia</b>	<b>Pouched Mammals</b>
Family Didelphidae	
<i>Didelphis marsupialis</i>	Opossum
<b>Order Insectivora</b>	<b>Insect Eaters</b>
Family Soridae	Shrews
<i>Sorex hoyi</i>	Pygmy shrew
<i>Sorex longirostris</i>	Southeastern shrew
<i>Blarina brevicauda</i>	Northern short-tailed shrew
<i>Cryptotis parva</i>	Least Shrew
Family Talpidae	Moles
<i>Condylura cristata</i>	Star-nosed mole
<i>Scalopus aquaticus</i>	Eastern mole
<b>Order Chiroptera</b>	<b>Bats</b>
Family Vespertilionidae	Plainnose Bats
<i>Myotis lucifugus</i>	Little brown bat
<i>Lasiuris borealis</i>	Red bat
<b>Order Carnivora</b>	<b>Flesh-eaters</b>
Family Canidae	Dogs, wolves and foxes
<i>Urocyon cinereoargenteus</i>	Gray fox
<i>Vulpes vulpes</i>	Red fox
<i>Canis latrans</i> <sup>2</sup>	Coyote
Family Ursidae	Bears
<i>Ursus americana</i>	Black bear
Family Procyonidae	
<i>Procyon lotor</i>	Raccoon
Family Mustelidae	Weasels, skunks, etc.
<i>Lontra canadensis</i>	River otter
<i>Mustela vison</i>	Mink
<i>Mephitis mephitis</i>	Striped skunk
<b>Order Rodentia</b>	<b>Gnawing Mammals</b>
Family Sciuridae	Squirrels
<i>Sciuris carolinensis</i>	Gray squirrel
<i>Sciuris niger</i>	Eastern fox squirrel <sup>3</sup>

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Table 6 (Cont). Checklist of mammals for Marine Corps Base, Quantico.

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<i>Glaucomys volans</i>	Southern flying squirrel
<i>Tamias striatus</i>	Eastern chipmunk
<i>Marmota monax</i>	Woodchuck
Family Castoridae	
<i>Castor canadensis</i>	Beaver
Family Cricetidae	
	Mice, rats and voles
<i>Reithrodontomys humulis</i>	Eastern harvest mouse
<i>Peromyscus leucopus</i>	White-footed mouse
<i>Microtus pennsylvanicus</i>	Meadow vole
<i>Microtus pinetorum</i>	Pine vole
<i>Ondatra zibethica</i>	Muskrat
<i>Oryzomys palustris</i>	Rice rat
Family Muridae	
	Old World rats and mice
<i>Mus musculus</i>	House mouse
Family Zapodidae	
	Jumping mice
<i>Zapus hudsonicus</i>	Meadow jumping mouse
<b>Order Lagomorpha</b>	<b>Hares and Rabbits</b>
Family Leporidae	
	Rabbits
<i>Sylvilagus floridanus</i>	Eastern cottontail
<b>Order Artiodactyla</b>	<b>Hoofed mammals</b>
Family Cervidae	
	Deer
<i>Odocoileus virginianus</i>	White-tailed deer

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<sup>1</sup>Based on staff observations and on small mammal surveys conducted by Dr. Joe Mitchell in 1991-1992 for the Virginia Division of Natural Heritage.

<sup>2</sup>Coyote range expanded into Quantico area about 1995.

<sup>3</sup>Fox squirrels occur only along the Cedar Run floodplain on the northwest border of the installation.

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Table 7. Butterfly species found at Marine Corps Base, Quantico during VDCR-DNH surveys from 1998-1999. X indicates the habitat type(s) in which a species was observed. Hodges is the reference number in the Checklist of the Lepidoptera of America North of Mexico (Hodges et. Al., 1983)

Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed	TOTAL
Hesperiidae	3870	Silver-spotted Skipper	Silver-spotted Skipper	S5	X	X	X		X	X	X	X	6
Hesperiidae	3904	Hoary Edge Skipper - P	Hoary Edge Skipper - P	S5					X	X	X		1
Hesperiidae	3909	Southern Cloudywing	Southern Cloudywing	S5						X	X		1
Hesperiidae	3910	Northern Cloudywing - F,S	Northern Cloudywing - F,S	S5						X	X		1
Hesperiidae	3946	Sleepy Duskywing - S	Sleepy Duskywing - S	S5							X	X	2
Hesperiidae	3947	Juvenal's Duskywing	Juvenal's Duskywing	S5						X	X		1
Hesperiidae	3993	Swarthy Skipper	Swarthy Skipper	S5						X	X		5
Hesperiidae	4004	Least Skipper - PW	Least Skipper - PW	S5	X		X	X		X	X		1
Hesperiidae	4027	Cowweb Skipper	Cowweb Skipper	S4						X	X		3
Hesperiidae	4036	Peck's Skipper - PW	Peck's Skipper - PW	S5	X					X	X		1
Hesperiidae	4041	Tawny-edged Skipper - S	Tawny-edged Skipper - S	S5	X					X	X		2
Hesperiidae	4042	Crossline Skipper	Crossline Skipper	S5	X					X	X		1
Hesperiidae	4046	Southern Broken-dash	Southern Broken-dash	SA?						X	X		2
Hesperiidae	4048	Little Glassywing	Little Glassywing	S5				X		X	X		4
Hesperiidae	4049	Sachem	Sachem	SAS5	X			X		X	X		4
Hesperiidae	4060	Zabulon Skipper - PW	Zabulon Skipper - PW	S5	X		X			X	X		1
Hesperiidae	4080	Dusted Skipper	Dusted Skipper	S4						X	X		1
Hesperiidae	4119	Ocola Skipper	Ocola Skipper	SA	X					X	X		4
Papilionidae	4157	Pipevine Swallowtail	Pipevine Swallowtail	S5	X					X	X		1
Papilionidae	4159	Black Swallowtail	Black Swallowtail	S5					X	X	X		8
Papilionidae	4176	Tiger Swallowtail	Tiger Swallowtail	S5	X		X	X		X	X		6
Papilionidae	4181	Spicebush Swallowtail	Spicebush Swallowtail	S5	X		X	X		X	X		2
Papilionidae	4184	Zebra Swallowtail	Zebra Swallowtail	S5	X					X	X		1
Pieridae	4193	Checkered White - PW	Checkered White - PW	S4						X	X		4
Pieridae	4197	Cabbage White	Cabbage White	SE					X	X	X		4
Pieridae	4209	Clouded Sulphur	Clouded Sulphur	S5	X					X	X		2
Pieridae	1210	Orange Sulphur	Orange Sulphur	S5						X	X		4
Pieridae	4228	Cloudless Sulphur - PW	Cloudless Sulphur - PW	SN	X					X	X		3
Pieridae	4237	Little yellow	Little yellow	S5						X	X		2
Pieridae	4242	Sleepy Orange - S, PW	Sleepy Orange - S, PW	SN						X	X		1
Lycaenidae	4251	American Copper	American Copper	S5						X	X		1
Lycaenidae	4282	Banded Hairstreak - S	Banded Hairstreak - S	S5						X	X		5
Lycaenidae	4299	Red-banded Hairstreak	Red-banded Hairstreak	S5	X		X			X	X		1
Lycaenidae	4318	Juniper Hairstreak	Juniper Hairstreak	S4						X	X		1
Lycaenidae	4326	Henry's Elfin	Henry's Elfin	S4						X	X		1

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Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed	TOTAL
Lycaenidae	4328		Eastern Pine Elfyn - S	S4							X		1
Lycaenidae	4335		White M Hairstreak - F	S4					X	X			1
Lycaenidae	4336		Gray Hairstreak	S5					X	X			2
Lycaenidae	4361		Eastern Tailed Blue	S5	X	X	X		X	X	X	X	7
Lycaenidae	4363		Spring Azure	S5						X	X		2
Nymphalidae	4411		American Snout	S5						X			1
Nymphalidae	4420		Question Mark	S5		X	X	X		X			3
Nymphalidae	4421		Comma	S5	X	X							3
Nymphalidae	4432		Mourning Cloak - S	S5	X	X				X		X	2
Nymphalidae	4434		American Lady	S5			X			X	X	X	4
Nymphalidae	4435		Painted Lady - S	S5						X	X		3
Nymphalidae	4437		Red Admiral - PW	S5	X					X	X	X	3
Nymphalidae	4440		Common Buckeye - PW	S5				X			X	X	3
Nymphalidae	4447		Variogated Fritillary - S	S5							X	X	2
Nymphalidae	4450		Great-Spangled Fritillary	S5	X	X		X	X	X	X	X	7
Nymphalidae	4465		Meadow Fritillary	S5	X						X		1
Nymphalidae	4481		Pearl Crescent	S5	X	X	X	X	X	X	X	X	8
Nymphalidae	4522		Red-spotted Purple	S5		X		X			X	X	4
Nymphalidae	4523		Viceroy	S5	X	X		X		X	X	X	5
Nymphalidae	4557		Hackberry Butterfly	S5	X	X							1
Nymphalidae	4568		Northern Pearly Eye - S	S4		X					X		2
Nymphalidae	4569		Appalachian Brown - PW	S4			X	X					2
Nymphalidae	4575		Carolina Satyr - S, PW	S5	X	X				X	X		3
Nymphalidae	4578		Little Wood Satyr - F	S5			X			X	X	X	4
Nymphalidae	4587		Common Wood Nymph - S	S5	X	X				X	X	X	4
Nymphalidae	4614		Monarch	S5	X	X	X			X	X	X	4
Total (61 species)													170



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Table 8. Moth species found at Marine Corps Base, Quantico during VDCR-DNH surveys from 1998-1999. X' indicates the habitat type(s) in which a species was observed. Hodges is the reference number in the Checklist of the Lepidoptera of America North of Mexico (Hodges et. Al., 1983)

FAMILY	HODGES NO.	SPECIES	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed	TOTAL
Thyatridae	6240		S5	X								1
Drepanidae	6255		S5	X								1
Geometridae	6258		S4S5		X							1
Geometridae	6261		S5			X						1
Geometridae	6270		S4S5	X								1
Geometridae	6273		S5	X			X					3
Geometridae	6326		S4S5		X		X					3
Geometridae	6331		S4S6		X							1
Geometridae	6348		S4S7	X								1
Geometridae	6352		S5		X		X			X		4
Geometridae	6353		S5		X		X					2
Geometridae	6362		S4S5						X			1
Geometridae	6386		S4S5	X								2
Geometridae	6443		S4S5		X							1
Geometridae	6584		S4S5							X		1
Geometridae	6586		S4S5		X							2
Geometridae	6588		S4S5	X	X		X					2
Geometridae	6590		S4S5		X					X		2
Geometridae	6597		S4S5		X							1
Geometridae	6598		S4S5							X		1
Geometridae	6599		S5	X			X					3
Geometridae	6620		S5	X				X		X		6
Geometridae	6654		S5		X					X		2
Geometridae	6655		S4S5		X					X		2
Geometridae	6667		S4S5	X								1
Geometridae	6678		S1S4		X							1
Geometridae	6711		S4S5	X								1
Geometridae	6720		S4S5	X								2
Geometridae	6724		S4S5		X		X				X	3
Geometridae	6726		S4S5	X		X						3
Geometridae	6733		S4S5	X						X		3
Geometridae	6733a		S1S4							X		1
Geometridae	6735		S4S5								X	1
Geometridae	6739		S4S5	X	X			X				4

