# U. S. AIR FORCE
# INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
## Joint Base McGuire-Dix-Lakehurst


*(See INRMP signature pages for plan approval date)*

## ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (USAF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-U.S. territories will comply with applicable Final Governing Standards (FGS). Where applicable, external resources, including Air Force Instructions (AFIs); AF Playbooks; federal, state, local, FGS, biological opinion and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language that address USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the USAF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by USAF environmental Installation Support Teams (ISTs) and/or installation personnel.

*NOTE: The terms 'Natural Resources Manager', 'NRM' and 'NRM/POC' are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in Department of Defense Instruction (DoDI) 4715.03.*

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## DOCUMENT CONTROL

**Record of Review** – The INRMP is updated not less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and Air Force Manual (AFMAN) 32-7003, *Environmental Conservation*, 20 April 2020, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

**INRMP APPROVAL/SIGNATURE PAGE**

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7 DEC 2021

JON A. BRIERTON, COLONEL, USA
Deputy Commander - Army, Joint Base McGuire-Dix-Lakehurst, NJ

Date

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Dec 8, 2021

Eric Schrading, Field Supervisor, U.S. Fish and Wildlife Service
New Jersey Field Office

Date

David M. Golden Digitally signed by David M. Golden Date: 2021.12.09 12:03:47 -05'00'

December 9, 2021

David Golden, Director, New Jersey Division of Fish and Wildlife

Date

## EXECUTIVE SUMMARY

This INRMP is a guide for the management and stewardship of natural resources on Joint Base McGuire-Dix-Lakehurst (JB MDL), in such a way that ensures the successful accomplishment of the on-base military missions. The JB MDL approach supports mission activities while efficiently managing the natural resources to conserve biodiversity and environmental quality.

The maintenance and enhancement of biological diversity is particularly important in the management of natural resources and is accomplished through the implementation of specific management practices identified in this INRMP. This plan presents recommendations designed to ensure minimal impact to the military missions at JB MDL while providing for the management and stewardship of natural resources as well as the conservation and enhancement of existing ecosystems on the installation. In some cases, it may be necessary to adapt natural resource management practices in order to address conflicts with the safe and effective implementation of DoD and USAF directives. The goals outlined in this INRMP are as follows:

- To support the military mission safely and effectively, including the implementation of best practices in natural resource management.
- To employ principles of adaptive management to conserve quality of natural resources and to protect unique or sensitive environments.
- To ensure compliance with the Endangered Species Act (ESA) and to protect rare and ecologically important species.
- To encourage native species and to discourage nonnative, exotic species.
- To ensure compliance with wetlands protections laws to prevent watershed degradation.
- To pursue partnering opportunities with outside organizations in order to promote compatible use of adjacent private lands and to reduce potentially negative impacts to the military mission.

In order to support these goals, objectives and management actions are identified in this INRMP that structure this plan's guidance. Each of the management strategies described in this plan should be monitored and updated at least annually in order to address changes in climate and environment.

The management actions identified below are intended to help JB MDL manage natural resources effectively to ensure that all federal, state, DoD and USAF regulations are followed and that lands remain available and in good condition to support the installation's mission activities. The actions incorporate the principles of ecosystem management and are consistent with standards identified by the New Jersey Pinelands Commission. This INRMP should also serve to increase awareness among base personnel of an ecosystem-management approach to natural resources management.

**Management Actions**

- Collect and analyze biological data for the base to ensure that wildlife and fisheries management strategies are accomplished using the best available data. This reduces the probability that species exist in areas on the base that have not been previously documented.
- Plan and program relevant support for other federal agencies to conduct species surveys and make data-driven management recommendations.
- Assist in the implementation of the Bird/Wildlife Aircraft Strike Hazard (BASH) Plan.
- Maintain and improve existing wildlife habitats so long as conflicts with mission activities are avoided.
- Maintain non-airfield areas of grassland habitat to support endangered grassland species of concern.
- Establish "core habitat" to aid in the survival of riparian species that require upland habitat for foraging, nesting, aestivation, and hibernation in areas outside the airfield fence.
- Continue control efforts for invasive species. Non-native and invasive species could be hindering

populations of native species and creating a lower quality habitat available for wildlife.

- Continue wetlands conservation and enhancement efforts.
- Increase awareness among base personnel and visitors about regulations governing jurisdictional wetlands and protected waterways.
- Install adequate erosion and sedimentation controls.
- Manage the installation hunting and fishing programs to maximize outdoor recreational opportunities and maintain the installation's deer population within carrying capacity.
- Maintain and operate the Installation Geospatial Information and Services (IGI&S) database to provide current, site-specific information.
- Improve environmental education outreach for installation personnel and the general public.
- Improve forest health and diversity through forest management activities such as timber stand improvements, stand thinning, reforestation, and forest pest monitoring.
- Implement integrated pest management (IPM) practices throughout the installation.
- Conduct prescribed burning for reducing the fire hazard and preventing woody encroachment in grasslands.

# 1.0 OVERVIEW AND SCOPE

This INRMP was developed to provide for effective management and protection of natural resources. The Sikes Act (16 United States Code § 670a et seq.) requires that federal military installations carry out a program to provide for the conservation and rehabilitation of natural resources. This INRMP summarizes the natural resources present on JB MDL and outlines a program to manage those resources in accordance with federal law, DoD and USAF policy. Natural resources are valuable assets of the USAF. They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF adaptability in all environments. The USAF has stewardship responsibility over the physical lands on which installations are located to ensure all-natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the USAF natural resources program is to sustain, restore and modernize natural infrastructure to ensure operational capability and no net loss in the capability of USAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

## *1.1 Purpose and Scope*

The purpose of this INRMP is to provide JB MDL (Figure 1: JB MDL Regional Settings/Site Location Map) with a description of the base, information about the surrounding physical and biotic environment, and a guide to manage natural resources that is consistent with mission requirements. Furthermore, the INRMP recommends various management practices, in compliance with federal, state, and local standards, designed to mitigate, minimize, or avoid negative impacts and enhance the positive effects of the base mission on local ecosystems.

The INRMP is a guide for the management and stewardship of all-natural resources. This plan integrates all aspects of natural resources management with the rest of the mission and therefore becomes the primary tool for effectively managing the associated ecosystems while ensuring the successful accomplishment of the military mission at the highest possible levels of efficiency. A multiple-use approach is implemented to support the presence of mission-oriented activities, as well as environmental quality, through the efficient management of natural resources.

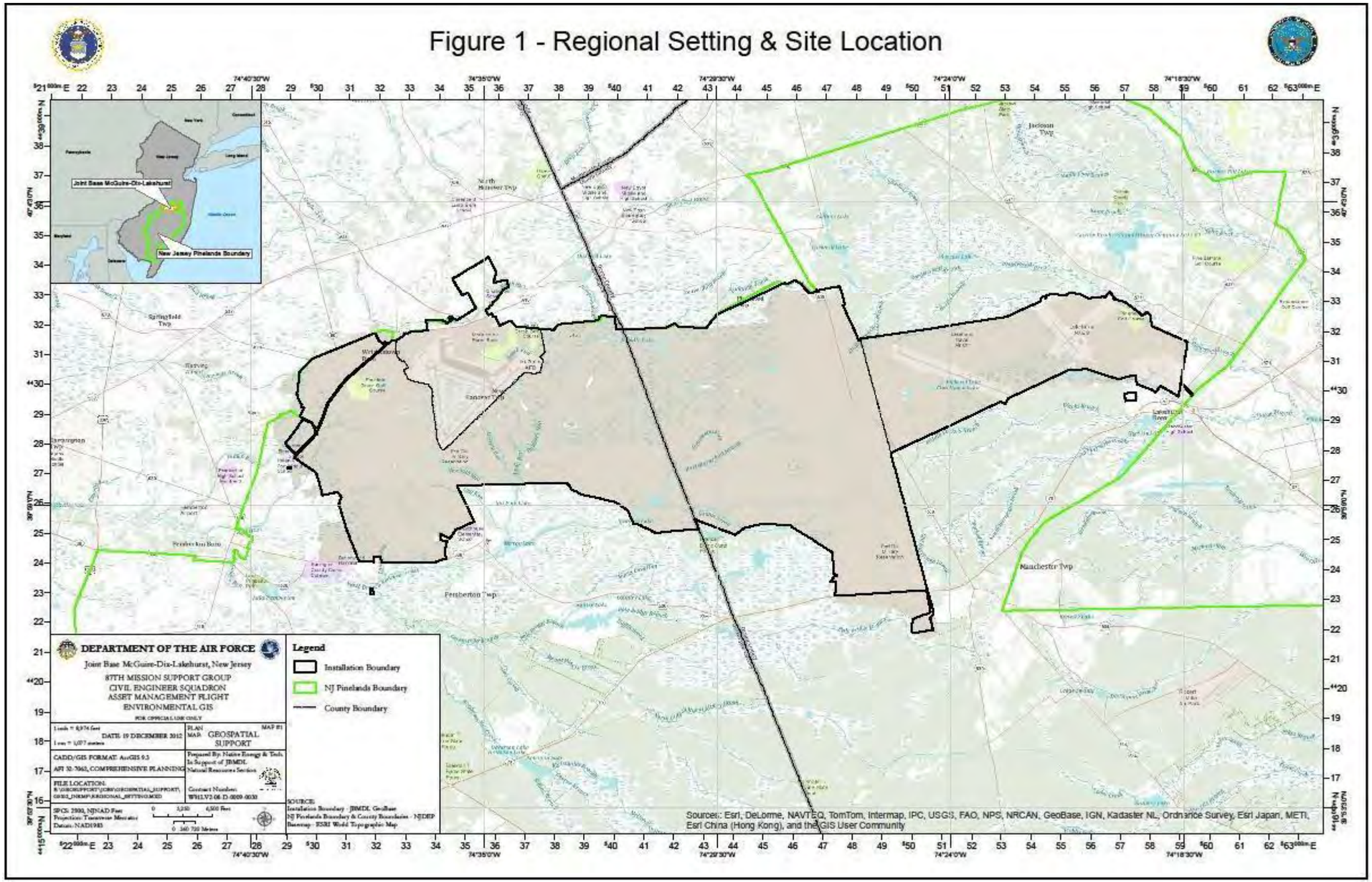
Specific management practices identified in this INRMP have been developed to enhance and maintain biological diversity within base boundaries. These practices also provide connectivity to the ecosystems surrounding the base. Specifically, management practices should (1) minimize habitat fragmentation and promote the natural pattern and connectivity of habitats; (2) protect native species and discourage non- native, exotic species; (3) protect rare and ecologically important species; (4) protect unique and sensitive environments; (5) maintain or mimic natural processes; (6) protect genetic diversity; (7) restore ecosystems, communities, and species; and (8) monitor biodiversity impacts. Each of the management practices described in this plan should be monitored so that modifications can be made during implementation as conditions change.

Biodiversity is defined as "the variety of life and its processes" and can be further defined on four basic levels: genetic diversity, species richness, ecosystem diversity, and landscape diversity. Ecosystem sustainability is the key to both biological diversity and human existence. It is the goal of this INRMP to successfully integrate ecological sustainability with goals and objectives that will sustain human communities and the operational mission of JB MDL. By protecting habitats that support the greatest biodiversity, this INRMP helps perpetuate viable, sustainable populations of native species and communities.

The JB MDL INRMP is prepared in cooperation with the USFWS, New Jersey Department of Environmental Protection Division of Fish and Wildlife (NJDFW), United States Department of Agriculture-Wildlife Services (USDA-WS), Natural Resources Conservation Service (NRCS), U.S. Army Corps of Engineers (USACE), Air Force Civil Engineer Center (AFCEC) and the 787 CES/CEIE Natural Resources Department. The NRM at JB MDL communicates with these groups and agencies on a project-by-project basis regularly throughout the year. The goal of these communications is to promote conservation initiatives throughout the installation and encourage input from state and federal partners.

The comprehensive planning process, which incorporates logistics and operations of the base, should incorporate the concerns presented in this INRMP so that the natural resources are protected, enhanced, and restored in a manner consistent with, and complementary to, the objectives of the USAF with regard to the protection of natural resources.

**JB MDL Regional Settings/Site Location Map**



### *1.2 Management Philosophy*

As part of its mission, JB MDL has chosen to be a national leader in environmental and natural resources stewardship both now and in the future. The vitality of natural resources must be ensured in order to achieve the military mission. As a steward of natural resources, JB MDL acknowledges its commitment to be a conservation leader for areas under its management. The INRMP is a dynamic document that will be maintained and adapted, as necessary, to reflect updated natural resources information. The development and implementation of this INRMP indicates that senior management at JB MDL are committed to natural resources management as reflected in DoDI 4715.3 Environmental Conservation Program.

The INRMP was developed using an interdisciplinary approach and information gathered from a variety of organizations. Information and guidance were also solicited from a variety of federal, state, and local agencies and groups. Representatives from the following federal, state and local regulatory agencies and groups were consulted to provide input on this INRMP: USFWS, NJDFW, USDA-WS, NRCS, USACE, AFCEC and the 787 CES/CEIE Natural Resources.

Consultation with, and concurrence from, representatives of USFWS and NJDFW satisfy the provisions of the Sikes Act (16 U.S.C. 670a et seq.). The Sikes Act requires the preparation of an INRMP in cooperation with the USFWS and the appropriate state fish and wildlife agency (i.e., NJDEP). In addition, it is required that the resulting plan reflect the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources.

The INRMP presents management practices for the protection and enhancement of natural resources and conservation of existing ecosystems, while minimizing impacts on the base mission and maintaining safety and efficiency. Implementing some of these recommendations may include taking into consideration potential conflicts with the military mission and striving to develop mutually beneficial management practices.

As outlined by the DoD under Secretary of Defense–Installations and Environment, DoD natural resources management will uphold the principles as outlined in DoDI 4715.3, Environmental Conservation Program as follows:

- Maintain or restore native ecosystem types across their natural range where practical and consistent with the military mission.
- Maintain or restore ecological processes such as fire and other disturbance regimes where practical and consistent with the military mission.
- Maintain or restore the hydrological processes in streams, floodplains and wetlands when feasible.
- Use regional approaches to implement ecosystem management on an installation by collaboration with other DoD components as well as other federal, state and local agencies and adjoining property owners.
- Provide for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources, provided that such use does not inflict long-term ecosystem damage or negatively impact the USAF mission.