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Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Geometridae	6740		S3S5	X	X	X				X		4
Geometridae	6743		S3S5		X					X		2
Geometridae	6754		S5		X				X			2
Geometridae	6796		S5	X	X							2
Geometridae	6817		S1S4			X						1
Geometridae	6826		S4S5				X					1
Geometridae	6837		S5	X	X							2
Geometridae	6838		S3S5	X	X			X				3
Geometridae	6884		S3S5				X					1
Geometridae	6885		S5	X								1
Geometridae	6888a		SU				X					1
Geometridae	6894		S4S5		X							1
Geometridae	6906a		S4S5									0
Geometridae	6941		S5	X				X		X		3
Geometridae	6963		S4S5		X	X						2
Geometridae	6964		S5	X	X					X		1
Geometridae	6966		S5		X	X				X		3
Geometridae	6974		S5		X					X		2
Geometridae	6982		S5		X		X					2
Geometridae	7033		S4S5		X						X	2
Geometridae	7047		S4S5		X	X						2
Geometridae	7084		S4S5	X	X				X			3
Geometridae	7136		S3S5	X	X				X			3
Geometridae	7159		S4S5	X	X					X		4
Geometridae	7169		S3S5							X		1
Geometridae	7176		S4S5			X						1
Geometridae	7196		S5	X	X		X			X		5
Geometridae	7330		S1S4	X								1
Geometridae	7390		S4S5	X	X							2
Geometridae	7416		S5		X					X		3
Geometridae	7440		S5		X					X		3
Geometridae	7474		S4S5	X	X							1
Geometridae	7647		S4S5		X	X						1
Geometridae	7647		S4S5									1
Geometridae	7650		S4S5		X							1
Epiplemidae	7660		S4S5		X							1
Mimallonidae	7662		S3S5	X								1
Apateleodidae	7663		S4S5		X							1

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Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Apateodidae	7665		S4S5			X						1
Lasiocampida	7670		S5		X							1
Lasiocampida	7674	Lasiocampida	S1S4							X		1
Lasiocampida	7698		S5	X	X					X		3
Lasiocampida	7701		S5	X	X					X		3
Saturniidae	7708		S4	X								1
Saturniidae	7715		S5		X		X					2
Saturniidae	7716		S4S5		X		X			X		3
Saturniidae	7746		S5	X	X		X			X		4
Saturniidae	7758		S5		X							1
Saturniidae	7765		S4S5		X							1
Sphingidae	7784		S3S5		X					X		2
Sphingidae	7787		S4S5		X					X		2
Sphingidae	7789		S4S5		X			X				1
Sphingidae	7816		S4S5		X					X		2
Sphingidae	7824		S4S5		X							1
Sphingidae	7825		S4S5			X						1
Sphingidae	7826		S3S5		X							1
Sphingidae	7827		S4S5	X								1
Sphingidae	7853		S5							X		1
Sphingidae	7859		S3S5							X		1
Sphingidae	7871		S4S5							X		1
Sphingidae	7885		S5				X					1
Sphingidae	7886		S4S5	X					X			2
Notodontidae	7895		S3S5	X								1
Notodontidae	7902		S4S5						X			4
Notodontidae	7903		S4S5		X							1
Notodontidae	7907		S4S5		X							1
Notodontidae	7915		S5	X						X		3
Notodontidae	7917		S5	X								1
Notodontidae	7920		S5		X			X				2
Notodontidae	7921		S4S5	X	X							2
Notodontidae	7931		S4S5		X							1
Notodontidae	7951X		S5		X					X		1
Notodontidae	7957		S4S5		X							2
Notodontidae	7958		S4S5		X					X		2
Notodontidae	7974		S4S5		X							1

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Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Notodontidae	7975	S5			X							1
Notodontidae	7983	S4S5			X		X			X		3
Notodontidae	7985	S3S5			X							1
Notodontidae	7990	S4S5	X		X							2
Notodontidae	7994	S4S5	X		X							2
Notodontidae	7995	S5			X							1
Notodontidae	7998	S4S5	X		X			X				3
Notodontidae	7999	S4S5			X							1
Notodontidae	8005	S4S5			X							1
Notodontidae	8011	S4S5					X					1
Notodontidae	8012	S4S5	X									1
Notodontidae	8017	S4S5	X		X		X			X		4
Arctiidae	8045.1	S3S5			X							2
Arctiidae	8046	S4S5						X		X		2
Arctiidae	8053a	S5							X	X		2
Arctiidae	8067	S5			X							1
Arctiidae	8072	S4S5								X		1
Arctiidae	8089	S5			X							1
Arctiidae	8090	S5			X		X			X		4
Arctiidae	8098	S5			X							1
Arctiidae	8106	S4S5								X		1
Arctiidae	8111	S4S5								X		1
Arctiidae	8118	S5	X		X							2
Arctiidae	8121	S5	X		X				X			4
Arctiidae	8129	S5			X							1
Arctiidae	8134	S5	X		X		X		X	X		6
Arctiidae	8137	S5			X		X		X	X		4
Arctiidae	8146	S5								X		1
Arctiidae	8171x	S5			X			X		X		4
Arctiidae	8176	S4S5	X		X		X					3
Arctiidae	8188	S5								X		1
Arctiidae	8197	S5			X							2
Arctiidae	8199	S4S5				X				X		1
Arctiidae	8203	S5			X		X			X		4
Arctiidae	8230	S5			X		X			X		3
Arctiidae	8231	S4S5			X					X		2
Arctiidae	8267	S4S5			X					X		1

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Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Lymantriidae	8292		S4S5		X					X		2
Lymantriidae	8296		S4S5			X	X	X				3
Lymantriidae	8302		S4S5	X								1
Lymantriidae	8314		S4S5		X	X						2
Lymantriidae	8318		SE		X							1
Noctuidae	8322		S5	X	X	X						3
Noctuidae	8323		S5		X			X	X	X		3
Noctuidae	8326		S5	X	X			X	X			4
Noctuidae	8334		S5		X							1
Noctuidae	8340		S4S5	X								1
Noctuidae	8351		S4S5	X	X							2
Noctuidae	8355		S5		X							1
Noctuidae	8357		S3S5		X							1
Noctuidae	8363		S3S5		X							1
Noctuidae	8364		S5		X			X		X		3
Noctuidae	8381		S5	X	X	X						3
Noctuidae	8397		S5		X			X				2
Noctuidae	8398		S5	X	X			X				3
Noctuidae	8404		S4S5	X					X			2
Noctuidae	8411		S3S5						X			1
Noctuidae	8441		S4S5		X	X						2
Noctuidae	8442		S5	X	X							2
Noctuidae	8443		S4S5		X	X						2
Noctuidae	8443		S4S5		X	X						1
Noctuidae	8465		S5		X					X		2
Noctuidae	8481		S3S5							X		1
Noctuidae	8491		S4S5		X		X					2
Noctuidae	8509		S4S5		X					X		1
Noctuidae	8514		S5		X		X		X			3
Noctuidae	8522		S3S5							X		1
Noctuidae	8528		S4S5			X						2
Noctuidae	8534		S4S5		X	X		X				1
Noctuidae	8536		S4S5		X					X		2
Noctuidae	8587		S4S5	X		X						2
Noctuidae	8591		S4S5		X	X						1
Noctuidae	8689		S5		X							1
Noctuidae	8692		S4S5		X							1

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Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Noctuidae	8694		S4S5		X							1
Noctuidae	8695		S4S5			X						1
Noctuidae	8717		S5	X		X			X			3
Noctuidae	8719		S5	X								1
Noctuidae	8721		S5	X	X	X				X		4
Noctuidae	8727		S5	X	X	X						3
Noctuidae	8733		S5	X						X		2
Noctuidae	8738		S5							X		1
Noctuidae	8739		S5							X		1
Noctuidae	8745		S5							X		1
Noctuidae	8747		S5			X						1
Noctuidae	8792		S5	X						X		1
Noctuidae	8801		S5									1
Noctuidae	8851		S4S5				X					1
Noctuidae	8857		S4S5			X	X			X		3
Noctuidae	8889		S4S5							X		1
Noctuidae	8908		S4S5		X	X				X		3
Noctuidae	8924		S4S5							X		1
Noctuidae	8955		S4S5							X		1
Noctuidae	8962		S4S5		X					X		2
Noctuidae	8970		S5		X							1
Noctuidae	8973		S5		X							1
Noctuidae	8989		S4S5		X					X		2
Noctuidae	9037		S4S5		X							1
Noctuidae	9038		S4S5						X			1
Noctuidae	9044		S5	X	X	X	X					4
Noctuidae	9047		S4S5		X	X						2
Noctuidae	9057		S4S5			X						1
Noctuidae	9062		S4S5				X					1
Noctuidae	9065		S4S5		X							1
Noctuidae	9095		S4S5							X		1
Noctuidae	9182		S4S5	X								1
Noctuidae	9189		S5		X							1
Noctuidae	9192		S2S4		X							1
Noctuidae	9200		S5		X		X					3
Noctuidae	9208		S4S5	X	X	X				X		4
Noctuidae	9225		S4S5		X				X			1

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Noctuidae	9227		S4S5		X	X						2
Noctuidae	9238		S4S5			X						1
Noctuidae	9243		S5							X		1
Noctuidae	9250		S5	X	X	X	X		X			5
Noctuidae	9272		S3S5			X						1
Noctuidae	9285		S5	X	X	X			X			4
Noctuidae	9299		S4S5			X						1
Noctuidae	9301		S4S5	X	X							2
Noctuidae	9373		S3S5		X							1
Noctuidae	9404		S4S5							X		1
Noctuidae	9427		S4		X							1
Noctuidae	9454		S4S5		X							1
Noctuidae	9457		S3S5		X					X		2
Noctuidae	9466		S4S5		X							1
Noctuidae	9483		S4S5		X							1
Noctuidae	9485		S5	X	X							2
Noctuidae	9485		S2S4		X							1
Noctuidae	9492		S1S4		X							1
Noctuidae	9522		S3S5	X	X	X						3
Noctuidae	9545		S4S5		X							1
Noctuidae	9556		S5		X		X					2
Noctuidae	9582		S5			X						1
Noctuidae	9619		S5		X							1
Noctuidae	9631		S4S5		X							1
Noctuidae	9638		S5		X							1
Noctuidae	9650		S5	X	X	X			X	X		5
Noctuidae	9666		S5	X	X					X		3
Noctuidae	9669		S5	X						X		2
Noctuidae	9688		S5						X			2
Noctuidae	9689		S3S5			X						1
Noctuidae	9690		S4S5		X	X				X		3
Noctuidae	9693		SA							X		1
Noctuidae	9725		S3S5			X						2
Noctuidae	9766		S3S5		X		X					1
Noctuidae	9781		S3S5		X							1
Noctuidae	9815		S4S5				X					1
Noctuidae	9818		S3S5		X							1



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Noctuidae	9886		S4S5		X							1
Noctuidae	9895		S4S5		X							1
Noctuidae	9915		S4S5		X							1
Noctuidae	9929		S4S5		X							1
Noctuidae	9944		S4S5		X							1
Noctuidae	9945.2		S4S5		X							1
Noctuidae	9946		S4S5		X							1
Noctuidae	9950		S4S5		X							1
Noctuidae	9957		S5		X							1
Noctuidae	10397		S5		X					X		2
Noctuidae	10414		S5		X				X			2
Noctuidae	10438		S5		X					X		2
Noctuidae	10445		S5	X		X				X		4
Noctuidae	10487		S4S5		X							1
Noctuidae	10488		S3S5		X							1
Noctuidae	10495		S4S5		X							1
Noctuidae	10521		S5	X								1
Noctuidae	10567		S4S5	X								1
Noctuidae	10587		S5		X					X		2
Noctuidae	10663		S5	X		X				X		3
Noctuidae	10870		S4S5		X							1
Noctuidae	10891		S5		X	X						1
Noctuidae	10915		S5		X							1
Noctuidae	10950		S5	X								1
Noctuidae	10955		S4S5		X							1
Noctuidae	10065		S3S5		X		X			X		3
Noctuidae	10288		S5		X							1
Noctuidae	10289		S4S5		X					X		2
Noctuidae	10301		S1S4							X		1
Noctuidae	10456		S4S5	X								1
Noctuidae	10459		S3S5		X							1
Noctuidae	10461		S5		X	X				X		3
Noctuidae	10532b		S5		X							1
Noctuidae	10585		S4S5					X				1
Noctuidae	10627		S4S5		X							1
Noctuidae	10676		S5	X								1
Noctuidae	10680		S5		X							1

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Family	Hodges	Scientific Name	Common Name	SRANK	Mixed Upland	Bottomland	Freshwater Marsh	Pond Edge	Cultivated Field	Beaver Meadow	Grassland	Disturbed
Noctuidae	10942.1		S5		X		X					2
Noctuidae	10967		S5	X								1
Noctuidae	10969		S5	X								1
Noctuidae	11006		S4S5	X								1
Noctuidae	11029		S5	X								2
Noctuidae	11068		S5	X		X						3
Noctuidae	11128		S5	X						X		1
Noctuidae	00000		SE							X		1
<b>TOTAL (301 species)</b>				<b>87</b>	<b>191</b>	<b>65</b>	<b>33</b>	<b>14</b>	<b>32</b>	<b>100</b>	<b>1</b>	<b>523</b>

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Table 9. List of flora at Marine Corps Base, Quantico, Virginia.

Compiled June 2003

This list has been compiled from two primary sources.

1. The Vascular Flora of Fire-Maintained Grasslands and Woodlands at Quantico Marine Corps Base, Virginia. Gary P. Fleming, Kathleen M. McCoy, and Nancy E. Van Alstine Virginia Department of Conservation and Recreation, Division of Natural Heritage. Taxa recorded May 1998 through August 1999. Nomenclature follows Kartesz (1999).
2. Floral Inventory of Quantico Marine Base, Virginia, F.L. Johnson, M.D. Proctor, N.A. McCarty, B.W. Hoagland, M.I. Holmes, G.E. Brown, T.L. Browning, D.L. Benesh, and G.D. Schnell. Oklahoma Biological Survey University of Oklahoma: Survey conducted Fall of 1993 and in the growing season of 1994.

The following table of flora at Marine Corps Base, Quantico, is arranged alphabetically by family. There are several different classifications of the ferns. In this table, the family POLYPODIACEAE includes the families of BLECHNACEAE (chain fern family), DENNSTAEDTIACEAE (bracken fern family), DRYOPTERIDACEAE (wood fern family), and THELYPTERIDACEAE (maiden fern family).

Taxa highlighted in yellow are exotic or introduced flora.

Taxa highlighted in red are considered to be highly invasive and a potential threat to ecosystem integrity.

Habitat key:

1. Upland grassland
2. Oak-hickory woodland /savanna
3. Boggy wetland
4. Marshy wetland
5. Ruderal habitats (roadsides, parking areas, wildlife plots, etc.)
6. Pine plantation.

Key to footnotes:

\*: Several taxa which were not observed in 1998-1999 but were recorded by DCR-DNH personnel in 1991 during a brief visit and are likely still present  
+: Introduced or exotic flora.  
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Scientific Name	Common Name	Habitat
ACANTHACEAE #	acanthus family	
<i>Justicia americanan</i> (L.) Vahl	water lilly	4
<i>Ruellia carolinensis</i> (Walter ex J.F.Gme.) Steud var. <i>carolinensis</i> #		1,2
ACERACEAE	maple family	
<i>Acer negundo</i> (L.) ssp. <i>negundo</i> #	box elder	3,4
<i>Acer rubrum</i> L. var. <i>rubrum</i>	red maple	1,2,3,4,6
ACORACEAE	calamus family	
<i>Acorus calamus</i> L.	single-vein sweetflag	4
ALISMATACEAE	water-plantain family	
<i>Alisma subcordatum</i> Raf.	American water-plantain	4,5
<i>Sagittaria engelmanniana</i> J.G. Smith ssp. <i>longirostra</i> (Micheli) Bogin		4
<i>Sagittaria latifolia</i> Willd.	duck-potato (common arrowhead)	4
AMARANTHACEAE §	amaranth Family	
<i>Amaranthus cannabinus</i> (L.) J.D. Sauer	tidemarsh amaranth	4
AMARYLLIDACEAE #	daffodil or amaryllis family	
<i>Hypoxis hirsuta</i> (L.) Coville		5
ANACARDIACEAE	sumac family	
<i>Rhus copallinum</i> L. var. <i>copallinum</i>	winged sumac	1,2,3,5
<i>Rhus glabra</i> L.	smooth sumac	1,5
<i>Toxicodendron radicans</i> (L.) Kuntze	eastern poison-ivy	2,4,5
<i>Toxicodendron vernix</i> (L.) Kuntze	poison-sumac	3
ANNONACEAE #	custard apple family	
<i>Asimina triloba</i> (L.) Dunal		2,4
APIACEAE (includes: UMBELLIFERAE #)	carrot family	
<i>Angelica venenosa</i> (Greenway) Fern.	hairy angelica	2
<i>Cicuta maculata</i> L.#		2,3,5
<i>Cryptotaenia canadensis</i> (L.) DC. #	honestwort	2,5
* <i>Daucus carota</i> L. +	Queen Anne's-lace (wild carrot #)	2,5
<i>Osmorhiza longistylis</i> (Torr.) DC #	sweet chervil	2,5
<i>Oxypolis rigidior</i> (L.) Raf.	stiff cowbane	3
<i>Sanicula canadensis</i> L. var. <i>floridana</i>	Canadian black-snakeroot	2,5
APOCYNACEAE	dogbane family	

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Scientific Name	Common Name	Habitat
<i>Apocynum cannabinum</i> L.	Indian-hemp	1,2,5
AQUIFOLIACEAE		
	holly family	
<i>Ilex opaca</i> Soland, in Ait.	American holly	2
<i>Ilex verticillata</i> (L.) Gray #	black alder	3
ARACEAE		
	arum family	
<i>Acorus calamus</i> (L.) #	sweet flag	5
<i>Arisaema draontium</i> (L.) Schott #	green dragon	3
<i>Arisaema triphyllum</i> (L.) Schott ssp. triphyllum	jack-in-the-pulpit	2,3,4
<i>Orontium aquaticum</i> (L.) #	golden club	3
<i>Peltandra virginica</i> (L.) Kunth #	arrow arum	4
<i>Symplocarpus foetidus</i> (L.) Salisb. ex Nutt.	skunk-cabbage	3,4
ARALIACEAE		
	ginseng family	
<i>Aralia spinosa</i> L.	devil's-walkingstick (Hercules club #)	2,5
ARISTOLOCHIACEAE #		
	birthwort family	
<i>Asarum canadense</i> (L.) var. <i>canadense</i>	wild ginger	3,4
<i>Asarum virginicum</i> (L.) var. <i>Hexastylis virginica</i> (L.) Small		2
ASCLEPIADACEAE		
	milkweed family	
<i>Asclepias amplexicaulis</i> J.E.Smith.	clasping milkweed	1,5
<i>Asclepias incarnata</i> ssp. <i>pulchra</i> (Ehrh. ex Willd.) Woodson var. <i>pulchra</i> (Ehrh.) Pers.	swamp milkweed	3,4,5
<i>Asclepias purpurascens</i> (L.) #		5
<i>Asclepias rubra</i> L.	red milkweed	3
<i>Asclepias tuberosa</i> L. ssp. <i>tuberosa</i>	butterfly milkweed	2,5
<i>Asclepias viridiflora</i> Raf. var. <i>viridiflora</i>	green comet milkweed	1
ASTERACEAE (COMPOSITAE #)		
	aster family	
<i>Achillea millefolium</i> L.	common yarrow (milfoil #)	1,2,5
<i>Ageratina altissima</i> (L.) R.M. King & H. Rob. var. <i>roanensis</i> (Small) Clewell & J.W. Wooten var. <i>Eupatorium rugosum</i> Houttuyn #		5
<i>Ambrosia artemisiifolia</i> L. var. <i>artemisiifolia</i>	annual ragweed	5
<i>Antennaria neglecta</i> Greene	field pussytoes	1
<i>Antennaria plantaginifolia</i> (L.) Richards var. <i>plantaginifolia</i>	woman's-tobacco	2
<i>Anthemis arvensis</i> (L.) + #		5
<i>Artemisia vulagris</i> (L.) + #	mugwort	5
<i>Aster divaricatus</i> (L.) <i>Aster divaricatus</i> L. var. <i>divaricatus</i> #	heart-leaved aster	2,4

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Scientific Name	Common Name	Habitat
<i>Aster praealtus</i> Poir. var. <i>praealtus</i> #		4
<i>Aster vimineus</i> Lam. var. <i>subdumosus</i> Wiegand <i>Aster vimineus</i> Lam. #		3, 4
<i>Bidens aristosa</i> (Michx.) Britt. var. <i>aristosa</i> = <i>Bidens polylepis</i> Blake var. <i>polylepis</i> #	bearded beggarticks	3, 4, 5
<i>Bidens coronata</i> (L.) Britton \$	tickseed sunflower	4
<i>Bidens laevis</i> (L.) BSP.#		3
<i>Bidens tripartita</i> (L.) + #		4
<i>Boltonia asteroides</i> (L.) L'Her. var. <i>glastifolia</i> (J.Hill) Fernald <i>Boltonia asteroids</i> (L.) L'Her		5
<i>Centaurea maculosa</i> auct. non Lam. + # = <i>Centaurea biebersteinii</i> DC.	spotted knapweed	5
<i>Chrysopsis mariana</i> (L.) Ell.	Maryland golden-aster	1, 2
<i>Cirsium discolor</i> (Muhl. ex Willd.) Spreng.	field thistle	1, 5
<i>Cirsium muticum</i> Michx.	swamp thistle	3
<i>Cirsium pumilum</i> (Nutt.) Spreng. nomen superfl var. <i>Carduus pumilus</i> Nuttall	pasture thistle	1
<i>Conoclinium coelestinum</i> (L.) D.C. <i>Eupatorium coelestinum</i> L. #	mistflower	4, 5
<i>Conyza canadensis</i> (L.) Cronq. var. <i>canadensis</i> #	horseweed	5
<i>Coreopsis tripteris</i> L.	tall tickseed	2, 3, 5
<i>Coreopsis verticillata</i> L.	whorled tickseed	1, 2
<i>Doellingeria umbellata</i> (P. Mill.) Nees = <i>Aster umbellatus</i> P. Miller	parasol white-top	3
<i>Elephantopus carolinianus</i> Raeusch var. <i>Elephantopus carolinianus</i> Willd. #		2
<i>Elephantopus tomentosus</i> (L.) #		4
<i>Erechtites hieraciifolia</i> (L.) Raf. ex DC var. <i>hieraciiflora</i>	American burnweed (fireweed #)	1, 2, 5
<i>Erigeron annuus</i> (L.) Pers.	eastern daisy fleabane	1, 5
<i>Erigeron strigosus</i> Muhl. ex Willd. var. <i>beyrichii</i> (Fisch. & C.A. Meyer) Torr. + Gray ex Gray)	prairie fleabane (daisy fleabane #)	1, 5
<i>Eupatoriadelphus dubius</i> (Willd. ex Poir.) R.M. King & H. Rob. var. <i>Eupatorium dubium</i> Willd. #		2
<i>Eupatorium album</i> L.	white thoroughwort	1, 5
<i>Eupatorium fistulosum</i> Barratt var. <i>Eupatoriadelphus fistulosus</i> (Barrattex. Hook) R.M. King & H. Rob.	trumpetweed (queen-of-the-meadow #)	3, 4, 5
<i>Eupatorium hyssopifolium</i> L. var. <i>hyssopifolium</i>	hyssop-leaf thoroughwort	1, 2, 3
<i>Eupatorium hyssopifolium</i> L. var. <i>laciniatum</i> Gray	hyssop-leaf thoroughwort	2
<i>Eupatorium perfoliatum</i> L. var. <i>cuneatum</i> Englem. ex Gray	common boneset	3, 4