In consideration of these requirements from DoD, coordination with outside entities, and a review of current scientific literature, the following management principles on biodiversity conservation, invasive species control and support of the Natural Heritage Program are integrally woven into the following JB MDL INRMP:

- Maintain viable populations of native species, especially keystone and rare species, on JB MDL.
- Identify the presence of exotic and invasive species and implement programs to control and/or eradicate those species.
- Develop joint control strategies with other federal, state and local cooperating agencies and adjacent landowners to increase the effectiveness of control measures.
- Survey and identify natural communities and species by working with the state Natural Heritage Program office.
- Develop and implement management strategies oriented toward the conservation of Heritage Status Ranked species listed in the Association for Biodiversity Information (ABI) database.

### *1.3 Authority*

This INRMP is prepared in accordance with the Sikes Act 16 USC 670 as amended by the Sikes Act Improvement Act (SAIA). The SAIA mandates not only that each military base prepare an INRMP, but also that they implement the management activities contained in the plan. DoDI 4715.3, Environmental Conservation Program; Air Force Policy Directive (AFPD) 32-70, Environmental Quality; and AFMAN 32-7003, Environmental Conservation, provide guidance and serve as key components in the process.

Additionally, this INRMP is prepared under authority of DODD 4700.4, Natural Resources Management Program, DODD 7310.5, Accounting for Production and Sale of Lumber and Timber Production, and AFPD 32-70, Environmental Quality.

Other federal and state laws and regulations that impact the management of natural resources at JB MDL and that were considered during the preparation of this INRMP include:

- Federal Water Pollution Control Act of 1977 (the Clean Water Act), 33 USC §1251-1387
- Endangered Species Act of 1973, 16 USC §1531
- Archaeological Resources Protection Act of 1979, 16 USC §470aa-mm
- Multiple-use and Sustained Yield Act of 1960, 16 USC §583
- Federal Land Policy and Management Act of 1976, 43 USC §1701
- Fish and Wildlife Coordination Act, 16 USC §661-667e
- Migratory Bird Treaty Act, 16 USC §703-712
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 USC §4701
- 10 USC 2665 (Forest Management)
- 10 USC 2667 (Agricultural Outleasing)
- Executive Order (EO) 11990 (Protection of Wetlands)
- EO 11987 (Exotic Organisms)
- EO 11989 (Off-road Vehicles on Public Land)
- EO 11988 (Floodplain Management)
- EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)

DoDI 4715.3, Environmental Conservation Program, is the overarching instruction for DoD natural and cultural resource management, and is the primary agent for implementing policy (including the Sikes Act), assigning responsibilities, and prescribing procedures for the integrated management of natural and cultural resources on DoD property. This Instruction also establishes the DoD Conservation Committee that reports to the Environmental, Safety, and Occupational Health (ESOH) Council Policy Board, and designates "DoD Executive Agents" to lead DoD implementation of primary conservation issues.

AFPD 32-70, Environmental Quality, establishes policies to: responsibly manage natural and cultural resources on USAF properties, clean up past environmental damage, meet current environmental standards, plan future activities to minimize impacts, and eliminate pollution from USAF activities whenever possible. Under this directive, an Air Force Environmental Quality Program was developed, which includes activities such as cleanup, compliance, conservation and pollution prevention. Additionally, this directive states that the USAF will pursue adequate funding to meet environmental legal obligations.

AFMAN 32-7003, Environmental Conservation, implements AFPD 32-70 and DoDI 4715.3. This Instruction provides details on how to manage natural resources on USAF installations so that they comply with applicable federal, state, and local laws and regulations. The INRMP facilitates compliance with federal, state, and local environmental requirements. Potential impacts to water and air quality, wetlands, endangered species, marine mammals, migratory birds, and other wildlife, forest, and fire management, and public access are all analyzed under these requirements. The relevant statutes and executive orders listed in this document show the applicability of various natural resources program components to significant laws and regulations.

Appendix A: Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP and Table 1: Installation-Specific Policies summarizes key legislation and guidance used to create and implement this INRMP.

**Table 1: Installation-Specific Policies**

| **Installation-Specific Policies (including State and/or Local Laws and Regulations)** | |
|---|---|
| *New Jersey Statutes Annotated [NJSA] 23:2A-1 to 13, the Endangered and Nongame Species Conservation Act* | Statutes that define the powers and duties of the supervising department, rules for establishing a list of endangered species, directives for regulations, inspections, and fees, and the investigation of suspected violators. Direction for the development of programs for conservation management and cooperation with and acceptance of funds from other agencies. This statute also bans the intentional feeding of black bears. |
| *NJSA 13:1B-15.151 to 15.158, the Endangered Plant Species List Act* | Directs the New Jersey Division of Parks and Forestry to develop a list of plant species that are endangered in New Jersey. Provides a definition of an endangered plant species and establishes procedures and criteria by which endangered plant species will be determined. The resulting list is included in New Jersey Administrative Code (NJAC) 7:5C-1.1 et seq. |
| *NJSA 13:9A-1 to -10, NJ Wetlands* | The installation follows NJDEP guidelines regarding exceptional resource value, intermediate resource value and ordinary resource value wetlands. Wetlands have been ground truthed for the Lakehurst and McGuire sections of JB MDL. For the Dix section, JB MDL uses the NJDEP statewide wetlands map. For major projects, ground truthing is still required. |
| *New Jersey Administrative Code (NJAC) 7:50-1.1 et seq., Pinelands* | USAF does not generally consult with the Pinelands Commission on major projects. The Commanding Officer generally writes a military "mission essential" exemption letter. |

***Integration with Other Plans***

The Installation Development Plan describes in detail any development restrictions there may be from a natural resource viewpoint, such as wetlands, Threatened and Endangered (T&E) species, or unique habitats, whereas the INRMP is a guide for the management of the wetlands, T&E species, or unique habitats.

The INRMP and the BASH plan deal with natural resources and how they may impact the mission. The BASH plan addresses conflicts with the ability to safely conduct flight operations, whereas the INRMP covers all potential mission/natural resource conflicts. The summer grass heights at the Lakehurst airfields continue to be a concern from both the natural resource management and safety perspectives. Heights prescribed in the previous INRMP conflict with standard grass heights (7-14") required by AFI 91-212. In 2019, JB MDL contracted with the USDA-Wildlife Services agency to conduct a Wildlife Hazard Assessment (WHA) at the Lakehurst airfield. The WHA also recommends mowing to 7-14 inches. An Environmental Assessment (EA) on mowing the grass during bird breeding season is scheduled to be completed in 2021. While the base awaits the completion and submittal of the EA, JB MDL will continue to ban bird breeding season mowing at the Lakehurst airfields until the EA is delivered. This completed EA will address the 7-14" grass mowing analysis and tree clearing at the Lakehurst airfields, as well as a required EA for the INRMP revision. At that point:

- JB MDL recognizes that allowing grass heights in the airfield to exceed 14" is out of compliance with AFI 91-212, the US Air Force Mishap Prevention Program, unless a tall grass waiver is obtained from the USAF Safety Center, which they have thus far refused to do. This causes significant concerns with flight safety for the Senior Airfield Authority and aircrews operating on the Lakehurst airfield. Therefore, airfield grass height management practices need to be re-evaluated and undergo the formal decision process following the National Environmental Policy Act (NEPA). The final decision will result in either maintaining the grass height at 7-14 inches throughout the year or seeking a waiver from the USAF Safety Center at Kirtland AFB, New Mexico.
- JBDML will develop a proposed action and alternatives for NEPA analysis in collaboration with 305 AMW Wing Safety office, NJDFW, USDA-WS and USFWS to achieve airfield grass height in compliance with AFI 91-212 and promote aviation safety.
- No changes to current mowing practices will take place until JB MDL, in collaboration with 305 AMW Wing Safety office, NJDFW, USDA-WS and USFWS, selects an alternative form of airfield grassland management and the NEPA process is completed.

The INRMP and the IPM plan discuss the impact of pest related management. The IPM addresses mainly pests that affect the built-up portions of the installation, including buildings, and the INRMP addresses pests that affect forested portions of the installation.

The Range Management Plan is for training related facilities and those portions of the installation that support the range training mission and relies on the INRMP for much of the basic information such as vegetation, soils, wetlands, etc.

The Landscape Plan addresses more intense management of plant maintenance but draws much of the basic information from the INRMP.

## 2.0 INSTALLATION PROFILE

| | |
|---|---|
| **Office of Primary Responsibility** | The 787 CES/CEIE has overall responsibility for implementing the Natural Resources Management program and is the lead organization for monitoring compliance with applicable federal, state and local regulations |
| **Natural Resources Manager/Alternate POC** | Mark Stevenson<br>609-754-1847<br>Mark.stevenson.16@us.af.mil |
| **State and/or local regulatory POCs** (For US-bases, include agency name | New Jersey Department of Environmental Protection and United States Fish and Wildlife Service North Atlantic - Appalachian Region 1 ( Legacy Region 5) |
| **Total acreage managed** | 41,776 |
| **Total acreage of wetlands** | 9,353 |
| **Total acreage of forested land** | 29,162 |
| **Does installation have any Biological Opinions?** (If yes, list title and date, and identify | No |
| **NR Program Applicability** (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0) | ☑Threatened and endangered species<br>☑Invasive species<br>☑Wetlands Protection Program<br>☑Grounds Maintenance Contract/SOW<br>☑Forest Management Program<br>☑Wildland Fire Management Program<br>☐ Agricultural Outleasing Program<br>☑Integrated Pest Management Program<br>☑Bird/Wildlife Aircraft Strike Hazard (BASH) Program<br>☐ Coastal Zones/Marine Resources Management Program<br>☑Cultural Resources Management Program |

### *2.1 Installation Overview*

#### *2.1.1 Location and Area*

JB MDL is located in south central New Jersey and straddles Burlington and Ocean Counties covering approximately 41,776 acres (Figure 1 JB MDL location map). McGuire is located in Burlington County in south-central New Jersey, east of Wrightstown Borough. The McGuire area is 3,562-acres and is approximately 18 miles southeast of downtown Trenton, New Jersey. The McGuire area is bordered on the east, south, and west by the Dix Area and the north side is traversed by Wrightstown-Cookstown Road. The Dix area is located 20 miles southeast of Trenton in central New Jersey on approximately 30,784 acres in Burlington and Ocean Counties. Wrightstown is adjacent to the north of Dix; Pemberton Township directly abuts to the southwest. The Dix area is bordered in part by the McGuire area to the north and the Lakehurst area to the east. Lakehurst encompasses approximately 7,430 acres in Ocean County,New Jersey. The Lakehurst area is about 45 miles east of

Philadelphia, 50 miles south of New York City, and 10 miles west of the Atlantic Ocean. Ocean County is in the south-central portion of New Jersey within the New Jersey Pinelands.

### *2.1.2 Installation History*

JB MDL was established on October 1, 2009, by joining McGuire Air Force Base, Fort Dix and Lakehurst Naval Air Engineering Station into a single entity, with the Air Force as the lead service.

**McGuire**

The history of McGuire Air Force Base (AFB) goes back to the 1930s, when a single strip runway, known as Rudd Field, was constructed in the rural New Jersey countryside by the Army Air Corps. At that time, the land that is now McGuire was agricultural fields and undeveloped woodlands. When the USAF assumed control of the installation in 1949, the installation was renamed McGuire AFB, after the late Major Thomas B. McGuire, Jr., a World War II fighter pilot and Medal of Honor recipient.

The first USAF host unit was the 91st Reconnaissance Wing of the Strategic Air Command which flew RB-29 and B-50 bombers. For a brief period in the early 1950s, F-94 and F-86 fighter aircraft operated from McGuire AFB after the 52nd Fighter Interceptor Wing assumed control of the base from the 91st Refueling Wing.

In 1954 the 1611th Air Transport Wing (ATW) arrived at the base, and McGuire AFB was assigned to the Military Air Transport Service. Transport aircraft continued to arrive at the base, and in 1966, the 1611th ATW was replaced by the 438th Military Airlift Wing as the host unit. Beginning in 1967, C-141s began arriving on base, replacing all C-135s and C-130s by 1968.

McGuire AFB aircrews transported troops and supplies, and airlifted prisoners of war during the Vietnam War. Similar missions continued through the 1980s as McGuire AFB aircrews participated in airlift and rescue efforts in Beirut, Panama, and other Military Operations Other Than War.

Air Mobility Command assumed control of McGuire AFB on June 1, 1992. Starting at this time, and continuing through 1994, McGuire AFB participated in developing, training, and operating the C-141B Special Operations Low-Level II program, supporting a wide variety of inter-service users. In 1993, the base was selected by AMC officials to be designated as the East Coast Air Mobility Wing (AMW). With this new designation, McGuire AFB received 32 KC-10 Extender tanker/cargo aircraft and three C-12 Huron aircraft. The Air Mobility Warfare Center was also established at the base.

Base Realignment and Closure (BRAC) is a congressionally authorized process the DoD had previously used to reorganize its base structure to more efficiently support US forces, increase operational readiness and facilitate joint basing. The current process began with a threat assessment of the future national security environment, followed by the development of a force structure plan and basing requirements to meet these threats. BRAC law set into effect the Joint Base initiative which established JB MDL on October 1, 2009, by joining McGuire Air Force Base, Fort Dix and Lakehurst Naval Air Engineering Station into a single entity, with the Air Force as the lead agency. The 87 Air Base Wing (ABW) Commander has overall responsibility for JB MDL. The consolidation has streamlined installation support, while increasing mission effectiveness.

McGuire received assets and support functions from Naval Air Station Joint Reserve Base Willow Grove, which was closed by BRAC. Under BRAC law, JB MDL received Army, Navy, Coast Guard, and Marine Corps assets and has built new structures to support these additions.

Relatively new support facilities include: Navy Fleet Logistics Operations Facility, C-130 flight simulator, Marine Air Group Headquarters and helicopter hangar, Aviation Support Division/Aviation Intermediate Maintenance division facility, munitions facility, New Jersey Army National Guard (NJARNG), Mobilization and Training Equipment Site (MATES), NJARNG Army Aviation Support Facility (AASF), and a joint use reserve training center.