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<i>Eupatorium pilosum</i> Walt.	rough boneset	1,2,3,5
<i>Eupatorium rotundifolium</i> L. var. <i>ovatum</i> (Bigelow) Torr.	round-leaf thoroughwort	1,2,3
<i>Euthamia graminifolia</i> (L.) Greene, Nutt. <i>Solidago graminifolia</i> (L.) Salisbury	flat-top goldentop	1,3,5
<i>Helenium autumnale</i> (L.) §	common sneezeweed	4
<i>Helenium flexuosum</i> Raf . #		5
<i>Helianthus atrorubens</i> L.	purple-disk sunflower	1
<i>Helianthus giganteus</i> L.	giant sunflower	3,
<i>Helianthus strumosus</i> L. #		5
<i>Helianthus tuberosus</i> L. #	Jerusalem artichoke	4
<i>Heliopsis helianthoides</i> (L.) Sweet var <i>scabra</i> (Dunal) Fernald var. <i>Heliopsis</i> <i>helianthoides</i> (L.) B.S.P. #	ox-eye	5
<i>Heterotheca mariana</i> (L.) Shinnery #		1
<i>Hieracium gronovii</i> L.	queendevil	1,2
<i>Hieracium venosum</i> L. +	rattlesnake-weed	2,5
<i>Ionactis linariifolius</i> (L.) Greene = <i>Aster linariifolius</i> L.	flax-leaf ankle-aster	1
<i>Krigia dandelion</i> (L.) Nutt. #		3
<i>Krigia virginica</i> (L.) Willd #		5
<i>Lactuca canadensis</i> L. var <i>latifolia</i> Kuntze var. <i>canadensis</i>	Florida blue lettuce (wild lettuce #)	1,5
<i>Lactuca floridana</i> (L.) Gaertner var. <i>floridana</i> #		5
<i>Leucanthemum vulgare</i> Lam.	ox-eye daisy	2,5
<i>Liatris squarrosa</i> (L.) Michx. var <i>squarrosa</i>	scaly gayfeather	1,2,5
<i>Matricaria matricarioides</i> (Less.) T. Porter #	pineapple-weed	5
<i>Mikania scandens</i> (L.) Willd.#	climbing hempweed	3,4
<i>Packera anonyma</i> (Wood) W.A. Weber & A. Löve = <i>Senecio anonymus</i> Wood	Small's groundsel	1
<i>Pseudognaphalium obtusifolium</i> (L.) Hilliard & Burtt = <i>Gnaphalium obtusifolium</i> L.	blunt-leaf rabbit- tobacco	1,5
<i>Rudbeckia fulgida</i> Ait.	orange coneflower	1
<i>Rudbeckia hirta</i> L. var <i>brittonii</i> (Small) Fernald	black-eyed Susan	1,5
<i>Rudbeckia laciniata</i> L. var. <i>laciniata</i>	green-head coneflower	3,4
<i>Senecio obovatus</i> Muhl. ex Willd #		5
<i>Sericocarpus asteroides</i> (L.) B.S.P. = <i>Aster paternus</i> Cronq.	toothed white-top-aster	2,5
<i>Sericocarpus linifolius</i> (L.) B.S.P. = <i>Aster solidagineus</i> Michx.	narrow-leaf white-top- aster	1,2
<i>Smallanthus uvedalia</i> (L.) Mackenz. ex Small var. <i>Polymnia uvedalia</i> L. #		5
<i>Solidago altissima</i> L. var. <i>altissima</i> #		5
<i>Solidago caesia</i> L. #	wreath goldenrod	2
<i>Solidago bicolor</i> L.	white goldenrod	1,2
<i>Solidago erecta</i> Pursh	slender goldenrod	2

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<i>Solidago juncea</i> Ait.	early goldenrod	1,2
<i>Solidago nemoralis</i> Ait. var <i>haleana</i> Fernald	gray goldenrod	1,2,5
<i>Solidago pinetorum</i> Small	Small's goldenrod	1
<i>Solidago rugosa</i> P. Mill.	wrinkle-leaf goldenrod	3,4
<i>Solidago ulmifolia</i> Muhl. ex. Willd. var. <i>ulmifolia</i> #		5
<i>Symphotrichum dumosum</i> (L.) Nesom = <i>Aster dumosus</i> L.	rice button American- aster	1,2,3,5
<i>Symphotrichum lateriflorum</i> (L.) A. & D. Löve = <i>Aster lateriflorus</i> (L.) Britt.	farewell-summer	1,2,3,4,5
<i>Symphotrichum puniceum</i> (L.) A. & D. Löve = <i>Aster puniceus</i> L.	purple-stem American- aster	3,4
<i>Symphotrichum undulatum</i> (L.) Nesom = <i>Aster undulatus</i> L.	wavy-leaf American- aster	1,2
<i>Taraxacum officinale</i> G.H. Weber var <i>Taraxacum officinale</i> Wiggers + #	common dandelion	1,5
<i>Verbesina alternifolia</i> (L.) Britton var <i>Verbesina alternifolia</i> (L.) Britton ex Kearney #		3
<i>Vernonia glauca</i> (L.) Willd. #		4
<i>Vernonia noveboracensis</i> (L.) Michx.	New York ironweed	3,4,5
<i>Xanthium strumarium</i> (L.) var. <i>strumarium</i> #	cockle bur	1,5
BALSAMINACEAE	touch-me-not family	
<i>Impatiens capensis</i> Meerb.	spotted touch-me-not	2,3,4
BERBERIDACEAE #	barbery family	
<i>Podophyllum peltatum</i> (L.)	May-apple	2
BETULACEAE	birch family	
<i>Alnus serrulata</i> (Ait.) Willd. var <i>Alnus</i> <i>rugosa</i> Sprengel	brookside alder (smooth alder #)	3,4
<i>Betula nigra</i> L.	river birch	3,4
<i>Carpinus caroliniana</i> Walter #	ironwood	2,3
<i>Corylus americana</i> Walter	American hazelnut	2,3,4
<i>Ostrya virginiana</i> (P. Mill.) K. Koch	eastern hop-hornbeam	2
BIGNONIACEAE #		
<i>Campsis radicans</i> (L.) Seem	trumpet vine	5
BORAGINACEAE #		
<i>Mertensia virginica</i> (L.) Pers.	bluebells	3
<i>Myosotis macrosperma</i> Engelm.		3
BRASSICACEAE (CRUCIFERAE #)	mustard family	
<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande + #	garlic mustard	3
<i>Arabidopsis thaliana</i> (L.) Heynh.	thalecress	1,5

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Scientific Name	Common Name	Habitat
<i>Barbarea vulgaris</i> Ait. f. = <i>arcuata</i> (Opiz) Fries +	garden yellow-rocket	2, 5
<i>Cardamine diphylla</i> (Michx.) A. Wood #		2
<i>Cardamine hirsuta</i> L. +	hairy bittercress	5
<i>Cardamine pensylvanica</i> Muhl. ex Willd. var. <i>pensylvanica</i> #		2
<i>Draba verna</i> L. var. <i>verna</i> + #	whitlow-grass	5
<i>Lepidium virginicum</i> L. var. <i>virginicum</i> <i>Lepidium virginicum</i> L. #	poor-man's pepper	5
CAESALPINIACEAE (See LEGUMINOSAE) #	senna family	
CAMPANULACEAE (includes: LOBELIACEAE #)	bellflower family	
<i>Lobelia cardinalis</i> (L.) var. <i>cardinalis</i> #	cardinal flower	4, 5
<i>Lobelia inflata</i> L.	Indian-tobacco	1, 2, 3, 4, 5
<i>Lobelia puberula</i> Michxauvar. <i>simulans</i> Fernald	downy lobelia	3, 4
<i>Lobelia spicata</i> Lam. var. <i>scaposa</i> McVaugh	pale-spike lobelia	1, 2
<i>Triodanis perfoliata</i> (L.) Nieuwl.	clasping-leaf Venus'- looking-glass	1, 3
CAPRIFOLIACEAE	honeysuckle family	
<i>Lonicera japonica</i> Thunb. +	Japanese honeysuckle	1, 2, 4
<i>Sambucus nigra</i> L. ssp. <i>canadensis</i> (L.) R. Bolli = <i>Sambucus canadensis</i> L.	black elder	3, 4
<i>Samucus racemosa</i> (L.) ssp. <i>pubens</i> (Michx) House #		5
<i>Symphoricarpos orbiculatus</i> Moench. #	coral-berry	2
<i>Viburnum acerifolium</i> L.	maple-leaf arrow-wood	2
<i>Viburnum dentatum</i> (L.) var. <i>lucidum</i> Ait.		2, 3
<i>Viburnum lantanoides</i> Michx var <i>Viburnum</i> <i>alnifolium</i> Marshall	hobblebush	2
<i>Viburnum nudum</i> L. var. <i>angustifolium</i> Torr. & Gray	possumhaw	3
<i>Viburnum prunifolium</i> L. var. <i>prunifolium</i>	smooth blackhaw	2, 3
<i>Viburnum recognitum</i> Fern.	smooth arrow-wood	4
CARYOPHYLLACEAE #	pink family	
<i>Cerastium vulgatum</i> (L.) <i>Cerastium</i> <i>holosteoides</i> Fries var <i>vulgare</i> (Hartman) Hylander +		5
<i>Dianthus armeria</i> (L.) +		5
<i>Saponaria officinalis</i> (L.) +	bouncing bet	5
<i>Stellaria media</i> (L.) Villars var. <i>Stellaria media</i> (L.) Cyrillo +		5
CELASTRACEAE #	staff tree family	
<i>Euonymus americanus</i> (L.)		3
CERATOPHYLLACEAE §	hornwort famly	

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<i>Ceratophyllum demersum</i>	Common hornwort	4
CHENOPODIACEAE	goosefoot family	
<i>Chenopodium album</i> (L.) var. <i>album</i> +	lamb's quarters	5
CISTACEAE	rock-rose family	
<i>Lechea minor</i> (L.) #		2
<i>Lechea pulchella</i> Raf.	Leggett's pinweed	1,2
<i>Lechea racemulosa</i> Michx.	oblong-fruit pinweed	1,2
CLUSIACEAE	St. John's-wort family	
<i>Hypericum crux-andreae</i> (L.) Crantz	St. Peter's-wort	2
<i>Hypericum gentianoides</i> (L.) B.S.P.	orange-grass	1,2
<i>Hypericum hypericoides</i> (L.) Crantz ssp. <i>multicaule</i> (Michx. ex Willd.) Robson	St. Andrew's-cross	1,2
<i>Hypericum mutilum</i> L.	dwarf St. John's-wort	3
<i>Hypericum punctatum</i> Lam.	spotted St. John's-wort	1,2
<i>Triadenum virginicum</i> (L.) Raf.	Virginia marsh-St. John's-wort	3
COMMELINACEAE	spiderwort family	
<i>Commelina diffusa</i> N.L. Burm. + #		2,5
<i>Murdannia keisak</i> (Hassk.) Hand.-Mazz var. <i>Aneilema keisak</i> Hasskarl + #	marsh dew flower	4
<i>Commelina virginica</i> §	Virginia dayflower	4
CONVOLVULACEAE	morning-glory family	
<i>Cuscuta campestris</i> Yunck. #	field dodder	4
<i>Cuscuta pentagona</i> Engelm. #		5
<i>Ipomoea pandurata</i> (L.) G.F. Meyer.	man-of-the-earth (man-root #)	1,2,3,5
<i>Ipomoea sagittata</i> Poir. var. <i>Ipomoea sagittata</i> Cav. #		4,5
CORNACEAE (includes: NYSSACEAE #)	dogwood family	
<i>Cornus amomum</i> Miller ssp. <i>amomum</i> #		2,5
<i>Cornus florida</i> L.	flowering dogwood	1,2,3,6
<i>Nyssa sylvatica</i> Marshall var. <i>sylvatica</i>	black tupelo (black gum #)	2,3,4
CRASSULACEAE		
<i>Penthorum sedoides</i> L. #		1,4,5
CUSCUTACEAE	dodder family	
<i>Cuscuta compacta</i> Juss. ex Choisy	compact dodder	3
<i>Cuscuta gronovii</i> Willd. ex J.A. Schultes	scaldweed	4
CUPRESSAVEAE (see PINACEAE) #		
CYPERACEAE	sedge family	
<i>Bulbostylis capillaris</i> (L.) Kunth ex C.B. Clarke	dense-tuft hair sedge	2