Since the completion of the BRAC initiative, McGuire houses 37 aircraft from NAS JRB Willow Grove: C-130s, C-9s, C-12s fixed wing aircraft and CH-53 Super Stallions helicopters. Additionally, AH-1s and UH-1 helicopters have come from Johnstown, Pennsylvania. The initiative has also brought over 1,700 joint support personnel.

Although the installation management functions have consolidated, the missions of each of the three installations continue. The USAF provides global mobility and expeditionary combat support; the Army mobilizes and trains soldiers; and the Navy continues to assure fixed and rotary wing aircraft operate safely and effectively worldwide.

**Fort Dix**

Fort Dix, initially called Camp Dix, was established on July 18, 1917, as a cantonment area and training post for World War I troops. After the war, the camp served as a demobilization center, and from 1922 to 1926 it was used as a training ground for active Army, Army Reserve, and National Guard units. The camp was inactive from 1926 to 1933, but from 1933 to 1939 it served as a reception, discharge, and replacement center for the Civilian Conservation Corps. In 1939, the camp became a permanent Army training center. During World War II and after the war it was used as a separation center. In 1947, Fort Dix was designed as a basic training center. In 1956, the post was officially designated the U.S. Army Training Center. Fort Dix is currently utilized for the training of reserve components.

Prior to October 1992, Fort Dix was under the jurisdiction of the U.S. Army Training and Doctrine Command. Its mission was to conduct Basic Combat Training and Advanced Individual Training, and to provide Combat Support and Support to Reserve and National Guard Units. In October 1992, the major command was shifted to Forces Command.

In FY 1998, Fort Dix was realigned to the U.S. Army Reserve Command and is one of the Army's Power Projection Platforms with capability to mobilize, train, equip, and deploy units anywhere in the world.

**Lakehurst**

Military land use at Lakehurst began in 1915 when the Eddystone Munitions Company leased a 1,500- acre parcel of land from the Manchester Land Company. A 4-mile range was completed in 1916 including the original lease and an additional 2,500 acres. Between 1915 and 1917, the firing range served as a proving ground, overseen by the Imperial Russian Government, for testing 3-inch shrapnel shells. Ground facilities were constructed just north of what is now Runway 24 of Maxfield Field (previously called West Field), an area now referred to as the Russian Ruins. In 1917, with the start of the Russian Revolution, the Russian Army withdrew from the site and within the same year, the U.S. Army acquired the land for development of an experimental proving ground for gas warfare.

The site became Camp Kendrick. By 1918, facilities at the site included permanent gun positions, batteries, magazines, a narrow gage railway for delivery of ordnance, laboratories, barracks, and various farm buildings and animal hospitals to treat animals subjected to gas in field tests.

In 1919, work began on Hangar 1 at what was to become Naval Air Station (NAS) Lakehurst. Sometime during construction of the hangar, the buildings of Camp Kendrick were moved, and the site was formally commissioned as NAS Lakehurst on June 28, 1921. An airship training school was formed at the air station in the 1920s, which included training for rigid and non-rigid airships in the country's first lighter-than-air (LTA) aviation program. From the late 1920s to late 1930s, the station also served as the East Coast terminal for commercial trans-Atlantic dirigible traffic and was the location of the Hindenburg disaster in 1937. During the late 1930s and early 1940s, training at NAS focused on non-rigid airships (commonly called blimps) and bombing exercises were conducted at various locations on the station. During World War II, the squadron of blimps assigned to NAS Lakehurst performed escort missions, submarine searches, and rescue work for the naval fleet, which drastically reduced the number of ships lost to German submarines in the subsequent years of the war. Most of the airships became inactive after the Second World War though there was increased use and activity at the station from the late 1940s through the 1950s in response to the Korean and Cold Wars. In the early 1950s, West Field was built to accommodate increased use of fixed-wing aircraft and in 1958; construction began on the Naval Test Facility, located in the western portion of the station. In the early 1960s, all the airships were removed from active duty and terminated. NAS Lakehurst had served as the nation’s oldest and largest LTA airship station for 40 years. In the mid-1970s, Naval Air Engineering Center (NAEC) assumed responsibility for the station and the major mission became research, development, testing, and engineering. The designation of Naval Air Engineering Station (NAES) came about in 1994.

### *2.1.3 Military Missions*

JB MDL is headquarters to the 87 ABW and is also home to several other tenant units. JB MDL has approximately 9,400 full-time DoD employees. Major current tenant units at the base include the 514th Air Mobility Wing (514 AMW) of the Air Force Reserve Command (AFRC), 108th Air Refueling Wing (108 ARW) of the New Jersey Air National Guard (NJANG), 305 Air Mobility Wing , 621st Contingency Response Wing, the USAF Expeditionary Center and the Civil Air Patrol. These units fly C-17 Globemaster IIIs, KC-10 Extenders, and KC-135 Stratotankers in their airlift missions responsibilities.

The mission of the 305 AMW is to provide worldwide air refueling and strategic airlift in support of the USAF’s Global Reach, Global Power mission. 305 AMW was charged under joint basing to be responsible for Operational Mission Services and Installation Movement, as defined by the Joint Basing Implementation Guidance. The 305 AMW/CC is considered the Senior Airfield Authority for the Joint Base Aviation complex. The 305 AMW also provides administrative, and logistical support to 305 AMW units, The 305 AMW is made up of wing staff agencies providing administrative support, the 305th Operations Group providing combat-ready airlift and operational support, the 305th Maintenance Group coordinating and controlling aircraft maintenance and supply activities to ensure readiness. In July 2021 the first squadron transitioned to the KC-46.

The 87th Medical Group operates a tri-service clinic offering a full range of outpatient and urgent care services. Each group is further composed of numerous squadrons.

The US Air Force Expeditionary Center located at the McGuire Area of JB MDL, ensures preparedness of troops by acting as a premier training and testing institution. The Air Mobility Weapons Instructor Course is located on McGuire as well, hosting the 57th Weapons Squadron. They specialize in advanced training in mobility aircraft.

Reservists of the 514 AMW are responsible for approximately 35% of all missions departing from the McGuire Area of JB MDL. The 514 AMW reservists directly support their active duty counterparts in numerous ways, including operations, maintenance, training, aeromedical evacuations, and civil engineering. Other tenant groups on the McGuire Area include Training Detachment 203, Armed Services Whole Blood Processing Laboratory, Civil Air Patrol and the Defense Courier Service Station McGuire.

The major mission partner at the Lakehurst area of JB MDL is Naval Air Warfare Center Aircraft Division (NAWCAD). This team supports Naval Aviation and Navy Aircraft Carrier Battle Groups.

The stated mission of the NAWCAD JB MDL team is to conduct programs of technology development, engineering, developmental evaluation and verification, systems integration, limited manufacturing, procurement, integrated logistics support management, and fleet engineering support for Aircraft Platform Interface systems.

The Dix Area of JB MDL houses a U.S. Army Reserve Command Training, Mobilization, and Deployment Center. Its primary mission is to provide training support to active and reserve component units of all services and licensed non-DoD activities. It also serves as a major power generation platform with the mission of receiving, training, equipping, and deploying military forces. The post has been deemed America's First Premier Joint Mobilization Station and Power Projection Platform.

JB MDL is host to the NJNG's joint force headquarters (JFHQ) for the NJANRG. The JFHQ serves to coordinate all training, support, maintenance, and contracting activities of the NJANRG and NJANG. NJARNG Mobilization and Training Equipment Site facility is the NJARNG's regional premier mobilization and maintenance training facility for the Army National Guard equipment. The NJANRG Army Aviation Support Facility consolidates all training and maintenance activities for NJARNG fixed and rotary wing assets. NJARNG Regional Training Support Maintenance is the regional Army National Guard school house for the various maintenance activities such as engine rebuilds and welding skills.

JB MDL functions as a support base for contingency operations and provides intra-area services, support and facilities to on- and off-post active and reserve component units, activities, and individuals. JB MDL has 60 firing ranges and various special training facilities which can accommodate the following weapons and training opportunities.

Individual training operations include:

- A movement contact range, squad assault course, night defense ranges.
- Chemical, Biological, Radiological, & Nuclear training complex.
- Engineering training sites.
- Heavy Equipment Operators site.
- Five physical fitness centers.
- An Army Physical Fitness test site.
- Common Task Training site for individual combat skills.
- A leadership training area, which includes a confidence course, an obstacle course, a 40-foot rappel tower, and a leadership reaction course.
- Combat Lifesavers Course for non-medical soldiers training.
- ARMY Military Occupational Specialty qualification and reclassification facilities.
- Officer and Non-commissioned officer education schools; and
- Military Operations in Urban Terrain (MOUT) Training

Live fire operations include:

- Pistol & Rifle ranges to include zeroing, familiarization, night firing, & qualification.
- Remote Electronic Target System ranges, from pistol to main tank gunnery.
- Computerized tank gunnery ranges.
- Tube-launched, Optically tracked, Wire-guided missile and Dragon live fire and tracking range.
- Aerial Attack Helicopter and Door Gunnery ranges.
- Artillery Firing Points (AFP) supporting 105-155mm artillery pieces.
- Mortar Firing Points (MFP) supporting 60-120mm mortar tubes.
- M203 grenade launcher qualification range.

- Explosive Ordinance Disposal (EOD) Range and demolition training.
- Urban Assault Course, a five-station training facility consisting of individual/team station,
- Squad/platoon station, grenade/gunnery, an urban offense/defense building, and an underground trainer.
- Convoy Live Fire Course for weapons systems up to .50 caliber.
- Improvised Explosive Device (IED) training; and
- Multi-Purpose Machine Gun Range

Additional operations include:

- 56 Various Tactical Training Areas (TA).
- Bivouac sites and administrative support areas.
- Areas dedicated to conduct Land Navigation training.
- Driver Training Areas for precision, on- and off-road driving scenarios.
- Combat Support Services.
- Forward Operating Base (FOB) facilities; and
- Internment Resettlement Training Facility.

**Listing of Tenants and NR Responsibility**

| Tenant Organization | NR Responsibility |
|---|---|
| 87 ABW | 787 CES/CEIE |
| 514 Air Mobility Wing | 787 CES/CEIE |
| 108 Wing/NJANG | 787 CES/CEIE |
| 305 Air Mobility Wing | 787 CES/CEIE |
| 21 Expeditionary Mobility Task Force | 787 CES/CEIE |
| 621 Contingency Response Wing | 787 CES/CEIE |
| USAF Expeditionary Center | 787 CES/CEIE |
| Civil Air Patrol | 787 CES/CEIE |
| Naval Air Warfare Center Aircraft Division | 787 CES/CEIE |
| USAR Command Training Mobilization and Deployment Center | 787 CES/CEIE |
| NJARNG | 787 CES/CEIE |

*2.1.4 Surrounding Communities*

JB MDL's neighbors include Brendan Byrne State Forest and Manchester Wildlife Management Area to the south and Jumping Brook Preserve to the north. Colliers Mills Wildlife Management Area directly borders the northern boundary of the base in the Lakehurst section of JB MDL, while private forested and agricultural lands are located further to the north. The municipalities of Wrightstown, Pemberton Township, New Hanover Township, North Hanover Township, Plumsted Township, Manchester Township, Lakehurst Borough and Jackson Township are proximate to JB MDL.

The Burlington County Office of Land Use Planning identifies the following land use designations for areas surrounding JB MDL (Nakata, 1999): Single Family, Manufacturing, Agriculture, Transportation, Mining, Utility, Wooded, Commercial/Services, Vacant Community Services, Water, Military, Multifamily, and Recreation.

The Ocean County Department of Planning identifies the following land use designations for the areas surrounding JB MDL: Residential, Agriculture, Commercial, Forest, Military, Water, Urban, Wetlands, Recreation, and Barren/Transitional.

Population numbers as seen in Table 2: Population Growth Chart for Areas Surrounding JB MDL, provide a framework for considering the level of development pressure in the vicinity of JB MDL and the potential degree to which new growth could affect military missions. The current and projected distribution of population surrounding the installation has implications for the potential impacts of military operations, as well as plans to manage these impacts.

**Table 2: Population Estimates for Areas Surrounding JB MDL**

| Geographic Area | 2010 | 2000 | 1990 | 1980 |
|---|---|---|---|---|
| Burlington County | 448,732 | 432,394 | 395,066 | 362,542 |
| Pemberton Township | 28,158* | 28,691 | 31,342 | 29,720 |
| Wrightstown borough | 802 | 746 | 3,843 | 3,031 |
| New Hanover Township | 9,479** | 9,744 | 9,546 | 14,258 |
| North Hanover Township | 7,577** | 7,347 | 9,994 | 9,050 |
| Ocean County | 576,567 | 510,916 | 433,203 | 346,038 |
| Lakehurst borough | 2,654 | 2,522 | 3,078 | 2,908 |
| Plumsted Township | 8,421 | 7,275 | 6,005 | 4,674 |
| Manchester Township | 43,070 | 38,928 | 35,976 | 27,987 |
| Jackson | 54,856 | 42,816 | 33,233 | 25,644 |

*estimated 2007 data
**estimated 2006 data, www.census.gov

In recent decades, the area to the east of JB MDL has experienced a greater degree of population growth. The population of Jackson Township increased at the most dramatic rate, more than doubling in the years between 1980 and 2010. Together, Jackson and Manchester Townships added more than 40,000 residents, significantly changing the landscape of that part of Ocean County. Conversely, many of the municipalities on the Burlington County side of the base declined in population over the past several decades, indicating a historically lesser degree of growth pressure in areas surrounding the McGuire and Dix area of JB MDL.

Population projections for municipalities surrounding the base were generated for Burlington and Ocean Counties, respectively. These 2035 forecasts indicated anticipated growth in each of the area localities, again to a greater percentage in areas to the east. While the forecast indicates a more modest level of growth in the Burlington County communities, the expectation is that the previous rates of decline will turn around and bring new residents to all areas surrounding the base. (Forecasts were based on 2010 population estimates from the U.S. Census).

### *2.1.5 Local and Regional Natural Areas*

JB MDL is located in the Pinelands within proximity to a number of state parks, forests and wildlife management areas, several which are contiguous with the base boundary (Table 3: State Parks, Forests, and Wildlife Management Areas near JB MDL).

**Table 3: State Parks, Forests, and Wildlife Management Areas near JB MDL**

| Park/Forest | County |
|---|---|
| Bass River State Forest | Burlington |
| Brendan T Byrne State Forest | Burlington |
| Medford WMA | Burlington |
| Pemberton Lake WMA | Burlington |
| Penn State Forest | Burlington |
| Rancocas State Park | Burlington |
| Swan Bay WMA | Burlington |
| Wharton State Forest | Burlington |
| Allaire State Park | Monmouth |
| Assunpink WMA | Monmouth |
| Butterfly Pond Fish and WMA | Ocean |
| Colliers Mills WMA | Ocean |
| Double Trouble State Park | Ocean |
| Edwin B. Forsythe NWR | Ocean |
| Greenwood Forest/Pasadena WMA | Ocean |
| Island Beach State Park | Ocean |
| Manchester WMA | Ocean |
| Webb's Mill Bog Cedar Swamp | Ocean |

Notes:
WMA -Wildlife Management Area NWR
- National Wildlife Refuge

## *2.2 Physical Environment*

### *2.2.1 Climate*

JB MDL is located within the central New Jersey Pinelands region, which lends itself to a particular climate due to the predominantly sandy, porous soils. This sandy soil soaks up heat from the sun during the day and radiates it back into the atmosphere at night, producing a humid, subtropical climate. Average temperatures in this region range from below freezing during the winter months (October-April) to the upper 70s- and 80-degrees F in the summer (May-September). Average annual precipitation ranges between 40 and 50 inches per year, with an average of 122 wet days. Snowfall occurs during the winter months (November-March) with an average of less than five inches per month. Although climate in the Lakehurst area of JB MDL can be affected by cooler, drier air from the Atlantic Ocean, there are no coastal areas that would be immediately affected by fluctuations in sea level.

Climate change is affecting New Jersey at a greater rate than other areas of the United States, with annual average temperatures rising by slightly over two-degrees Fahrenheit over the historic average. This region is also experiencing a greater increase in precipitation than any other region in the US, including higher overall amounts of rainfall and a greater number of extreme weather events with heavy rainfall. Climate trends predict that the intensity of weather events (extreme high temperatures and heavy rainfall) will continue along with periods of intermittent drought. The impacts to the environment on the predicted changes may include drier growing seasons as well as increased run off and flooding during heavy precipitation.

Habitat in the NJ Pinelands that supports threatened and endangered species is especially vulnerable to predicted climate change. Slight changes in fire regime, flooding and depth of water table can have a dramatic impact on the already fragile ecosystem that supports globally rare species found in New Jersey. As already limited habitat becomes impacted, species that depend on those areas become vulnerable to extinction. The NJDEP recommends a program of ongoing monitoring for the occurrence of threatened and endangered species and adopting a program to support the distribution of endangered and rare plant species.

In 2019, the Colorado State University (CSU) through the USACE was tasked to provide individual USAF installations with a model for climate change that predicts broad scale trends over a 30- and 50-year period. Climate data used in this report were generated originally for international climate assessment reports sanctioned and provided by the Intergovernmental Panel on Climate Change (IPCC-CMIP5) (Hibbard, Meehl, Cox, & Friedlingstein, 2007; Moss et al., 2008, 2010), and subsequently used by the US Fourth National Climate Assessment Report (USGCRP, 2017). The model was based on a moderate emissions profile (Representative Concentration Pathway [RCP] 4.5) and a high emissions profile (RCP 8.5). The two emission scenarios were based on assumptions about future worldwide changes in demographic development, socio-economic development, and technological change that result in different greenhouse gas concentrations in the atmosphere. Site- specific temperature and precipitation climate projections were generated and are summarized below in Table 4 and Table 5. The climate projections represent general trends and did not take into consideration extreme weather events, but rather averages over a long period of time.

Climate projections for JB MDL suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030, and extracted data from 2046 to 2055 for the decadal average for 2050.

For the decade centered around 2030, both of the scenarios project a similar degree of increase in average annual temperature (TAVE) of between 2.1 °F (1.2 °C) and 2.3 °F (1.3 °C) over historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 2.9 °F (1.6 °C). RCP 8.5 expresses a slightly greater warming of 3.6 °F (2.0 °C) for this period.

Average annual precipitation (PRECIP) varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, the RCP 4.5 scenario projects a small increase in PRECIP of 8% while RCP 8.5 shows an increase of 9%. For 2050, RCP 4.5 projects an increase in PRECIP of 13% while RCP 8.5 shows an increase of 12%.

**Table 4: Summary Climate Data**

| Variable | Historical | RCP 4.5 | | RCP 8.5 | |
|---|---|---|---|---|---|
| | | 2030 | 2050 | 2030 | 2050 |
| PRECIP (inches) | 51.0 | 55.0 | 57.4 | 55.5 | 56.9 |
| TMIN (°F) | 43.1 | 45.1 | 46.0 | 45.3 | 46.6 |
| TMAX (°F) | 64.4 | 66.6 | 67.4 | 66.8 | 68.2 |
| TAVE (°F) | 53.6 | 55.8 | 56.5 | 55.9 | 57.2 |
| GDD (°F) | 3760 | 4265 | 4484 | 4330 | 4592 |
| HOTDAYS | 16.0 | 34.9 | 41.2 | 37.9 | 42.6 |
| WETDAYS | 1.1 | 0.6 | 0.7 | 0.3 | 0.8 |

Notes: TAVE $^{o}$F = annual average temperature; TMAX $^{o}$F = annual average maximum temperature; TMIN $^{o}$F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD $^{o}$F = Average annual accumulated growing degree days with a base temperature of 50 $^{o}$F; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 $^{o}$F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

Understanding changes in daily intensity and total precipitation for multi-day precipitation events is helpful to evaluate precipitation patterns in addition to assessment of annual averages. Three-day storm events (design storms) were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes. Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison. Design storms were used to model stream channel overflow in the hydrology assessment.

**Table 5: Design Storm Precipitation**

| Design Storm | | Baseline | RCP 4.5 | | RCP 8.5 | |
|---|---|---|---|---|---|---|
| | | 2000 | 2030 | 2050 | 2030 | 2050 |
| Precipitation (inches) | Day 1 | 2.4 | 1.8 | 1.2 | 1.9 | 1.4 |
| | Day 2 | 2.2 | 2.2 | 2.1 | 2.1 | 2.4 |
| | Day 3 | 1.9 | 1.5 | 2.7 | 0.9 | 1.5 |
| | Total | 6.5 | 5.5 | 6.0 | 4.9 | 5.3 |
| Percent change from baseline | | | -15% | -8% | -25% | -18% |

*2.2.2 Landforms*

JB MDL lies within the Inner and Outer Coastal Plains physiographic regions, which are separated by a band of hills with a maximum height of about 375 feet above mean sea level (msl) (Figure 1: JB MDL Regional Settings/Site Location Map). The Inner Coastal Plain slopes primarily to the northwest from this ridge and the Outer Coastal Plain slopes primarily to the southeast from this ridge. Relief is generally low throughout the Outer Coastal Plain; however, portions of JB MDL within the Inner Coastal Plain contain erosion resistant cuestas with higher elevations that slope to the West. For purposes of this INRMP, the land use at JB MDL is defined by the following subcategories: improved, semi- improved and unimproved/vacant lands. This INRMP deals primarily with the land classified as unimproved/vacant, especially those lands not paved or occupied by buildings which generally includes wildlands/wetlands.

*2.2.3 Geology and Soils*

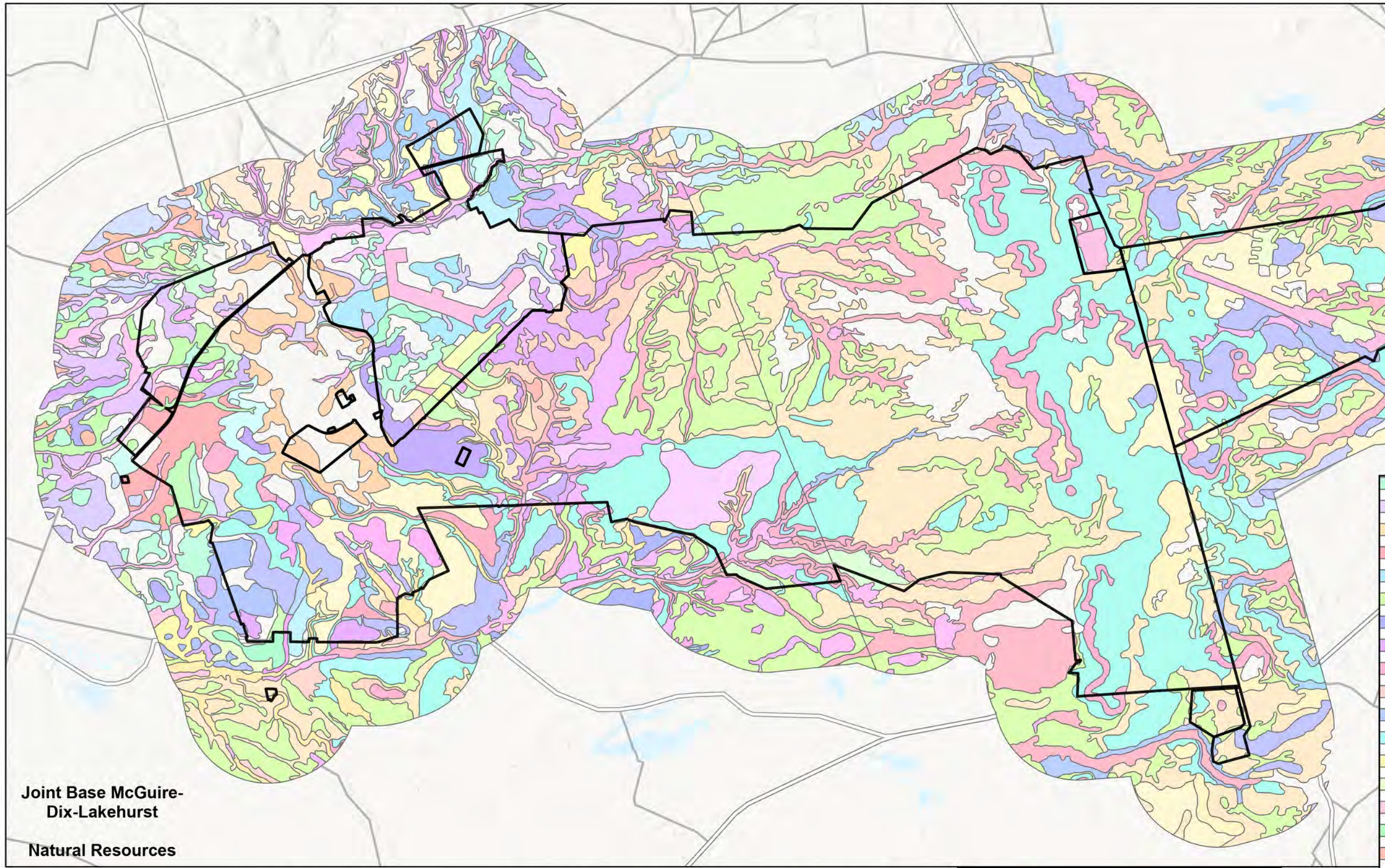
Past geologic processes have contributed greatly to the soil formation, topography, hydrology, and vegetation of the Inner and Outer Coastal Plain physiographic regions. Early in the Cretaceous period (135 to 65 million years ago), the Inner Coastal Plain began accumulating sediments being carried down river from the Piedmont physiographic province. In the Tertiary period (65 to 1.75 million years ago) that followed, sea levels along the NJ coast rose and fell many times. Rising sea levels left behind marine sediments of sands, silts, clays, and gravels creating the Outer Coastal Plain. When the sea levels fell, erosion caused by streams and wind further shaped the region by carrying some of these materials back to sea (Collins 1994). Sediments deposited during the last cycle include the Cohansey Sand Formation comprised of unconsolidated, yellow quartz sand with gravel, silt, and clay. The Cohansey Sand Formation is from 50 to 100 feet deep in the JB MDL area. Its sandy nature exerts a major influence on the region as soils that have developed are generally droughty, acidic and low in nutrients.

The major types of soils on the base as delineated in the two county soil maps are shown with their acreage totals in Table 6: Soil Types and Acreage found at JB MDL and in Figure 2: Soil Survey Area Map.

**Table 6: Soil Types and Acreage at JB MDL**

| Soil Type | Acres | Soil Type | Acres |
|---|---|---|---|
| Adelphia Loam | 814.2048 | Lakewood Sand | 9662.681 |
| Atison Sand | 4560.27 | Manahawkin Muck | 2063.819 |
| Berryland Sand | 2058.468 | Mullica Sandy Loam | 475.357 |
| Buddtown Sandy Loam | 169.4162 | Pemberton Sand | 340.4058 |
| Colemantown Loam | 16.60297 | Phalanx Loamy Sand | 27.66275 |
| Collington Sandy Loam | 201.8375 | Pits Sand | 441.8488 |
| Downer Sandy Loam | 3257.258 | Psamments Substratum | 172.0816 |
| Evesboro Sand | 1813.844 | Sassafras Sandy Loam | 2136.231 |
| Fluvaquents Sandy Loam | 378.8155 | Shrewsbury Sandy Loam | 428.4074 |
| Freehold Sandy Loam | 666.95 | Udorthents Sand | 492.9005 |
| Galloway Sand | 465.7008 | Urban Land | 2092.182 |
| Holmdel Sandy Loam | 248.6104 | Water | 316.5938 |
| Humaquepts Sand | 10.48336 | Westphalia Sandy Loam | 450.8935 |
| Jade Run Sand | 260.2684 | Woodmansie Sand | 532.2248 |
| Lakehurst Sand | 7455.382 | Woodstown Sand | 157.7272 |

# Soil Survey Area




AdmB
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FrfC
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FrmE
GakB
GamB
HbmB
HoaB
HocA
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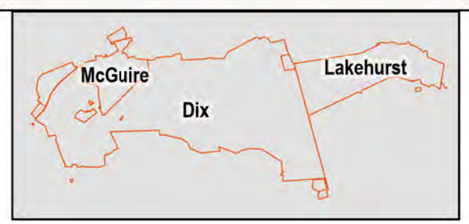
LasB
LasC
LasD
LasfB
LashB
LatB
LathB
MakAt
MunA
MunhA
PHM
PeftB
PhbC
PssA
PstAt
PsuB
SacB
ShsA
ShtA
ShuA
ThfB
ThfC
ThftB
UR
URSAAB
USADEB
UdauB
UdoB
UdrB
UdsB
UdwB
WATER
WedA
WedB
WeeA
WeeB
WobB
WobC
WofA
Installation Boundary

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W9126G-20-2-0004

N

Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:83,000

0 1 2 3 4 Miles
0 1.5 3 4.5 6 Kilometers

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### *2.2.4 Hydrology*

**Ground Water**

The Cohansey Aquifer underlies much of the Outer Coastal Plain and supplies most of the installation with potable fresh water. The water in this shallow aquifer frequently lies at or near the surface and feeds the area's abundant bogs, marshes, and swamps. Because of the high-water table and permeable soils, the underlying groundwater resources are particularly sensitive to contamination making ground water pollution prevention an important issue on the installation. Immediately below the Cohansey Formation is the Kirkwood Formation. Together, these two aquifers are estimated to contain as much as 17 trillion gallons of water (Boyd 1991). Underlying the Cohansey and Kirkwood Formations is the Potomac-Raritan- Magothy Formation. The installation's largest capacity well taps into the Potomac-Raritan-Magothy Aquifer at about 1,580 feet.