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<i>Carex amphibola</i> Steud. var. <i>rigida</i> (L.H. Bailey) Fernald #	Eastern narrowleaf sedge %	5
<i>Carex atlantica</i> Bailey ssp. <i>atlantica</i>	prickly bog sedge	3
<i>Carex blanda</i> Dewey #	Eastern woodland sedge %	3
<i>Carex buxbaumii</i> Wahlenb.	Buxbaum's sedge	3
<i>Carex caroliniana</i> Schweitnitz #	Carolina sedge %	2,3,5
<i>Carex crinita</i> Lam.	fringed sedge	3,4
<i>Carex debilis</i> Michx.	white-edge sedge	3
<i>Carex emoryi</i> Dewey	Emory's sedge	3
<i>Carex festucacea</i> Schkuhr ex Willd.	fescue sedge	4
<i>Carex folliculata</i> L. var <i>folliculata</i>	northern long sedge	3,5
<i>Carex frankii</i> Kunth #	Frank's sedge %	4
<i>Carex grayi</i> S. Carey var. <i>hispidula</i> Gray #	gray sedge %	3
<i>Carex hirsutella</i> Mackenzie	hirsute sedge	1,2
<i>Carex intumescens</i> Rudge	greater bladder sedge	3
<i>Carex laevivaginata</i> (Kukenth.) Mackenzie	smooth-sheath sedge	3,4
<i>Carex lupulina</i> Muhl. ex Willd var <i>Carex lupulina</i> Muhl. ex Schkuhr. #	hop sedge %	4
<i>Carex lurida</i> Wahlenb.	sallow sedge	3,4,5
<i>Carex pennsylvanica</i> Lam.	Pennsylvania sedge	2
<i>Carex platyphylla</i> J. Carey #	silver sedge %	2
<i>Carex radiata</i> (Wahlenb.) Small var. <i>Carex rosea</i> Schkuhr #	rosey sedge %	3
<i>Carex squarrosa</i> L. #	squarrosa sedge %	3
<i>Carex scoparia</i> Schkuhr ex Willd.	pointed broom sedge	4
<i>Carex stricta</i> Lam. var <i>stricta</i>	tussock sedge	3,4
<i>Carex swanii</i> (Fern.) Mackenzie	Swan's sedge	1,3
<i>Carex tribuloides</i> Wahlenb.	blunt broom sedge	3,4
<i>Carex vulpinoidea</i> Michx #	fox sedge %	5
<i>Carex x stipata</i> Muhl. ex Willd. var. <i>stipata</i> <i>Carex stipata</i> Muhl. ex. Schkuhr #		4
<i>Cyperus echinatus</i> (L.) Wood	globe flat sedge	1
<i>Cyperus erythrorhizos</i> Muhl.#	redroot sedge %	4
<i>Cyperus iria</i> L. + #		5
<i>Cyperus odoratus</i> L. #	fragrant flatsedge %	4
<i>Cyperus ovularis</i> (Michx.) Torr. var <i>ovularis</i> #		5
<i>Cyperus strigosus</i> L.	straw-color flat sedge	3,4
<i>Dulichium arundinaceum</i> (L.) Britton	three-way sedge	4
<i>Eleocharis engelmannii</i> Steud. #		5
<i>Eleocharis obtusa</i> (Willd.) J.A. Schultes	blunt spike-rush	3,4,5
<i>Eleocharis quadrangulata</i> (Michx.) Roem. & J.A. Schultes var. <i>quadrangulata</i> #	square-stem spikerush \$	3, 4
<i>Eleocharis tenuis</i> (Willd.) J.A. Schultes	slender spike-rush	3
<i>Fimbristylis autumnalis</i> (L.) Roem. & J.A. Schultes #	slender fimbry %	4
<i>Rhynchospora capitellata</i> (Michx.) Vahl.	brownish beak sedge	3,5
<i>Rhynchospora globularis</i> (Chapman) Small	globe beak sedge	3
<i>Rhynchospora glomerata</i> (L.) Vahl	clustered beak sedge	3
<i>Rhynchospora gracilentata</i> Gray	slender beak sedge	3

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<i>Schoenoplectus purshianus</i> (Fern.) M.T. Strong	weak stalk club rush	4
<i>Scirpus americanus</i> Pers. #	American three-square	\$ 3,4
<i>Scirpus atrovirens</i> Willd.#	leafy bulrush	% 5
<i>Scirpus cyperinus</i> (L.) Kunth.	cottongrass bulrush	3,4
<i>Scirpus georgianus</i> Harper	Georgia bulrush	3
<i>Scirpus polyphyllus</i> Vahl.	leafy bulrush	3,4
<i>Scirpus purshianus</i> Fernald #		4
<i>Scirpus validus</i> Vahl. #	soft-stem bulrush	\$ 3,4
<i>Scleria muehlenbergii</i> Steud.	Muehlenberg's nut-rush	3
<i>Scleria pauciflora</i> Muhl. ex Willd.	few-flower nut-rush	1,2
<i>Scleria triglomerata</i> Michx.	whip nut-rush	3
DIOSCOREACEAE	yam family	
<i>Dioscorea quaternata</i> J.F. Gmel.	four-leaf yam	3
<i>Dioscorea villosa</i> L. var. <i>villosa</i> #	wild yam	2
EBENACEAE	ebony family	
<i>Diospyros virginiana</i> L.	common persimmon	2,5
ELAEAGNACEAE	oleaster family	
<i>Eleagnus umbellata</i> Thunb. var. <i>parvifolia</i> (Royle) Schneid. +	autumn-olive	\$ 3
EQUISETACEAE #	horsetail family	
<i>Equisetum hyemale</i> L. var. <i>affine</i> (Engelm.) A.A. Eat. <i>Equisetum hyemale</i> L. #	scouring rush	4
ERICACEAE	heath family	
<i>Epigaea repens</i> L. #	trailing arbutus	2
<i>Gaylussacia baccata</i> (Wangenh.) K. Koch	black huckleberry	2
<i>Kalmia latifolia</i> L.	mountain laurel	2,6
<i>Lyonia ligustrina</i> (L.) DC. var. <i>ligustrina</i>	maleberry	3
<i>Lyonia mariana</i> (L.) D. Don	staggerbush	3
<i>Rhododendron periclymenoides</i> (Michx.) Shinnery var. <i>Rhododendron nudiflorum</i> (L.) Torrey #	wild azalea	2
<i>Rhododendron viscosum</i> (L.) Torr.	clammy azalea	3
<i>Vaccinium amoenum</i> Ait. #		3
<i>Vaccinium atrococcum</i> (Gray) Porter #	black highbush blueberry	5
<i>Vaccinium cf. caesariense</i> Mackenzie	New Jersey blueberry	2
<i>Vaccinium corymbosum</i> L.	highbush blueberry	1,2,3
<i>Vaccinium pallidum</i> Ait.	early lowbush blueberry	2

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<i>Vaccinium stamineum</i> L.var. <i>melanocarpura</i> Mohr var. <i>stamineum</i>	deerberry % (squaw huckleberry #)	2,3,5
<i>Vaccinium vacillans</i> Torr. var. <i>vacillans</i> #	blueridge %	
EUPHORBIACEAE	spurge family	
<i>Acalypha rhombiodes</i> Raf. #	Virginia threeseed mercury %	2,5
<i>Euphorbia corollata</i> L.var. <i>zinniiflora</i> (Small) H.E. Ahles	flowering spurge	1,2,5
<i>Euphorbia cyparissias</i> L. + #	cypress spurge	2
<i>Euphorbia exserta</i> (Small) Coker var. <i>Euphorbia gracilior</i> Cronq. #	coastal sand spurge %	5
<i>Euphorbia maculata</i> L.#	spotted spurge %	5
FABACEAE (LEGUMINOSAE, includes: CAESALPINIACEAE, MIMOSACEAE, PAPILIONACEAE #)	pea family	
<i>Albizia julibrissin</i> Durazzini + #	mimosa	5
<i>Amorpha fruticosa</i> (L.) \$	indigobush	4
<i>Apios americana</i> Medik. var. <i>americana</i> <i>Apios americana</i> Medicus	groundnut	3,4,5
<i>Baptisia tinctoria</i> (L.) R. Br. ex Ait. f. var. <i>tinctoria</i>	horseflyweed	1,2,5
<i>Cassia hebecarpa</i> Fernald #	wild senna	2
<i>Cassia nictitans</i> L. #	wild sensitive plant	5
<i>Cercis canadensis</i> L. var. <i>Canadensis</i> #	redbud	2
<i>Chamaecrista fasciculata</i> (Michx.) Greene var. <i>fasciculata</i>	partridge-pea	1,4,5
<i>Chamaecrista nictitans</i> (L.) Moench	wild sensitive senna	1
<i>Clitoria mariana</i> L. #	butterfly pea	2
<i>Crotalaria sagittalis</i> L. Arrow-Head	rattlebox	1
<i>Desmodium canescens</i> (L.) DC. #		5
<i>Desmodium ciliare</i> (Muhl. ex Willd.) DC.	hairy small-leaf tick- trefoil	1,2
<i>Desmodium laevigatum</i> (Nutt.) DC.	smooth tick-trefoil	2,5
<i>Desmodium marilandicum</i> (L.) DC.	smooth small-leaf tick- trefoil	1,2,5
<i>Desmodium nudiflorum</i> (L.) DC. #		2,5
<i>Desmodium nuttallii</i> (Schindl.) Schub.	Nuttall's tick-trefoil	2
<i>Desmodium paniculatum</i> (L.) DC.	panicled-leaf tick- trefoil	1,2
<i>Desmodium perplexum</i> Schub.	perplexed tick-trefoil	1,2
<i>Desmodium rotundifolium</i> DC.	prostrate tick-trefoil	2
<i>Desmodium strictum</i> (Pursh) DC. #		5
<i>Galactia volubilis</i> (L.) Britt.	downy milk-pea	1,2
<i>Lathyrus latifolius</i> L. + #	everlasting pea	5
<i>Lathyrus palustris</i> L. var. <i>myrtifolius</i> (Muhl. ex Willd.) Gray #		3
<i>Lespedeza bicolor</i> Turcz. +	two-color bush-clover	5

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<i>Lespedeza cuneata</i> (Dumont-Cours.) G. Don var <i>sericea</i> +	Chinese bush-clover	3, 5
<i>Lespedeza frutescens</i> (L.) Hornem. = ? <i>Lespedeza</i> ? <i>intermedia</i> (S. Wats.) Britt	shrubby bush-clover	2, 5
<i>Lespedeza procumbens</i> Michx.	trailing bush-clover	2
<i>Lespedeza repens</i> (L.) W. Barton	creeping bush-clover	2
<i>Lespedeza stuevei</i> Nutt. #		5
<i>Lespedeza violacea</i> (L.) Pers. #		5
<i>Lespedeza virginica</i> (L.) Britt.	slender bush-clover	1, 2
<i>Melilotus officinalis</i> (L.) Lam. (yellow sweet clover on Banesteria article) + (Includes <i>Melilotus albus</i> Medik. ) +	sweet-clover	5, 1
<i>Pueraria lobata</i> (Willd.) Ohwi + #	kudzu	5
<i>Robinia pseudoacacia</i> L. var. <i>Robinia</i> <i>pseudo-acacia</i>	black locust	1, 5
<i>Strophostyles helvola</i> (L.) Elliott #		2
<i>Strophostyles umbellata</i> (Muhl. ex Willd.) Britt.	pink fuzzy-bean	1, 5
<i>Stylosanthes biflora</i> (L.) B.S.P. var. <i>hispidissima</i> (Michx) Polland + CR. Ball	side-beak pencil-flower	2, 5
<i>Trifolium arvense</i> L. + #	rabbit foot clover	1, 5
<i>Trifolium campestre</i> Schreb. + #	low hop clover	5
<i>Trifolium pratense</i> L. + #	red clover	5
<i>Wisteria sinensis</i> (Sims) Sweet + #		5
FAGACEAE	beech family	
<i>Castanea dentata</i> (Marshall) Borkh.	American chestnut	2
<i>Castanea pumila</i> (L.) P. Mill. var. <i>pumila</i>	Allegheny-chinkapin (chinquapin)	1, 2
<i>Fabus grandifolia</i> Ehrh. var. <i>caroliniana</i> (Loudon) Fernald & Rehder #	beech	2, 3
<i>Quercus alba</i> L.	northern white oak	2, 3
<i>Quercus bicolor</i> Willd. #	swamp white oak	2, 3
<i>Quercus coccinea</i> Muenchh.	scarlet oak	2
<i>Quercus falcata</i> Michx. var. <i>falcata</i>	southern red oak (Spanish oak #)	2, 5
<i>Quercus falcata</i> Michx var. <i>pagaodifolia</i> Elliott #	swamp Spanish oak	6
<i>Quercus ilicifolia</i> Wangenh.	bear oak	1, 2
<i>Quercus marilandica</i> Muenchh.	black-jack oak	2
<i>Quercus michauxii</i> Nutt. #	swamp chesnut oak	2
<i>Quercus muehlenbergii</i> Engelm.	chinkapin oak	2
<i>Quercus palustris</i> Muenchh. #	pin oak	2, 3
<i>Quercus phellos</i> L.	willow oak	2, 5
<i>Quercus prinus</i> L.	chestnut oak	2
<i>Quercus rubra</i> L. var. <i>rubea</i>	northern red oak	2, 3
<i>Quercus shumardii</i> Buckley var. <i>shumardii</i> #	swamp red oak	3
<i>Quercus stellata</i> Wangenh. var. <i>stellata</i>	post oak	2
<i>Quercus velutina</i> Lam.	black oak	2

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GENTIANACEAE	gentian family	
<i>Bartonia paniculata</i> (Michaux.) Muhl. var. <i>paniculata</i> #	screw-stem	2
<i>Bartonia virginica</i> (L.) B.S.P. #	yellow screw-stem %	2
<i>Gentiana saponaria</i> L. #	soapwort gentian	5
<i>Gentiana villosa</i> L.	striped gentian	2,3
<i>Sabatia angularis</i> (L.) Pursh	rose-pink	1
GRAMINEAE (see POACEAE)	grass family	
GUTTIFERAE (CLUSIACEAE, HYPERICACEAE) #	St. John's Wort Family %	
<i>Ascyrum hypericoides</i> L. var. <i>hypericoides</i>	St. Andrew's cross	2
<i>Hypericum hypericoides</i> (L.) Crantz		
<i>Hypericum gentianoides</i> (L.) B.S.P.	pineweed	5
<i>Hypericum mutilum</i> L.		5
<i>Hypericum prolificum</i> L.		1,3,5
<i>Hypericum punctatum</i> Lam.		5
<i>Triadenum walteri</i> (J.F. Gmel.) Gleason var. <i>Hypericum walteri</i> Gmelin.		4
HALORAGACEAE	water milfoil family	
<i>Myriophyllum spicatum</i> + §	Eurasian water-milfoil	4
HAMAMELIDACEAE #		
<i>Hamamelis virginiana</i> L. #	witch-hazel	2
<i>Liquidambar styraciflua</i> L.#		2,3,5
HYDROCHARITACEAE §	Frog's bit family	
<i>Eloдея nuttallii</i> (Planch.) H. St. John #		4
<i>Hydrilla verticillata</i> (L.f) Royle + #	hydrilla, water thyme	4
<i>Vallisneria americanan</i> Michaux	wild Celery	4
IRIDACEAE	iris family	
<i>Belamcanda chinensis</i> (L.) DC. + #	blackberry lily	2
<i>Iris pseudoacorus</i> L. + #	yellow flag	4
<i>Iris virginica</i> L. #	blue flag	4
<i>Sisyrinchium angustifolium</i> P. Mill.	narrow-leaf blue-eyed-grass	3
<i>Sisyrinchium mucronatum</i> Michx.	needle-tip blue-eyed-grass	1
JUGLANDACEAE	walnut family	
<i>Carya alba</i> (L.) Nutt. ex Ell. = <i>Carya tomentosa</i> (Lam. ex Poir.) Nutt.	mockernut hickory	2
<i>Carya cordiformis</i> (Wangenh.) K. Koch #	bitternut hickory	2,3,4
<i>Carya glabra</i> (P. Mill.) Sweet	pignut hickory	2

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<i>Carya ovalis</i> (Wangenh.) Sargent var. <i>ovalis</i> #	sweet pignut hickory	5
<i>Carya tomentosa</i> (Lam. ex. Poiret) Nuttall #	mockernut	2
<i>Juglans nigra</i> L. #	black walnut	2
JUNCACEAE	rush family	
<i>Juncus acuminatus</i> Michx.	knotty-leaf rush	3,5
<i>Juncus biflorus</i> Ell.	bog rush	3
<i>Juncus canadensis</i> J. Gay ex Laharpe	Canadian rush	3,4
<i>Juncus debilis</i> Gray	weak rush	3
<i>Juncus dichotomus</i> Ell.	forked rush	3
<i>Juncus effusus</i> L. var. <i>pylæi</i> (Laharpe) Fern. & Wieg.	lamp rush	3,5
<i>Juncus effusus</i> L. var. <i>solutus</i> Fern. & Wieg.	lamp rush	3
<i>Juncus scirpoides</i> Lam.	needle-pod rush	3
<i>Juncus subcaudatus</i> (Engelm.) Coville & Blake	woodland rush	3
<i>Juncus tenuis</i> Willd. var. <i>tenius</i> #	path rush	5
<i>Juncus validus</i> Coville #		3
<i>Luzula bulbosa</i> (A. Wood) Smyth & Smyth	bulbous wood-rush	1,2
<i>Luzula echinata</i> (Small) F.J. Herm.	hedgheg wood-rush	1
LAMIACEAE (LABIATAE #)	mint family	
<i>Clinopodium vulgare</i> L.	wild basil	1
<i>Collinsonia Canadensis</i> L. var. <i>punctata</i> (Elliott) Brig. #		2
<i>Cunila origanoides</i> (L.) Britton #		5
<i>Glechoma hederacea</i> L. + #		3
<i>Lamium purpureum</i> L. + #		5
<i>Lycopus americanus</i> Muhl. ex. W. Barton #		5
<i>Lycopus virginicus</i> L.	Virginia water-horehound	2,3,4
<i>Mentha arvensis</i> L. #		4
<i>Prunella vulgaris</i> L. ssp. <i>vulgaris</i> + #	common selfheal	1,2,5
<i>Pycnanthemum incanum</i> (L.) Michx #		5
<i>Pycnanthemum tenuifolium</i> Schrad.	narrow-leaf mountain-mint	1,2,3
<i>Salvia lyrata</i> L.	lyre-leaf sage	1,5
<i>Satureja vulgaris</i> (L.) Fritsch		2
<i>Scutellaria elliptica</i> Muhl. ex Spreng. var. <i>hisuta</i> (Short) Fernald	hairy skullcap	21,2
<i>Scutellaria integrifolia</i> L.	helmet-flower	1
<i>Scutellaria lateriflora</i> L. #	skullcap	2,4
<i>Scutellaria nervosa</i> Pursh var. <i>nervosa</i> #		5
<i>Stachys tenuifolia</i> Willd. #		3,5
<i>Teucrium canadense</i> L. var. <i>canadense</i> #		4,5
<i>Trichostema dichotomum</i> L.	forked blue-curlys	1,2,3,5

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LAURACEAE	laurel family	
<i>Sassafras albidum</i> (Nutt.) Nees	sassafras	2,3
LEMNACEAE §	duckweed family	
<i>Lindera benzoin</i> (L.) Blumes #	spicebush	3,4
<i>Spirodela polyrhiza</i> (L.) Schleiden §	greater duckweed	4
<i>Wolffia papulifera</i> C.H. Thomps #		4
LENTIBULARIACEAE #	bladderwort family	.
<i>Utricularia gibba</i> L. #		4
LILIACEAE (includes: SMILACACEAE (greenbrier family #)	lily family	
<i>Aletris farinosa</i> L.	white colic-root	1,2,3,5
<i>Allium vineale</i> L.	crow garlic	5
<i>Erythronium umbilicatum</i> C.R. Parks & J.W. Hardin var. <i>Erythronium americanum</i> Ker #	dog-tooth violet	3
<i>Hypoxis hirsuta</i> (L.) Coville	eastern yellow star-grass	2
<i>Lilium superbum</i> L.	Turk's-cap lily	3
<i>Maianthemum racemosum</i> (L.) Link	feathery false Solomon's-seal	2
<i>Medeola virginiana</i> L. #	Indian cucumber-root	3
<i>Melanthium virginicum</i> L.	Virginia bunchflower	3
<i>Ornithogalum umbellatum</i> L. + #	star of Bethlehem	5
<i>Polygonatum biflorum</i> (Walter) Elliott var. <i>biflorum</i>		3
<i>Smilacina racemosa</i> (L.) Desf. var. <i>cylindrica</i> Fernald #	false Solomon's seal	2
<i>Smilax glauca</i> Walter. var. <i>leuophyllia</i> Blake.	sawbrier	2,3
<i>Smilax rotundifolia</i> L. var. <i>quadrangularis</i> (Muhl. Ex Willd) A. Wood	horsebrier	2,5,6
<i>Uvularia perfoliata</i> L.	perfoliate bellwort	2,3
<i>Uvularia sessilifolia</i> L.	sessile-leaf bellwort	2,5
<i>Yucca filamentosa</i> L. var. <i>smalliana</i> (Fernald) H.E. Ahles #	bear-grass	5
LINACEAE	flax family	
<i>Linum medium</i> (Planch.) Britt var. <i>texanum</i> (Planch.) Fern.	stiff yellow flax	1,2
<i>Linum striatum</i> Walt.	ridged yellow flax	3
LYCOPODIACEAE #	clubmoss famly	
<i>Lycopodium complanatum</i> L. <i>Lycopodium complanatum</i> (Fernald) Blanchard var. <i>flabelliforme</i> Fernald #	running pine	3
<i>Lycopodium obscurum</i> L. var. <i>obscurum</i> #	groundpine	2

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LYTHRACEAE §	loosestrife family	
<i>Cuphea viscosissima</i> Jacq. #		5
<i>Decodon verticillatus</i> (L.) Elliott §	water willow	4
MAGNOLIACEAE	magnolia family	
<i>Liriodendron tulipifera</i> L. #	tulip tree	2,3
<i>Magnolia virginiana</i> L.	sweet-bay	3
MALVACEAE	mallow family	
<i>Abutilon theophrasti</i> Medik. var. <i>Abutilon theophrastii</i> Medicus + #	indian mallow	5
<i>Hibiscus moscheutos</i> L. ssp. <i>moscheutos</i> #	swamp rose mallow	3,4
<i>Hibiscus trionum</i> L var. <i>Trionum trionum</i> (L.) Wootton & Standley + #	flower-of-the-hour	5
<i>Sida spinosa</i> L. #	prickly mallow	5
MELASTOMATACEAE	melastome family	
<i>Hibiscus laevis</i> §	halberd-leaf rosemallow	4
<i>Rhexia virginica</i> L.	handsome-Harry	3
MIMOSACEAE (See LEGUMINOSAE) #		
MORACEAE #	mulberry family	
<i>Morus rubra</i> L #	red mulberry	2
NYMPHAEACEAE	water-lily family	
<i>Brasenia schreberi</i> J.F. Gmel. #	water shield	3
<i>Cabomba caroliniana</i> Gray var. <i>caroliniana</i> #	fanwort	4
<i>Nelumbo lutea</i> (Willdenow) Persoon §	American lotus	4
<i>Nelumbo nucifera</i> Gaertn. + #	scared lotus	4
<i>Nuphar lutea</i> (L.) Sm. §	yellow pond-lily	4
<i>Nuphar luteum</i> (L.) Sibth. & J.E.Smith ssp <i>luteum</i> #	spatterdock	4
<i>Nuphar luteum</i> (L.) Sibth. & J.E.Smith ssp <i>Macrophyllum</i> (Small) E.O. Beal #	spatterdock, also known as cow-lily	3,4
NYSSACEAE (See CORNACEAE) #		
OLEACEAE	olive family	
<i>Chionanthus virginicus</i> L.	white fringetree	3,4
<i>Fraxinus americana</i> L. var. <i>americana</i> #	fringe-tree	2
ONAGRACEAE	evening-primrose family	
<i>Circaea lutetiana</i> L. ssp. <i>canadensis</i> (L.) Aschers. & Magnus. #		2
<i>Ludwigia alternifolia</i> L.	seedbox	4
<i>Ludwigia decurrens</i> Walter var. <i>Jussiaea decurrens</i> (Walter) D.C. #		3,4
<i>Ludwigia palustris</i> (L.) Ell.	marsh primrose-willow (water purslane §)	4
<i>Oenothera biennis</i> L. + #		5