JB MDL obtains potable water from both surface and groundwater sources. The primary sources of water at the installation are a surface water diversion on Greenwood Branch on the North Branch of Rancocas Creek and eleven (11) deep wells in the Middle Aquifer of the Potomac-Raritan-Magothy (PRM) Aquifer for drinking water supply. All water sources are tested and treated to ensure that State quality standards are met. Also, there are five Cohansey Aquifer wells, two Englishtown Aquifer wells and two Wenonah-Mt. Laurel Aquifer wells. The current water allocation permits limit annual diversions from the eleven PRM wells to 1021.891 million gallons per year and requires a passing flow of 23 cubic feet per second (cfs) at the Greenwood Branch of North Branch of Rancocas Creek. JB MDL is required to adopt and implement a continuous program to encourage water conservation in all types of use.

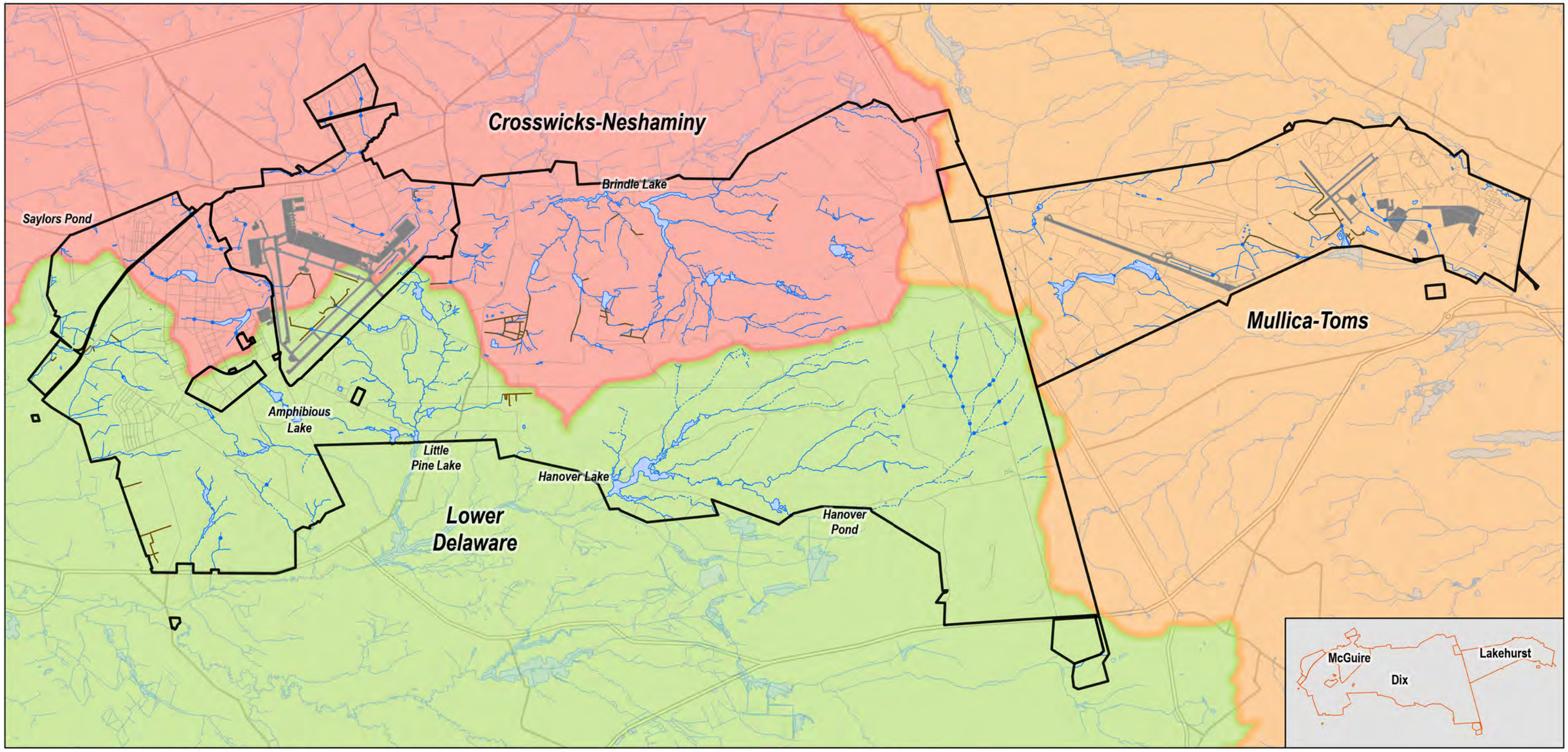
**Surface Water**

Figure 3: Watersheds, Waterbodies and Water Course Lines Map shows the surface water resources at JB MDL, which consist of seven major streams: Ridgeway Brook, Assiscunk Creek, Crosswicks Creek, Rancocas Creek, Manapaqua Brook, North Ruckles Branch and the Toms River. Three of these creeks are tributaries to the Delaware River: Assiscunk Creek, Crosswicks Creek, and North Branch Rancocas Creek. Rancocas Creek is the only major Pinelands stream that flows west and drains into the Delaware River. In the Lakehurst area of JB MDL surface water drainage runs southeast and is primarily in the Toms River Basin, which drains southeast into Barnegat Bay. The western portion of the installation is in the Rancocas and Crosswicks Creeks watersheds. Smaller streams include Harris Branch, Elisha Branch, Paint Branch, and a number of unnamed tributaries.

Natural lakes are virtually absent from the Pinelands, and any occurring in the region are the result of damming to form mill ponds, lakes, or cranberry bogs. At JB MDL, North Ruckles Branch was dammed in the 1950s to create three small lakes: Pickerel Lake, Clubhouse Lake, and Bass Lake. Several other created lakes on the installation include Hanover Lake, Willow Pond, Laurel Pond, Brindle Lake and Dogwood Pond. Other impoundments have been created for fire suppression, fishing, and waterfowl use.

The streams of the Pinelands are slow moving, warm, largely forest-covered, and shallow. The waters are low in nutrients, turbidity, and dissolved solids. However, they are generally high in acidity and dissolved iron. Surface water conditions determine the fish, amphibians, invertebrate populations, and flora that occur (McCormick 1970).

# Watershed (HU-8), Waterbodies, and Water Course Lines

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Coordinate System: WGS 1984 UTM Zone 18N
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Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

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- Perennial lake or pond
- Reservoir
- Canal or ditch
- Intermittent stream or river
- Perennial stream or river
- Underground water aqueduct
- Crosswicks-Neshaminy Watershed
- Lower Delaware Watershed
- Mullica-Toms Watershed
- Roads
- Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

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**Floodplains**

A floodplain study was prepared by the USACE for the Lakehurst area of JB MDL in 1989 and was later revised in 1990 (USACE 1990). Peak discharges for flood levels that occur with average intervals of 10, 50, 100, and 500 years were determined for Ridgeway Branch, North Ruckles Branch, Manapaqua Brook, Paint Branch, and Harris Branch. Flood Insurance Studies have also been prepared by the Federal Emergency Management Agency for the Township of Manchester and the Borough of Lakehurst, which are in close agreement with the USACE studies. No floodplain studies have been conducted on the Dix or McGuire areas of JB MDL.

**Wetlands**

A total of 9,353 acres are classified as wetlands at JB MDL (JB MDL, 2015). Wetlands at the Lakehurst area of JB MDL were mapped following the Cowardin Wetland Classification Codes (Cowardin et al. 1979). The Cowardin classification is divided into five major systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Wetlands delineated at JB MDL belong primarily to the Palustrine system. Wetlands for the eastern 1/3rd of Lakehurst were ground truthed in 1996 by Dames and Moore. Wetlands in the western 2/3rds of Lakehurst were ground truthed by Geo-Marine during the writing of the Lakehurst INRMP in 2000. Wetlands on the McGuire section were delineated in 2007 with a Letter of Interpretation from the Pinelands. Wetlands on the Dix area have not been formally delineated, except on a case by case basis. JB MDL currently uses the NJDEP wetlands map for general planning purpose on the Dix section of the base. Larger projects are required to perform their own wetlands delineations to ground truth the NJDEP map.

**Stream Channel Flood Modeling**

In the 2019 CSU climate study, modeling of stream channel overflow (or flood modeling) was conducted for JB MDL to examine the extent of flooding along Ridgeway Branch associated with climate projections. Flood modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. Flood modeling was conducted using local watershed characteristics and the design storms generated from climate projection data. The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts).

Stream channel overflow associated with the baseline design storm was estimated to inundate 49 acres along Ridgeway Branch. Although design storm precipitation is estimated to decrease by between 8-25% for projected climate scenarios, projected inundation is expected to remain approximately the same as baseline conditions, with estimated reductions of only a few acres.

## *2.3 Ecosystems and the Biotic Environment*

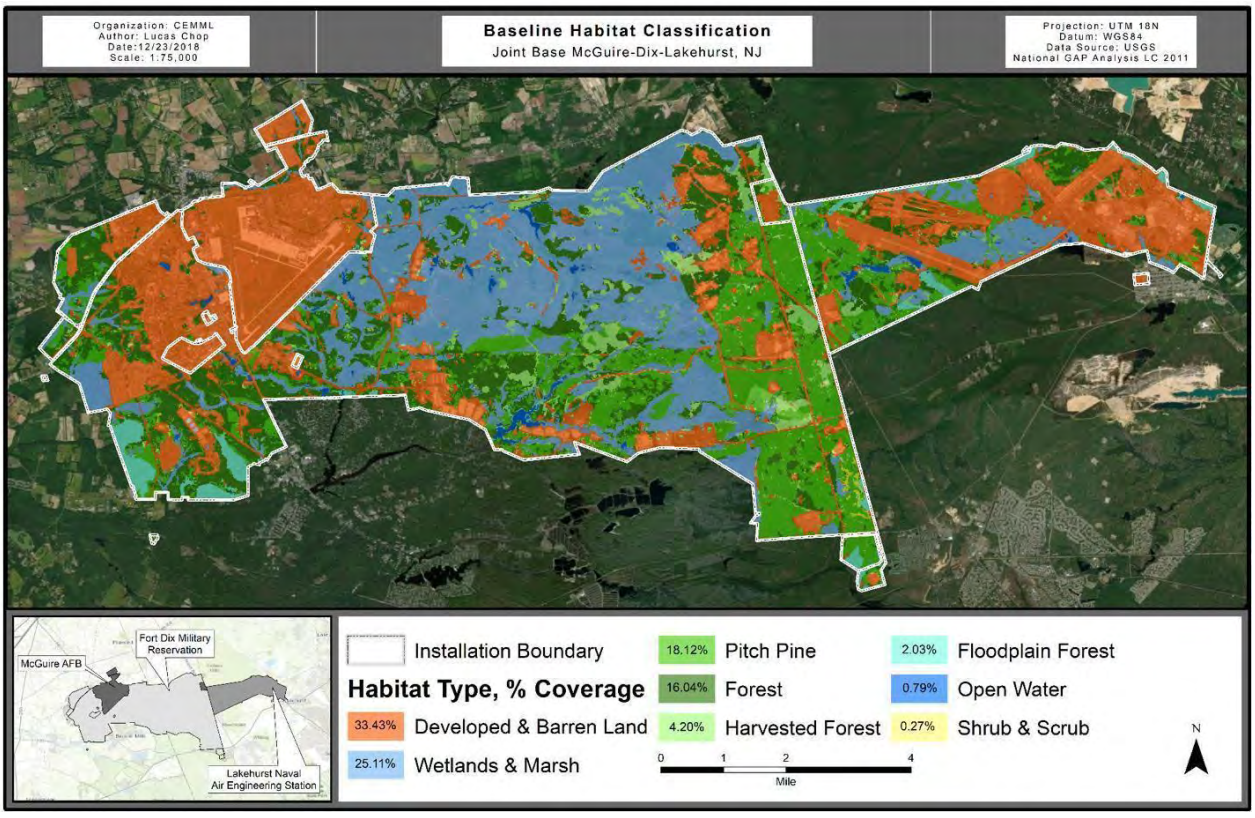
### *2.3.1 Ecosystem Classification*

JB MDL is classified within the Humid Temperate Domain, Hot Continental Division, Eastern Broadleaf Forest (Oceanic) Province, Upper Atlantic Coastal Plain Section (Bailey, 2014). Ecosystems in this domain are subject to seasonal fluctuations in precipitation and temperature, which results in vegetation such as prairie, broadleaf deciduous forest and evergreen conifer forests. These areas also experience high humidity, absence of very cold winters, ample rainfall heaviest in summer months, severe thunderstorms frequent in summer months, possibility of tropical hurricanes, and a moderately wide range of temperatures (Bailey, 2014).

Seven ecosystems were identified at JB MDL from the United States Geological Survey (USGS) National Gap Analysis Project (GAP) Land Cover 2011 classification including wetlands and marsh, pitch pine, forest, harvested forest, floodplain forest, open water and shrub/scrub. Natural ecosystems as well as developed land and crop/pasture areas are summarized in Table 7.

**Table 7: Ecosystem coverage by area (USACE 2019)**

| Habitat Type | Area (acres) | Coverage (%) |
|---|---|---|
| Wetlands and Marsh | 9353.11 | 22.27% |
| Pitch Pine | 8139.59 | 19.38% |
| Forest | 7049.01 | 16.78% |
| Harvested Forest | 2060.03 | 4.90% |
| Floodplain Forest | 856.67 | 2.04% |
| Open Water | 331.44 | 0.79% |
| Shrub and Scrub | 113.66 | 0.27% |
| Developed and Barren Land | 14091.34 | 33.55% |




Ecosystems identified at JB MDL (USACE 2019)

### *2.3.2 Vegetation*

Vegetation in the Pinelands is characterized by a mix of pitch pine (*Pinus rigida*), Virginia pine (*Pinus virginiana*) and short leaf pine (*Pinus echinata*). Forest vegetation is divided into three major associations: mixed mesophytic, Appalachian oak, and pine-oak. Much of the installation is forested with pine/oak or oak/pine forest communities and includes an abundant understory vegetation of mountain laurel, blueberry, huckleberry, vines, grasses and wildflowers that provide excellent cover. The dense pine stands provide valuable evergreen cover throughout the critical winter months. Dense deciduous stands of red maple, sweet gum and black gum in wetland forests include thickets of native green briar in the understory that provide cover for wildlife.

Previously, intensively used training areas remained in an early successional stage due to frequent disturbance from training activities. Some of these areas are now used less intensively and have reverted to scrub/shrub vegetation and will eventually become forested. Some of these areas should be kept open to maintain early successional habitat to provide for diverse wildlife habitat on the base.

#### 2.3.2.1 Historic Vegetative Cover

The original forests in this region were dominated by canopy tree species such as pitch pine, shortleaf pine, and several species of oaks (*Quercus* sp.). There was probably a larger percentage of hickory in the oak areas and a larger percentage of shortleaf pine in the pitch pine areas before Europeans arrived. Subcanopies and understories were composed of shrubby oaks such as bear oak (Quercus ilicifolia), dwarf chinaquapin oak (*Quercus prinoides*), and members of the heath family, Ericaceae. Additionally, the flora occurs within the Middle District of NJ's Coastal Plain. The original flora was more diverse than at present, as indicated by remnants of scrub pine (*Pinus virginiana*) and pure stands of Atlantic white cedar (*Chamaecyparis thyoides*), as well as marl-influenced plant associations (Synder 1994).

#### 2.3.2.2 Current Vegetative Cover

The major portion of the total land area (69%) of JB MDL is forested. Of the total of 41,776 acres on the installation, 29,162 (24,609 on Dix, 4,230 on Lakehurst and 324 on McGuire) are wooded. Of the 29,162 wooded acres, 18,267 acres are considered potentially commercial forest, where forest products could be harvested as determined by the base forester.

In 1986, the NJDEP initiated a State-wide vegetation classification and mapping program, the Integrated Terrain Unit Mapping (ITUM) Project, which created a standard land use/land cover map and GIS database for the entire State (http:// www.state.nj.us/dep/gis.). The initial mapping project was based on 1986 color infrared aerial photography and was delineated by county. In October 2007, an updated map was produced based on USGS color infrared orthophotos, which is the latest version of the vegetation classification. The updated maps are delineated by watershed management areas. The eastern portion of JB MDL lies within the Barnegat Bay watershed area and the western side of the installation lies in the Delaware River watershed area. A standardized classification system, adapted from Anderson et al. (1976) by NJDEP, was used to classify cover classes across the State. This classification system is hierarchical and has varying levels of detail. Level I categories are general categories that can be divided into more specific Level II subcategories. Some classifications in this system are based on land use, such as industrial or residential, and some are based on the type of vegetation that occurs in the area, such as the forest cover type. In natural vegetative cover types, species composition, density, and height are added to the Level II category. This high level of detail is important to show distinctions in vegetation communities and accurately reflect the level of biodiversity in an area.

A total of 29 Level II vegetative cover/land use classifications were identified at JB MDL. Each classification and its subcategories delineated at JB MDL are described below. Figure 4: Vegetation Map shows a simplified version of the classification using only Level I classifications. Slight modifications were applied to several of the classifications described below in order to better describe all of the cover types at JB MDL. For example, minimum size restrictions on water bodies and canals were dropped to allow all water to be classified.

**Deciduous Forest 4120 (>50% Crown Closure)**

Deciduous forests include forested areas in which at least 75% of the canopy cover is comprised of deciduous tree species that are least 20 feet tall. Very little upland forest on JB MDL has greater than 75% hardwood cover and only one subtype occurs on the installation. Dominant trees in this forest type include black, white, scarlet, and chestnut oaks (*Quercus velutina*, *Q. alba*, *Q. coccinea*, and *Q. prinus*). Smaller amounts of hickories (*Carya* spp.) and other hardwoods can also occur. Flowering dogwood (*Cornus florida*), and sassafras (*Sassafras albidum*) can occur as understory trees. The shrub layer is dominated by a variety of heaths, including dangleberry and black huckleberry (*G. baccata*), early lowbush blueberry (*Vaccinium pallidum*) and small amounts of mountain laurel (*Kalmia latifolia*) and staggerbush. The herbaceous layer is sparse and includes pin cushion mosses (*Leucobryum* spp.), wintergreen, spotted wintergreen (*Chimaphila maculata*), and Pennsylvania sedge (*Carex pensylvanica*). Leaf litter is the primary ground cover. These forest communities occur on mesic sites where fire regimes tend to be infrequent. Fires that do occur tend to be low intensity fires because of mesic conditions and deep shade under the closed hardwood canopy (Windisch 2000). These communities are more common on the Inner Coastal Plain.

**Coniferous Forest 4210 (10-50% Crown Closure) and 4220 (>50% Crown Closure)**

Evergreen forest land includes all forested areas in which the trees are predominantly those which remain green throughout the year. Both coniferous and broadleaved evergreens are included in this category. In all areas throughout JB MDL the coniferous evergreens are predominant and consist of several species of pine. The coniferous evergreens are commonly referred to or classified as softwoods. They include such eastern species as Pitch pine (*Pinus rigida*), Shortleaf pine (*Pinus echinata*), and Loblolly pine (*Pinus taeda*). The three subtypes below occur at JB MDL. Pine comprises less than 50% of the basal area in pine stands, or 50% or less of the stems in sapling and seedling stands. In mixed pine stands, pitch pine is predominant.

**Pine Plantation 4230**

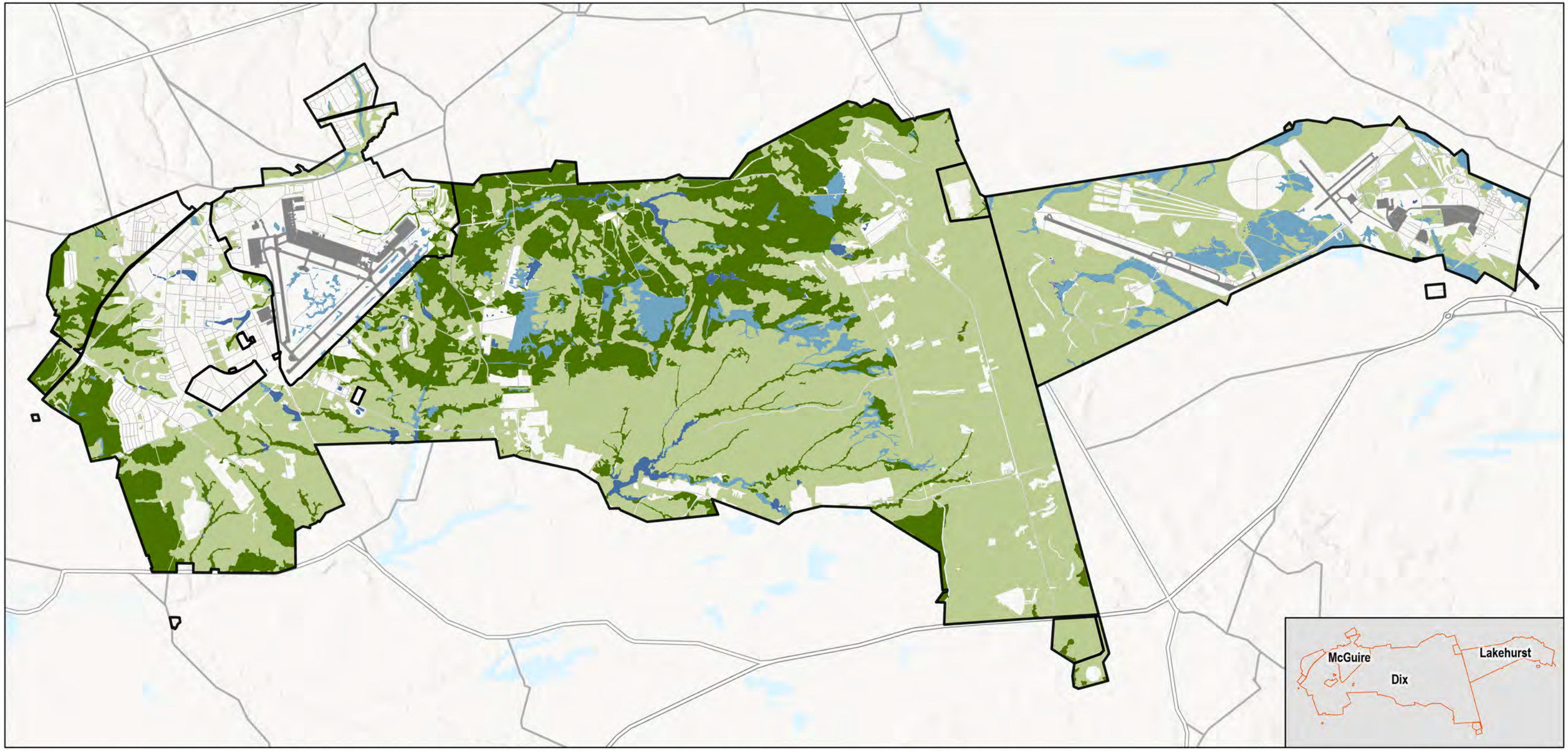
This is an area of mixed or single species of pine that were originally purposefully planted and usually make up a pure, even-aged stand.

**Effects of Climate Change on JB MDL Ecosystems**

As reported in the 2019 CSU climate change study for JB MDL (USACE 2019), slight changes in temperature and precipitation can substantially alter the composition, distribution, and abundance of species in these ecosystems, and the products and services they provide. The extent of these changes will also depend on changes in precipitation and fire. Increased drought frequency could also cause major changes in vegetation cover. Losses of vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability will dramatically increase potential erosion rates.

Wetland and riparian vegetation are the most abundant vulnerable habitats at JB MDL. These ecosystems will face increases in air and surface water temperatures, alterations in the magnitude and seasonality of precipitation and run-off and shifts in reproductive phenology and distribution of plants and animals. Wetlands provide linear habitat connectivity, link aquatic and terrestrial ecosystems, and create thermal refugia for wildlife, all characteristics that can contribute to ecological adaptation to climate change.

# Vegetation

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Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

- Woody Wetlands
- Emergent Herbaceous Wetlands
- Forest
- Open Water
- Roads
- Installation Boundary

This map depicts a discrete area where terrestrial flora has been classified according to the National Vegetation Classification Standard (Version 2). Areas without a classification have been developed beyond their natural state and include, but are not limited to, urban areas, roads, ranges, and areas that are consistently mowed/ maintained.

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

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In general, forests and hardwood ecosystems are susceptible to climate change. There is a temperature below which the equilibrium state of the forest appears constant, but above which the equilibrium forest cover declines steadily. This threshold represents a point where some degree of loss of the forest is inevitable. As the threshold is exceeded, there is a gradual increase in the committed die-back, with changes that are more progressive than sudden. Therefore, forested areas vegetation at JB MDL may experience some degree of die-back before impacts are observed. For example, if climate were stabilized in 2050, a significant die-back could still occur over the next 100-200 years.

Losses of vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability will dramatically increase potential erosion rates. Rising temperatures under various climate change scenarios will likely enhance soil decomposition. Together with reductions in rainfall, this may also reduce plant productivity over large areas.

#### 2.3.2.3 Turf and Landscaped Areas

In the developed portions of the installation, the areas requiring the most lawn maintenance are golf courses, the lawns around buildings, monuments, flagpoles, recreation fields, and entrances to the installation. Some of these areas receive irrigation, lime, fertilizer, and lawn chemicals.

In the past, JB MDL maintained two 18-hole golf courses, one in the McGuire area and one in the Dix area. The McGuire golf course was shut down in late summer 2018. The Lakehurst area also has a nine-hole course. In the case of the golf courses, chemicals used could include fungicides, herbicides, and insecticides. The golf courses are maintained by specially trained turf managers. The remaining lawn acreage is not intensively maintained and generally no herbicides or fertilizers are used. The public works contractor has reduced the need for irrigation by planting native, low-maintenance shrubs by all newly constructed buildings. High maintenance shrubs have also been replaced with low maintenance; native varieties as needed.

In past years, buffers were maintained around streams, lakes, ponds, wells, and monitoring wells. Un-mowed areas should be re-established around the majority of the ponds. Natural vegetation at the water's edge reduces pond bank erosion and also acts as a water quality buffer and discourages Canada geese (*Branta canadensis*) from using these ponds. Large, mowed open areas that are not generally used for a specific purpose should be considered for a reduced frequency of mowing. Re-establishing wildflower patches in large, open, but visible areas, would beautify these low maintenance areas while reducing mowing cost over the long term.

The installation has discontinued sampling for soil quality parameters. Soil testing can be used to determine if lime and fertilizer is needed. The high cost of fertilization and lime has reduced the amount of highly maintained areas. Certain lawn areas have bare patches due to poor quality, highly acidic, and drought-prone soils. Lawn maintenance is usually limited to regular mowing and has historically lacked liming, fertilization, pest control and, most importantly, irrigation. Mowing at a higher height would reduce lawn weeds and soil erosion and make grasses more drought tolerant.

### *2.3.3 Fish and Wildlife*

Wildlife habitat management involves changing the characteristics of, and interactions among plants, wildlife and humans to achieve specific wildlife goals and objectives. Wildlife management challenges at JB MDL include balancing recreational opportunities with military training operational needs, including consideration of the installation's BASH requirements to ensure aviation safety.