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<i>Oenothera fruticosa</i> L. ssp. <i>fruticosa</i>	narrow-leaf evening-primrose (sundrops #)	1,5
OPHIOGLOSSACEAE #	adder's tongue family	
<i>Botrychium virginianum</i> (L.) Swartz #	rattlesnake fern	2
ORCHIDACEAE	orchid family	
<i>Cypripedium acaule</i> Ait. Pink	lady's-slipper (pink moccasin flower #)	2,5
<i>Goodyera pubescens</i> (Willd.) R.Br. #	downy rattlesnake plantain	2,5
<i>Liparis lilifolia</i> (L.) L.C.Rich. ex. Ker-Gawl #	lily-leaved twayblade	2
<i>Platanthera ciliaris</i> (L.) Lindl.	yellow fringed orchid	3
<i>Platanthera clavellata</i> (Michx.) Luer	green woodland orchid	3
<i>Platanthera lacera</i> (Michx.) G. Don var. <i>Habenaria lacera</i> (Michaux) Lodd. #	green fringed-orchid	3
<i>Spiranthes cernua</i> (L.) L.C. Rich.	white nodding ladies'-tresses	3,5
<i>Spiranthes lacera</i> (Raf.) Raf. var. <i>gracilis</i> (Bigelow) Luer	northern slender ladies'-tresses	1
<i>Spiranthes vernalis</i> Engelm. & Gray	spring ladies'-tresses	1
<i>Tipularia discolor</i> (Pursh) Nutt. #	crane-fly orchid	2
<i>Isotria medeoloides</i> (Pursh) Raf.	Small whorled pogonia	2
<i>Isotria verticillata</i> ((Muhl. Ex Willd.) Raf.	Large whorled pogonia	2
OSMUNDACEAE	royal fern family	
<i>Osmunda cinnamomea</i> L.	cinnamon fern	3
<i>Osmunda regalis</i> L var. <i>spectabilis</i> (Willd.)	gray royal fern	3
OXALIDACEAE	wood-sorrel family	
<i>Oxalis</i> L. sp.	wood-sorrel	2
<i>Oxalis stricta</i> L. #		5
<i>Oxalis violacea</i> L. #	violet wood sorrel	5
PAPAVERACEAE #	poppy family	
<i>Corydalis micrantha</i> (Engelm.) Gray var. <i>austrailis</i> (Chapm.) Shinnars ssp <i>australis</i> (Chapman) Ownbey #		5
PHYTOLACCACEAE #	pokeweed family	
<i>Phytolacca americana</i> L. #	pokeweed	2,5
PINACEAE (includes: CUPRESSACEAE #)	pine family	
<i>Juniperus virginiana</i> L. #	red cedar	2
<i>Pinus echinata</i> P. Mill.	short-leaf pine	2
<i>Pinus rigida</i> P. Mill.	pitch pine	2
<i>Pinus taeda</i> L.	loblolly pine	2,4,5
<i>Pinus virginiana</i> P. Mill.	Virginia pine (scrub	1,2,5

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	pine #)	
<i>Tsuga canadensis</i> (L.) Carriere #	Canada hemlock	2,3
PLANTAGINACEAE	plantain family	
<i>Plantago aristata</i> Michx.	large-bract plantain	5
<i>Plantago lanceolata</i> L. + #	English plantage	2
<i>Plantago major</i> L. var. <i>scopulorum</i> Fr. & Broberg + #		5
<i>Plantago virginica</i> L. #		5
PLATANACEAE #	planetree family	
<i>Platanus occidentalis</i> L. #	sycamore	2,3,5
POACEAE ( includes: GRAMINEAE #)	grass family	
<i>Agrostis hyemalis</i> (Walt.) B.S.P.var. <i>tenuis</i> (Tuckerman) Gleason	winter bent	1,2
<i>Agrostis perennans</i> (Walt.) Tuckerman var. <i>perennans</i>	upland bent	2,3
<i>Andropogon glomeratus</i> (Walt.) B.S.P.	bushy bluestem	3
<i>Andropogon gyrans</i> Ashe	Elliott's bluestem	1,2
<i>Andropogon virginicus</i> L. var. <i>virginicus</i>	broom-sedge	1,5
<i>Anthoxanthum odoratum</i> L. + #	spring grass, sweet vernal grass %	5
<i>Anthoxanthum odoratum</i> L. + #	spring grass, sweet vernal grass %	5
<i>Aristida dichotoma</i> Michx.	church-mouse three-awn	1,5
<i>Aristida oligantha</i> Michx.	prairie three-awn	1,5
<i>Aristida purpurascens</i> Poir.	arrow-feather three-awn	1
<i>Arthraxon hispidus</i> (Thunb.) Makino var. <i>Arthraxon hispidus</i> Beauvois var. <i>cryptatherus</i> (Hackel) Honda + #	hairyseed reedgrass %	4
<i>Brachyelytrum erectum</i> (Schreb.) Beauv. var. <i>erectum</i> .#	bearded shorthusk	2
<i>Calamagrostis coarctata</i> (Torr.) Eat.	Nuttall's reed grass	3
<i>Chasmanthium laxum</i> (L.) H. Yates var. <i>Uniola laxa</i>	slender wood-oats	2,3
<i>Cinna arundinacea</i> L. var. <i>arundinacea</i> #	wood reedgrass	2,3
<i>Cynodon dactylon</i> (L.) Pers. +	Bermuda grass	5
<i>Dactylis glomerata</i> L. var. <i>glomerata</i> + #	orchard grass	5
<i>Danthonia spicata</i> (L.) Beauv. ex Roemer & J.A. Schultes	poverty wild oat grass	1,2,5
<i>Dichanthelium aciculare</i> (Desv. ex. Poir.) Gould & C.A. Clark var. <i>Panicum aciculare</i> Desvaux ex. Poiret #	needleleaf witchgrass %	5
<i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A. Clark	tapered rosette grass	1,2
<i>Dichanthelium boscii</i> (Poir.) Gould & C.A.Clark also <i>Panicum boscii</i> Poir. var. <i>mille</i> (Vasey) A. Hitchc. & Chase #	Bosc's panic grass, deer tongue panic grass, witch grass %	4

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<i>Dichanthelium boscii</i> (Poir.) Gould & C.A.Clark <i>Panicum boscii</i> Poir. var. <i>boscii</i> #	Bosc's panic grass, deer tongue panic grass, witch grass %	2
<i>Dichanthelium clandestinum</i> (L.) Gould	deer-tongue rosette grass	3,4
<i>Dichanthelium commutatum</i> (J.A. Schultes) Gould	variable rosette grass	2
<i>Dichanthelium depauperatum</i> (Muhl.) Gould	starved rosette grass	1
<i>Dichanthelium dichotomum</i> (L.) Gould Includes var. <i>dichotomum</i> and two varieties not recognized by Kartesz (var. 3 = <i>lucidum</i> ; var. 4= <i>ramulosum</i> per Weakley (1999)	cypress rosette grass	1,2,3,4,5
<i>Dichanthelium scoparium</i> (Lam.) Gould	broom rosette grass	3,4,5
<i>Dichanthelium sphaerocarpon</i> (Elliott) Gould var. <i>isophyllum</i> (Scribn.) Gould & C.A.Clark var. <i>Panicum polanthes</i> Schultes #	many-flowered panic grass #	2,3,5
<i>Echinochloa crusgalli</i> (L.) Beauv. var. <i>crusgalli</i> + #	barnyard grass	5
<i>Eleusine indica</i> (L.) Gaertn. + #	goose grass	5
<i>Elymus virginicus</i> L. var. <i>virginicus</i> #	Virginia wild rye %	3,5
<i>Eragrostis hirsute</i> (Michx.) Nees #		5
<i>Eragrostis spectabilis</i> (Pursh) Steud.	petticoat-climber	1
<i>Festuca arundinacea</i> Schreb. var. <i>Festuca</i> <i>elatiior</i> + #	tall fescue %	1,5
<i>Festuca subverticillata</i> (Pers.) Alexeev	nodding fescue	2
<i>Hystrix patula</i> Moench #	bottlebrush grass	5
<i>Leersia oryzoides</i> (L.) Sw. var <i>Homalochenchrus oryzoides</i> (L.) Pollard	rice cut grass	4,5
<i>Leersia virginica</i> Willd. var. <i>virginica</i> #	white grass %	3,4
<i>Lolium perenne</i> L. var. <i>multiflorum</i> (Lam.) R. Parnell + #	perennial ryegrass %	5
<i>Miscanthus sinensis</i> Andersson var. <i>sinensis</i> + #		5
<i>Panicum anceps</i> Michx. var. <i>anceps</i>	beaked panic grass	1,2
<i>Panicum dichotomiflorum</i> Michx.	fall panic grass	5
<i>Panicum philadelphicum</i> Bernh. ex Trin.	Philadelphia panic grass	1
<i>Panicum rigidulum</i> Bosc ex Nees var. <i>elongatum</i> (Pursh) Lelong var. <i>stipitatum</i> Nash	red-top panic grass	2,4
<i>Panicum rigidulum</i> Bosc ex Nees var. <i>rigidulum</i>	red-top panic grass	3
<i>Panicum verrucosum</i> Muhl.	warty panic grass	2,3
<i>Panicum virgatum</i> L.	wand panic grass (switchgrass \$)	3,4
<i>Paspalum floridanum</i> Michx. var. <i>glabratum</i> Englem. ex. Vasey #		5
<i>Paspalum laeve</i> Michx.	field crown grass	1,5
<i>Paspalum setaceum</i> Michx.	slender crown grass	1

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<i>Phleum pratense</i> L. var. <i>pratense</i> <i>Phleum pratense</i> L. Timothy + #		5
<i>Phragmites australis</i> \$	common reed	3
<i>Poa compressa</i> L.	flat-stem blue grass	1
<i>Poa pratensis</i> L.	Kentucky blue grass	1,3
<i>Poa sylvestris</i> Gray #		3
<i>Saccharum giganteum</i> (Walt.) Pers.	giant plume grass	3
<i>Schizachyrium scoparium</i> (Michx.) Nash	little bluestem	1,2
<i>Setaria faberi</i> Herrm. + #	foxtail	5
<i>Setaria glauca</i> (L.) Beauv + #	foxtail	1
<i>Setaria parviflora</i> (Poir.) Kerguelen = <i>Setaria geniculata</i> auct. non (Wild.) Beauv.	perennial foxtail	1
<i>Setaria viridis</i> (L.) Beauv. var. <i>Chaetochloa viridis</i> (L.) Scribner + #	green bristle grass	55
<i>Sorghastrum nutans</i> (L.) Nash	yellow Indian grass	1,2,3,5
<i>Spartina cynosuroides</i> (L.) Roth \$	big cordgrass	4
<i>Sphenopholis obtusata</i> (Michx.) Scribn.	prairie wedgescale	1
<i>Tridens flavus</i> (L.) A.S. Hitchc.	tall redtop	1
<i>Trisetum pensylvanicum</i> (L.) Beauv. #		5
<i>Vulpia octoflora</i> (Walt.) Rydb.	eight-flower six-weeks grass	1
<i>Zizania aquatica</i> L. var. <i>aquatica</i>	wild rice	3,4
POLEMONIACEAE	phlox family	
<i>Phlox maculata</i> L.	wild sweetwilliam	3
<i>Phlox paniculata</i> L. #	summer phlox	4,5
POLYGALACEAE	milkwort family	
<i>Polygala incarnata</i> L.	procession-flower	1
<i>Polygala mariana</i> P. Mill.	Maryland milkwort	2,3,5
<i>Polygala sanguinea</i> L.	purple milkwort	1,2,3
<i>Polygala verticillata</i> L. var. <i>ambigua</i> (Nutt.) A. Wood #		5
POLYGONACEAE	buckwheat family	
<i>Polygonum arifolium</i> L. var. <i>arifolium</i>	halberd-leaf tearthumb	4
<i>Polygonum cuspidatum</i> Siebold & Zuccar + #	Japanese knotweed	5
<i>Polygonum erectum</i> L. #		5
<i>Polygonum hydropiperoides</i> Michx var. <i>hydropiperoides</i> #	mild water pepper	4,5
<i>Polygonum perfoliatum</i>	Mile-a-minute	5
<i>Polygonum persicaria</i> L.+	lady's-thumb	3,4
<i>Polygonum punctatum</i> Ell. var. <i>punctatum</i>	dotted smartweed	4
<i>Polygonum sagittatum</i> L.	arrow-leaf tearthumb	3,4,5
<i>Polygonum scandens</i> L. var. <i>scandens</i> #		3
<i>Polygonum virginianum</i> L. var. <i>Tovara</i> <i>virginiana</i> (L.) Raf.	jumpseed	2,3
<i>Rumex acetosella</i> L.	common sheep sorrel	1,5