Habitat management at JB MDL includes planting native species of warm season grasses, monitoring for rare plants and animals that may be impacted by mission activities, control of invasive pests and non-indigenous species, and forestry activities such as prescribed burning.

Some wildlife species are habitat generalists that do not have very specific habitat requirements and seem to thrive despite human disturbance. Examples of these types of species include American robins (*Turdus migratorius*) and white-tailed deer (*Odocoileus virginianus*). Other species require very specific habitats and do not fare as well with human disturbance. Examples of these types of species include brook trout (*Salvelinus fontinalis*) and barred owls (*Strix varia*).

White-tailed deer populations will continue to be managed at a level consistent with the installation's military mission and within the carrying capacity of the Pinelands ecosystem. Natural Resources personnel will continue to cooperate with NJDFW to set annual hunting seasons and bag limits at JB MDL. Annual harvest records will continue to be collected, summarized, and reported to NJDFW to help assess deer population levels and herd condition.

Fish and wildlife communities on JB MDL are not expected to experience significant changes due to climate change. Increasing temperatures and precipitation are not likely to impose direct threats to the majority of wildlife species found there but raise concern for indirect threats. Migrating birds may be particularly indirectly vulnerable to rising temperatures. Many birds time their migration routes to coincide with the springtime emergence of insects from their overwintering states. Rising temperatures will prompt insects to emerge earlier, and birds migrating to or through JB MDL will miss a major feeding opportunity, resulting in decreased bird populations (Both et al., 2010).

Changing climate also has the potential to alter vegetation communities. This will likely have a negative impact on specialist wildlife species that have historically depended on specific native plant communities for their survival (Dukes & Mooney, 1999). Changing environmental conditions may also create open niches for non-native species to expand onto JB MDL. Newly arriving invasive species often have the ability to outcompete native species, which are already experiencing reduced fitness due to environmental conditions shifting away from historic standards (Hellmann, Byers, Bierwagen, & Dukes, 2008). Rising temperatures could also result in the increased potential for foodborne diseases and incidences of infectious diseases of animals that are transmittable to humans, particularly those carried by foxes, rodents and arthropods such as rabies and West Nile virus (Githeko, Lindsay, Confalonieri, & Patz, 2000).

Average annual precipitation is projected to increase slightly but will possibly be offset by higher evapotranspiration rates due to increasing temperatures. Increasing temperature will likely have a negative impact on water quality, particularly in lentic systems (still fresh water). As water temperatures rise in lentic systems, dissolved oxygen content will lower, decreasing habitat quality particularly for larval amphibians and macroinvertebrates. Increasing water temperature will also raise the chances of algal blooms occurring, further depleting dissolved oxygen content and habitat quality (Paerl, Hall, & Calandrino, 2011).

### *2.3.4 Threatened and Endangered Species and Species of Concern*

Because of its location within the Pinelands National Reserve, along with its diversity of habitat and large land area, JB MDL supports many rare, threatened, and endangered plant and animal species protected at the Federal level, as well as those protected by the State of NJ.

A base's overall ecosystem management strategy must provide for protection and recovery of federally designated threatened and endangered species (see Figure 5: Special Status Species). When practical, Natural Resources personnel shall give the same protection to any State-listed threatened, endangered, or other rare species as given to federal species. The USFWS, NJDFW, and the Pinelands Commission cooperate in managing threatened and endangered species in the geographic area of JB MDL pursuant to the requirements of Section 7(a) of the ESA (16 U.S.C. 1536), the Endangered and Nongame Species Conservation Act, NJSA 23:2A-1 to 13, and the Endangered Plant Species List Act, NJSA 13:1B-15.151 to 15.158.

Under the ESA, an "endangered species" is defined as any species that is in danger of extinction throughout all or a significant portion of its range. A "threatened species" is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The USFWS has also presented an updated list of species being considered for listing under the ESA. With respect to species being considered for listing, JB MDL follows AFMAN 32-7003 paragraph 3.38.1: "When practical, provide similar protection to plants and animals that are species being considered for Federal listing." Although species being considered for listing receive no statutory protection under the ESA, the USFWS believes it is important to advise government agencies, industry, and the public that these species are at risk and might warrant protection under the Act.

The NJ law defines endangered wildlife species as "any species or subspecies of wildlife whose prospects of survival or recruitment are in jeopardy or are likely within the foreseeable future to become so due to any of the following factors: (1) the destruction, drastic modification, or severe curtailment of its habitat, or (2) its over-utilization for scientific, commercial or sporting purposes, or (3) the effect on it of disease, pollution, or predation, or (4) other natural or manmade factors affecting its prospects of survival or recruitment within the State, or (5) any combination of the foregoing factors. The term shall also be deemed to include any species or subspecies of wildlife appearing on any Federal endangered species list" (NJSA 23:2A-1). New Jersey law defines endangered plant species as "any native plant species whose survival in the State or the nation is in jeopardy, including, but not limited to, plant species designated as listed, proposed, or under review by the Federal government as endangered or threatened throughout its range in the United States pursuant to the "Endangered Species Act of 1973, Public Law 93-205 (16 U.S.C. 1533), any additional species known or believed to be rare throughout its worldwide range, and any species having five or fewer extant populations within the State" (NJSA 13:1B-15.151).

**Rare Plant and Animal Surveys**

Many rare plant and animal species surveys have been conducted on JB MDL throughout the years.

Biological inventories conducted on the installation include rare invertebrate surveys focusing on Lepidoptera. These surveys were conducted on the Dix Area in 1995 (Schweitzer, 1996) and the Lakehurst Area in 1988 (Schweitzer, 1988). The surveys showed a number of State and globally rare Lepidoptera, including a NJ threatened butterfly, silver-bordered fritillary (*Bolaria selene myrina*) and the NJ endangered skipper, arogos skipper (*Atrytone arogos arogos*). The findings show that JB MDL has one of the three highest concentrations of globally rare Lepidoptera found anywhere in eastern North America north of the Florida peninsula (Schweitzer, 1988). The full results of these surveys are presented in the final reports located in the Natural Resource office. Both Schweitzer reports give species data as well as management recommendations, including the continuation of prescribed burns to maintain early successional habitat.

See Appendix O for a full listing of the various surveys and monitoring programs conducted on JB MDL.

**Federally Listed Threatened and Endangered Species Identified on JB MDL**

Of the 57 rare, threatened, or endangered species listed in Appendix B: JB MDL Threatened and Endangered Species Fauna Register, 24 State threatened, or endangered species have been documented on the installation. Individual species of concern are described in more detail below. Updated summary information for animals can also be found on the NJ DEP website at www.state.nj.us/dep/fgw/tandespp.htm. Updated summary information for plants can be found on the following NJDEP website: https://www.nj.gov/dep/parksandforests/natural/heritage/njplantlist.pdf.

## Table 8: Federally Listed Threatened and Endangered Species and Occurrences on JB MDL

| Scientific Name | Common name | Federal status | State Status | State rank | Global rank | Occurrence |
|---|---|---|---|---|---|---|
| | | | | | | |
| Plants | | | | | | |
| *Aeschynomene virginica* | Sensitive Joint vetch | T | E | S1 | G2 | Not identified on JB MDL |
| *Amaranthus pumilus* | Seabeach Amaranth | T | E | S1 | G2 | Not identified on JB MDL |
| *Helonias bullata* | Swamp-pink | T | E | S3 | G3 | Present Dix |
| *Isotria medeoloides* | Small Whorled Pogonia | T | E | S1 | G2 | Not identified on JB MDL |
| *Rhynchospora knieskernii* | Knieskern's Beaked rush | T | E | S2 | G2 | Present Lakehurst |
| *Schwalbea americana* | Chaffseed | E | E | S1 | G2G3 | Potential Dix and Lakehurst |
| Animals | | | | | | |
| *Glyptemus muhlenbergii* | Bog Turtle | E | E | S1 | G3T1T2 | Present Lakehurst, potential Dix |
| *Myotis septentrionalis* | Northern Long-eared Bat | T | | | | Present Lakehurst, potential Dix |
| *Myotis sodalis* | Indiana Bat | E | E | | | Not identified on JB MDL |
| *Nicrophorus americanus* | American Burying Beetle | E | E | | | Not identified on JB MDL |
| *Neonympha m. mitchellii* | Mitchell's Satyr | E | E | | | Not identified on JB MDL |

| **Federal and State Status Key** | |
|---|---|
| Endangered | E |
| Threatened | T |
| Candidate | C |
| **NatureServe State (S) and Global (G) Conservation Codes** | |
| Critically Imperiled | S/G1 |
| Imperiled | S/G2 |
| Rare/Vulnerable | S/G3 |
| Infraspecific taxon ranked differently than full species | T |

### Swamp pink (*Helonias bullata*)

Swamp pink is a State-listed endangered and Federally listed threatened plant species. Swamp pink habitat is found on all three areas of JB MDL. Swamp pink is one of the first wildflowers to appear in the spring. The plant typically flowers from March through the middle of May. It is frequently found growing on hummocks formed by trees, shrubs, and sphagnum moss. Swamp pink flowers are fragrant, pink, and occur as a terminal cluster at the end of a hollow stem. The flower cluster consists of approximately 30 to 50 florets. The stem supporting flowers typically emerges in late winter from a basal rosette of dark evergreen, lance-shaped, and parallel-veined leaves. Height of the stem varies from a height of 2 to 9 decimeters during flowering to 1.5 meters during seed production. Swamp pink grows in infertile, acidic soils. The specialized habitat requirement of the plant has contributed to its rare occurrence and consequent decline of the species. New Jersey supports approximately 70% of the known populations of swamp pink. There are approximately 68 sites distributed throughout the southern Coastal Plain of NJ. Most of the swamp pink populations in NJ are located along the Pinelands fringe in the Delaware River Drainage Basin. The loss of forested wetland habitat through either filling or draining has contributed to the decline of the species throughout all of its range. Swamp pink is sensitive to pollution and changes in the hydrologic regime. Swamp pink is protected under the NJ Endangered Plant Species List Act of 1989 (NJSA 13:1B-15.151).

In December 2015, a Swamp pink colony was discovered in a stream section of Gaunt's Brook located between BIV 13 and BIV 13A on the JB MDL Dix Ranges. In January 2016, John Joyce, JB MDL Natural Resource Manager, escorted botanist Ted Gordon to the site where he confirmed that the colony was indeed Swamp pink (Helonias bullata).

The original site was visited in May 2016 and 2 more colonies in the same stream system were identified. All 3 colonies occur between the BIV 13 and BIV 13A area along Gaunt's Brook. A count survey was conducted, and a total of 271 plants were counted and of those 43 were flowering. Colony 1 (the original colony found in 2015) had 80 plants with 24 flowering, colony 2 had 40 plants with 8 flowering, and colony 3 had 151 plants with 11 flowering.

Due to the close proximity to active bivouac sites, USFWS Best Management Practices will be employed including avoiding direct modifications to the wetlands supporting Swamp pink and providing adequate upland buffers around wetlands supporting Swamp pink. Discussions are underway with the Army regarding planting trees on both sides of the bivouac areas, and possibly shifting BIV 13 further west away from Gaunt's Brook to limit disturbance to this area. In the interim, non-descript fencing will be installed on both sides of Gaunt's Brook to discourage encroachment in this wetland/riparian area. Yearly monitoring will be conducted during the April/May timeframe to assess the health and numbers of Swamp pink. Additional attention will be paid to this area to monitor for beaver (Castor Canadensis) activity that may present a change in hydrology that could adversely affect the colony's health. A May 2020 survey again revealed a healthy population of Swamp pink, with a new population found further down the Gaunt's Brook drainage.

The USFWS survey protocol has been added as Appendix L.

### Knieskern's Beaked-Rush (*Rhynchhospora knieskernii*)

Knieskern's beaked- rush was federally listed as a threatened species in 1991. A semi-perennial member of the sedge family, Knieskern's beaked-rush is a grass-like plant that grows 0.6 to 24 inches tall and is distinguished from other species by its fruit (achene). Fruiting typically occurs from July to September.

Knieskern's beaked-rush is found only in (endemic to) New Jersey. An obligate wetland species, this species occurs in early successional wetland habitats, often on bog-iron substrates adjacent to slow-moving streams in the Pinelands region. In the past, fire may have played an important role in creating and maintaining suitable

habitat for Knieskern's beaked-rush. This species is also found in human-disturbed wet areas that exhibit similar early successional stages due to water fluctuation or periodic disturbance from vehicles, mowing or fire. These human-influenced habitats include abandoned borrow pits, clay pits, ditches, rights-of-way and unimproved roads. It is often associated with other sedge and grass species. However, it is intolerant of shade and competition, especially from woody species, and is sometimes found on relatively bare substrate. Knieskern's beaked-rush has been identified at the Jump Circle on the Lakehurst side of JB MDL. Three quarters of the Jump Circle will undergo prescribed burning in late Fall/Early winter, while one quarter will be mowed. This burn/mowing cycle is rotated every year to control woody species from colonizing this area.

Threats to Knieskern's beaked-rush include habitat loss from development, agriculture, hydrologic modification, and other wetland modifications; excessive disturbance from vehicle use, trash dumping, and other activities; and natural vegetative succession of the open, sparsely-vegetated substrate preferred by this species.

**American Chaffseed (*Schwalbea americana*)**

American chaffseed is a Federally-listed endangered hemiparasitic herb that requires frequent fire or understory removal to persist. Due to the disappearance of the species from over half of its range, American chaffseed was listed as an endangered species in 1992. Although this herb was never historically observed at JB MDL, the remaining natural occurrence of chaffseed in New Jersey is in the vicinity of JB MDL's boundary. Suitable habitat for the species exists on JB MDL as a result of prescribed burns and a mowing regime maintaining suitable grassland areas at an early successional stage, which potentially could provide prime habitat for the species.

Seven personnel from the NJ Natural Heritage Program have been cleared and given base badges to conduct surveys for American chaffseed at Joint Base starting in 2019. Natural Resource personnel will encourage other botanists to conduct surveys on the Base and will continue the prescribed burning program on select grasslands that appear to benefit this species.