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<i>Rumex crispus</i> L. + #		5
<i>Rumex obtusifolius</i> L. ssp. <i>obtusifolius</i> #		2
<i>Rumex verticillatus</i> (L.) \$	swamp dock	4
POLYPODIACEAE <sup>i</sup>	polypody family	
<i>Asplenium platyneuron</i> (L.) B.S.P. var. <i>platyneuron</i> <i>Asplenium platyneuron</i> (L.) Oakes #	ebony spleenwort	2
<i>Athyrium filix-fermina</i> (L.) Roth ssp. <i>asplenioides</i> (Michx.) Hulten <i>Athyrium asplenioides</i> (Michaux) A.A. Eaton #	southern lady fern	2,3
<i>Dennstaedtia punctilobula</i> (Michx.) T. Moore	eastern hay-scented fern	2
<i>Dryopteris clintoniana</i> (D.C. Eat.) P. Dowell #		2
<i>Dyopteris marginalis</i> (L.) Gray #	marginal shield fern	2
<i>Onoclea sensibilis</i> L.	sensitive fern Christmas fern	3,5 2,3
<i>Polystichum acrostichoides</i> (Michx.) Schott #		
<i>Pteridium aquilinum</i> (L.) Kuhn var. <i>latiusculum</i> (Desv.) Underwood ex A. Heller	northern bracken fern	2,3,5
<i>Thelypteris hexagonoptera</i> (Michx.) Weatherby #	broad beech fern	2
<i>Thelypteris noveboracensis</i> (L.) Nieuwl.	New York fern	2,3,4
<i>Thelypteris palustris</i> Schott var. <i>pubescens</i> (Lawson) Fern.	eastern marsh fern	3,4
* <i>Woodwardia areolata</i> (L.) T. Moore	netted chain fern	3
PONTEDERIACEAE \$	water hyacinth family	
<i>Pontedaria cordata</i> (L.) var. <i>lanceolata</i> (Nutt.) Griseb. #	pickerelweed	4
<i>Heteranthera dubia</i> (Jacquin) Macmillan	water star-grass	4
PORTULACACEAE	purslane family	
<i>Claytonia virginica</i> L.	Virginia spring beauty	3,5
POTAMOGETONACEAE	pondweed family	
<i>Potamogeton diversifolius</i> Raf.	waterthread	4
<i>Potamogeton foliosus</i> Raf. \$	leafy pondweed	4
PRIMULACEAE	primrose family	
<i>Lysimachia ciliata</i> L.		4,5
<i>Lysimachia quadrifolia</i> L.	whorled yellow-loosestrife	1,2,3
<i>Lysimachia terrestris</i> (L.) B.S.P.	swamp loosestrife	3
PYROLACEAE #	wintergreen family %	

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<i>Chimaphila maculata</i> (L.) Pursh var. <i>maculata</i> (L.) Pursh #	spotted wintergreen	1
<i>Monotropa uniflora</i> L. #	Indian-pipe	2
RANUNCULACEAE		
<i>Cimicifuga racemosa</i> (L.) Nutt.#	black cohosh	2
<i>Clematis viorna</i> L.#		3
<i>Clematis virginiana</i> L.	devil's-darning-needles	3
<i>Clematis terniflora</i> \$	Japanese virgin's bower	4
<i>Ranunculus abortivus</i> L. ssp. <i>abortivus</i> #		3
<i>Ranunculus bulbosus</i> + #		5
<i>Ranunculus hispidus</i> Michx. var. <i>hispidus</i> #		2
<i>Thalictrum dioicum</i> L. #		4
<i>Thalictrum pubescens</i> Pursh	king-of-the-meadow	3,4
<i>Thalictrum revolutum</i> DC.	waxy-leaf meadow-rue	3
<i>Thalictrum thalictroides</i> (L.) A. Eames & B. Boivin var. <i>Thalictrum thalictroides</i> (L.) Boivin	windflower	2,3
RHAMNACEAE		
<i>Ceanothus americanus</i> L.	buckthorn family New Jersey-tea	2
ROSACEAE		
<i>Agrimonia parviflora</i> in Ait.	rose family harvestlice	3,4
<i>Amelanchier canadensis</i> (L.) Medik.	Canadian service-berry	3
<i>Amelanchier laevis</i> Wieg.	Allegheny service-berry	2
<i>Amelanchier</i> cf. <i>stolonifera</i> Wieg.	running service-berry	2
<i>Aronia arbutifolia</i> (L.) Elliott Sorbus <i>arbutifolia</i> (L.) Heynoid var. <i>arbutifolia</i> #	red chokeberry	2
<i>Fragaria</i> cf. <i>virginiana</i> Duchesne	Virginia strawberry	1
<i>Geum canadense</i> Jacq. #		2,3
<i>Photinia pyrifolia</i> (Lam.) Robertson & Phipps = <i>Aronia arbutifolia</i> (L.) Pers.	red chokeberry	3
<i>Physocarpus opulifolius</i> (L.) Maxim. var. <i>opulifolius</i> #	nine bark	5
<i>Potentilla canadensis</i> L. var. <i>villosissima</i> Fernald	dwarf cinquefoil (five fingers #)	1,5
<i>Potentilla simplex</i> Michx. var. <i>calvescens</i> Fernald	oldfield cinquefoil	2,3
<i>Prunus serotina</i> Ehrh. var. <i>serotina</i>	black cherry	2,4
<i>Rosa carolina</i> L.	carolina rose (wild rose #)	1,2,5
<i>Rosa multiflora</i> Thunb. + #		5
<i>Rosa palustris</i> Marshall	swamp rose	3,4
<i>Rosa wichuraiana</i> Crepin + #	memorial rose	5
<i>Rubus flagellaris</i> Willd.	whiplash dewberry	1,2,3
<i>Rubus hispidus</i> L.	bristly dewberry	2,3,5
<i>Spiraea prunifolia</i> Sieb. & Zucc.	bridalwreath	5

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RUBIACEAE	madder family	
<i>Cephalanthus occidentalis</i> L.	common buttonbush	3,4
<i>Diodia teres</i> Walt. var. <i>teres</i>	poorjoe	5
<i>Galium aparine</i> L.#		2,5
<i>Galium circaezans</i> Michx. var. <i>circaezans</i>	licorice bedstraw	2
<i>Galium mollugo</i> L. + #		2
<i>Galium obtusum</i> Bigelow	blunt-leaf bedstraw	4
<i>Galium tinctorium</i> (L.) Scop.	stiff marsh bedstraw	3,4
<i>Galium triflorum</i> Michx. var. <i>asprelliforme</i> Fernald	fragrant bedstraw	2
<i>Houstonia caerulea</i> L. var. <i>caerulea</i>	quaker-ladies (bluets #)	1,5
<i>Houstonia purpurea</i> L.	Venus'-pride	1,2,5
<i>Mitchella repens</i> L.	partridge-berry	2,3
SALICACEAE (includes: POPULACEAE #)	willow family	
<i>Populus alba</i> L. + #	white poplar	5
<i>Populus grandidentata</i> Michx.	big-tooth aspen (large-tooth aspen #)	1,2,3,5,6
<i>Salix humilis</i> Marsh.	prairie willow	2
<i>Salix nigra</i> Marshall	black willow	3,4,5
SANTALACEAE	sandalwood family	
<i>Comandra umbellata</i> (L.) Nutt.	bastard-toadflax	2
SAURURACEAE	lizard's-tail family	
<i>Saururus cernuus</i> L.	lizard's-tail	2,4
SAXIFRAGACEAE #	saxifage family	
<i>Hydrangea arborescens</i> L. ssp. <i>arborescens</i> #		2
<i>Saxifraga virginiana</i> Michx. var. <i>virginiana</i> #		3
SCHIZAEACEAE #	curly grass family	
<i>Lygodium palmatum</i> (Bernh.) Swartz #	American climbing fern	3
SCROPHULARIACEAE	figwort family	
<i>Agalinis fasciculata</i> (Elliott) Raf. #		5
<i>Agalinis purpurea</i> (L.) Pennell var <i>purpurea</i> (L.) Raf	purple false foxglove	1,3
<i>Agalinis tenella</i> Pennell #	false foxglove	4
<i>Agalinis tenuifolia</i> (Vahl) Raf.	slender-leaf false foxglove	1,3
<i>Aureolaria virginica</i> (L.) Pennell #		2
<i>Chelone glabra</i> L. var. <i>dilatata</i> Fernald & Wiegand <i>Chelone glabra</i> L. #		4
<i>Gratiola neglecta</i> Torr.	clammy hedge-hyssop	4,5
<i>Gratiola virginiana</i> L.#		2,5

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<i>Melampyrum lineare</i> Desr. var. <i>lineare</i> + #		3
<i>Mimulus alatus</i> Ait.	sharp-wing monkey-flower	4
<i>Mimulus ringens</i> L. var. <i>ringens</i> L. #		4
<i>Paulownia tomentosa</i> (Thunb.) Siebold & Zuccar. ex Steud. <i>Paulownia tomentosa</i> (Thunb.) Steudel + #	princess tree	5
<i>Penstemon digitalis</i> Nutt. #		4
<i>Penstemon laevigatus</i> Ait.	eastern smooth beardtongue	1
<i>Verbascum thapsis</i> L. + #	woolly mullein	3
<i>Veronica hederifolia</i> L. <i>Veronica hederifolia</i> + #		2
<i>Veronica officinalis</i> L. + #		5
SIMAROUBACEAE		
<i>Ailanthus altissima</i> (Mill.) Swingle + #	tree of heaven	5
SOLANACEAE		
<i>Solanum carolinense</i> L. var. <i>carolinense</i>	Carolina horse-nettle	1,5
SPARGANIACEAE		
<i>Sparganium americanum</i> Nutt.	American burr-reed	4,5
TILIACEAE #		
<i>Tilia americana</i> L. var. <i>Tilia floridana</i> Small #	Linden family	2
TYPHACEAE		
<i>Typha angustifolia</i> §	narrow-leaf cattail	3
<i>Typha latifolia</i> L.	broad-leaf cat-tail (common cattail #)	4,5
UMBELLIFERAE # (see APIACEAE: §)		
ULMACEAE #		
<i>Celtis tenuifolia</i> Nutt. var. <i>Celtis occidentalis</i> L. var. <i>Georgiana</i> (Small) Ahles. #		3
<i>Ulmus rubra</i> Muhl. #	slippery elm	3,5
URTICACEAE		
<i>Boehmeria cylindrica</i> (L.) Swartz var. <i>cylindrica</i>	small-spike false nettle	2,4
<i>Laportea canadensis</i> (L.) Wedd. #	wood-nettle	4
<i>Pilea pumila</i> (L.) Gray #	clearweed	3
VERBENACEAE		
<i>Verbena hastata</i> L.	simpler's-joy	4
<i>Verbena urticifolia</i> (L.) Nutt. var. <i>leiocarpa</i> L.M. Perry & Fernald		5

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VIOLACEAE	violet family	
<i>Viola affinis</i> Leconte #		3
<i>Viola bicolor</i> Pursh var. <i>Viola rafinesquii</i> Greene #		2
<i>Viola blanda</i> Willd. #		3
<i>Viola cucullata</i> Ait.	marsh blue violet	3,4
<i>Viola primulifolia</i> L.	primrose-leaved violet	3
<i>Viola sagittata</i> Ait. var. <i>sagittata</i>	arrow-leaf violet	1,2
<i>Viola</i> cf. <i>sororia</i> Willd.	hooded blue violet	2
VITACEAE	grape family	
<i>Parthenocissus quinquefolia</i> (L.) Planch.	Virginia-creeper	2,3,5
<i>Vitis cinerea</i> Englem. var. <i>cinerea</i> #	pigeon grape	2,5
<i>Vitis labrusca</i> L.	fox grape	3
XYRIDACEAE	yellow-eyed-grass family	
<i>Xyris torta</i> Sm.	slender yellow-eyed-grass	3

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