## Bog turtle (*Glyptemmys muhlenbergii*)

The bog turtle is listed as Federally threatened, and State endangered. This species has been documented within 0.1 mile of the northwest boundary of JB MDL (USFWS 2001). The bog turtle is a tiny (3-4 inch), dark turtle with a distinct orange patch behind the tympanum (ear membrane) on either side of the head. Bog turtles inhabit open, wet meadows and bogs with standing or slow-moving water over mucky substrates. Bog turtles also occur in emergent and scrub/shrub wetland habitat. Bog turtles prefer areas with good sunlight, high evaporation rates, high humidity in the near-ground microclimate, and perennial saturation of portions of the ground.

Suitable habitat exists on all three areas of JB MDL but the only confirmed sightings are on the Lakehurst Area. In 1988, Ray Stein, and again in 1993, John Joyce, found a bog turtle in the southeast corner of the base. In 2004 and 2005, extensive surveys were conducted for this species on the Dix Area, but no bog turtles were found. A 2004 survey on the McGuire Area concluded that habitats for the bog turtle exist in the forested wetlands along North Run and its tributaries in the northeastern part of the McGuire section of JB MDL. These reports indicated that some suitable habitat for this species still exists on the installation. Natural Resources staff will continue to look for this turtle while conducting other monitoring projects. Management efforts will include wetland network protection and the control of vegetative succession and invasive plant encroachment as well as any management actions required by the USFWS Bog Turtle Best Management Practices published October 2019 (See Appendix Q: USFWS BMPs for Bog Turtles).

An extensive bog turtle survey was conducted by Herpetological Associates (HA) in 2011 next to the McGuire Airfield prior to clearing of all woody vegetation and obstructions on the east side of Runway 06/24. During this survey, HA investigated approximately 194 acres of wetlands and transitional areas associated with the designated "Clear Zones" for bog turtle habitat.

At that time, HA found only one wetland that was considered suitable habitat. HA conducted a bog turtle survey again in 2018, but their assessment during this latest survey was that no suitable habitat remained on the base. This assessment may partially be due to vegetative succession by wetland trees and invasive plants, but also due to changing water levels from beaver activity on the base. Recent (November 2018) installation of "beaver deceivers", devices designed to prevent beavers from damming culverts and other structures, may help manage and maintain water levels and may establish more favorable habitat around JB MDL. A beaver deceiver device was installed in the wetlands in the southeast corner of the Lakehurst base where a bog turtle was last captured in 1993. Base Natural Resources personnel will survey for bog turtles from April 15th-June 15th around this wetland again once water levels become stable.

## Table 9. State Listed Threatened and Endangered Animals and Identified on JB MDL

| Common Name | Genus | Species | Subspecies | Federal Status | State Status | State Rank | Global Rank | Occurrence |
|---|---|---|---|---|---|---|---|---|
| Amphibians | | | | | | | | |
| Eastern Mud Salamander | *Pseudotriton* | *montanus* | *montanus* | NL | T | S2 | G5, T5 | PDi |
| Pine Barrens Tree Frog | *Hyla* | *andersonii* | | NL | T | S2 | G4 | DD, DL |
| Southern Gray Tree Frog | *Hyla* | *chrysoscelis* | | NL | E | S1 | G5 | PDi |
| Birds | | | | | | | | |
| American Bittern | *Botaurus* | *lentiginosus* | | MNB | Ebr, SCnb | S2B | G4 | DDi, DL |
| American Kestrel | *Falco* | *sparverius* | | NL | T | S3B, S3N | G5 | DDi, DM, DL |
| Bald Eagle | *Haliaeetus* | *leucocephalus* | | BGEPA | Ebr, Tnb | S1B, S1N | G5 | DDi, DL, DM |
| Barred Owl | *Strix* | *varia* | | NL | T | S2B, S1N | G5 | DDi, DL |
| Bobolink | *Dolichonyx* | *oryzivorus* | | NL | Tbr, SCnb | S2B, S3N | G5 | DDi, DL, DM |
| Grasshopper sparrow | *Ammodramus* | *savannarum* | *pratensis* | MNB | Tbr | S3B, S3N | G5 | DDi, DM, DL |
| Henslow's Sparrow | *Ammodramus* | *henslowii* | | MNB | E | S1B, S1N | G4 | PDi, PM, DL |
| Horned Lark | *Eremophila* | *alpestris* | | NL | Tbr, SCnb | S3B, S3N | G5 | DL, DM |
| Long-eared Owl | *Asio* | *otus* | | NL | T | S2B, S2N | G5 | DDi |
| Northern Goshawk | *Accipter* | *gentilis* | | MNB | Ebr, Ecnb | S1B, S3N | G5 | PDi |
| Northern Harrier | *Circus* | *cyaneus* | | MNB | Ebr, SCnb | S1B, S3N | G5 | DDi, DM, DL |
| Osprey | *Pandion* | *haliaetus* | | NL | Tbr | S2B | G5 | DDi, DL |
| Pied-billed Grebe | *Podilymbus* | *podiceps* | | NL | Ebr, SCnb | S1B, S3N | G5 | DDi, DM, PL |
| Red-headed Woodpecker | *Melanerpes* | *erythrocephalus* | | MNB | T | S2B, S2n | G5 | PDi |
| Red-shouldered Hawk | *Buteo* | *lineatus* | | MNB | Ebr, SCnb | S1B, S2N | G5 | DDi |
| Savannah Sparrow | *Passerculus* | *sandwichensis* | | NL | Tbr | S2B, S4N | G5 | DDi, DM, DL |
| Sedge Wren | *Cistothorus* | *platensis* | | MNB | E | S1B, S1N | G5 | PDi |
| Upland Sandpiper | *Barramia* | *longicauda* | | MNB | E | S1B, S1N | G5 | PDi, DM, DL |
| Vesper Sparrow | *Pooecetes* | *gramineus* | | NL | Ebr, SCnb | S1B, S2N | G5 | PDi, PM, DL |
| | | | | | | | | |
| Invertebrates | | | | | | | | |
| Arogos Skipper | *Atryone* | *arogos* | *arogos* | NL | Ebr, SCnb | S1 | G3, T1, T2 | DDi, PL |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frosted Elfin | *Callophrys* | *irus* | | NL | T | S2 | G3, T1, T2 | PDi, PL |
| Silver-bordered Fritillary | *Boloria* | *selene* | *myrina* | NL | T | SNR | G5 | DDi |
| Mammals | | | | | | | | |
| Bobcat | *Lynx* | *rufus* | | NL | E | S1 | G5 | PDi, PL |
| Reptiles | | | | | | | | |
| Bog Turtle | *Glyptemys* | *muhlenbergii* | | T | E | S1 | G3, T1, T2 | PDi, DL |
| Corn Snake | *Elaphe* | *guttata* | *guttata* | NL | E | S1 | G5, T5 | DDi, DL |
| Northern Pine Snake | *Pituophis* | *melanoleucus* | *melanoleucus* | NL | T | S2 | G4, T4 | DDi, PM, DL |
| Timber Rattlesnake | *Crotalus* | *horridus* | | NL | E | S1 | G4 | DDi, PL |
| Wood Turtle | *Glyptemys* | *insculpta* | | NL | T | S2 | G4 | DDi |

| **Status and Occurrence Key** | | **NatureServe State (S) and Global (G) Conservation Codes** | |
|---|---|---|---|
| Documented | D | Critically Imperiled | S/G1 |
| Potential to Occur | P | Imperiled | S/G2 |
| McGuire | M | Rare/Vulnerable | S/G3 |
| Dix | Di | Apparently Secure | S/G4 |
| Lakehurst | L | Secure | S/G5 |
| Endangered | E | Infraspecific taxon ranked differently than full species | T |
| Threatened | T | | |
| Not Listed | NL | | |
| Special Concern | SC | | |
| Breeding | br | | |
| Non-Breeding | nb | | |
| Bald and Golden Eagle Protection Act BGEPA | | | |
| Migratory Nongame Bird of Management Concern MNB | | | |

## Table 10. State Animal Species of Concern Identified on JB MDL

| Common Name | Genus | Species | Subspecies | Federal Status | State Status | State Rank | Global Rank | Occurrence |
|---|---|---|---|---|---|---|---|---|
| Amphibians | | | | | | | | |
| Carpenter Frog | *Lithobates* | *virgatipes* | | NL | SC | S3 | G5 | DDi, PM, DL |
| Fowlers Toad | *Anaxyrus* | *fowleri* | | NL | SC | S3 | G5 | DDi, DM, DL |
| Marbled Salamander | *Ambystoma* | *opacum* | | NL | SC | S3 | G5 | PDi, DL |
| Birds | | | | | | | | |
| Barn Owl | *Tyto* | *alba* | | NL | SC | S3B, S3N | G5 | PDi, PM, PL |
| Black-throated Blue Warbler | *Dendroica* | *caerulescens* | | NL | SCbr | S3B, S3N | G5 | DDi |
| Black-throated Green Warbler | *Dendroica* | *virens* | | NL | SCbr | S3B, S3N | G5 | DDi, DL |
| Broad-windged Hawk | *Buteo* | *platypterus* | | NL | SCbr | S3B, S3N | G5 | DDi, DL |
| Brown Thrasher | *Toxostoma* | *rufum* | | NL | SCbr | S3 | G5 | DDi |
| Common Nighthawk | Chordeiles | minor | | NL | SC | G5T5 | S3 | DDi, DL |
| Cooper's Hawk | *Accipiter* | *cooperi* | | NL | SCbr | S2B, S4N | G5 | DDi, DL |
| Eastern Meadowlark | *Sturnella* | *magna* | | MNB | SCbr, SCnb | S3B, S3N | G5 | DDi, DL, DM |
| Great Blue Heron | *Ardea* | *herodias* | | NL | SCbr | S3B. S4N | G5 | DDi, PM, DL |
| Hooded Warbler | *Wilsonia* | *citrina* | | NL | SCbr | S3B | G5 | DDi, DM, DL |
| Northern Parula | *Parula* | *americana* | | NL | SCbr | S3 | G5 | DDi |
| Sanderling | *Calidris* | *alba* | | NL | SCnb | S3 | G5 | DDi |
| Sharp-shinned Hawk | *Accipter* | *striatus* | | NL | SC | S3B, S1N | G5 | PDi, PM, DL |
| Veery | *Catharus* | *fuscenscens* | | MNB | SCbr | S3B | G5 | DDi, DL |
| Whip-poor-will | *Caprimulgus* | *vociferus* | | NL | SCbr, Unb | S3B | G5 | DDi, DL |
| Winter Wren | *Troglodytes* | *hiemalis* | | NL | SCbr | S3 | G5 | DDi |
| Wood Thrush | *Hylocichla* | *mustenlina* | | NL | SCbr | S3 | G5 | DDi, DL |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| Dotted Skipper | *Hesperia* | *attalus* | *slossonae* | NL | SC | S3 | G3, G4 | DL |
| Fish | | | | | | | | |
| Black-banded Sunfish | *Enneacanthus* | *chaetodon* | | NL | SCbr | S4 | G3, G4 | PDi, PM, DL |
| Mud Sunfish | *Acantharchus* | *pomotis* | | NL | SC | S4 | G4, G5 | PDi, PM, DL |
| Pirate Perch | *AphreDoDerus* | *saynus* | | NL | SC | S4 | G5 | PDi, PM, DL |
| Reptiles | | | | | | | | |
| Eastern Box Turtle | *Terrapene* | *carolina* | *carolina* | NL | SC | S3 | G5, T5 | DDi, DM, DL |
| Eastern King Snake | *Lampropelitis* | *getula* | *getula* | NL | SC | SNR | G5 | DL |
| Spotted Turtle | *Clemmys* | *guttata* | | NL | SC | S3 | G5 | PDi, PM, DL |

| **Status and Occurrence Key** | | **NatureServe State (S) and Global (G) Conservation Codes** | |
|---|---|---|---|
| Documented | D | Critically Imperiled | S/G1 |
| Potential to Occur | P | Imperiled | S/G2 |
| McGuire | M | Rare/Vulnerable | S/G3 |
| Dix | Di | Apparently Secure | S/G4 |
| Lakehurst | L | Secure | S/G5 |
| Endangered | E | Infraspecific taxon ranked differently than full species | T |
| Threatened | T | | |
| Not Listed | NL | | |
| Special Concern | SC | | |
| Breeding | br | | |
| Non-Breeding | nb | | |
| Bald and Golden Eagle Protection Act BGEPA | | | |
| Migratory Nongame Bird of Management Concern MNB | | | |

# Birds

## Grasshopper sparrow (*Ammodramus savannarum*) and Savannah sparrow (*Passerculus sandwichensis*)

These two sparrow species have been found on all three areas of JB MDL. The USFWS has conducted grassland bird breeding surveys in 2017, 2018, 2019 and 2020 for the grasshopper sparrow population at the McGuire Airfield. Observations of grasshopper sparrow within or adjacent to the airfield averaged approximately 50 birds per survey. The grasshopper sparrow is a small- to medium-sized grassland sparrow with a narrow, short tail. They are adaptable to disturbed grasslands that are common at places such as airports. Optimal habitat for these sparrows contains short- to medium-height bunch grasses interspersed with patches of bare ground, a shallow litter layer, scattered forbs, and few shrubs. Clumped grasses, such as poverty grass (*Danthonia spicata*) and broom-sedge (*Andropogon virginicus*), provide cover and foraging areas and are consequently favored over sod or matting grasses. In addition, orchardgrass (*Dactylis glomerata*), alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), and dewberry (*Rubus sp*.) provide sparrow habitat. As the result of population declines and severe habitat loss, the grasshopper sparrow was listed as a threatened species in NJ in 1979. In NJ, the survival of grasshopper sparrows is critically linked with management practices for grassland birds on airports, agricultural lands, and pastures (NJDEP 2008). A grassland generalist, the savannah sparrow, is found in a variety of grassland habitats in the northeast ranging from heathland to farmland. This species is associated with hayfields and pastures as well as coastal grasslands and blueberry barrens. Suitable tracts must provide a mix of short and tall grasses; a thick litter layer; dense ground vegetation; and scattered shrubs, saplings, or forbs.

To manage for these species, burning or mowing maintains the early successional habitat and removes woody growth. In areas protected for these species, such management practices are only conducted before or after the nesting season (April 15-July 31). Mowing is not done until all chicks have fledged. Due to the fact that these sparrows often have two broods per year, mowing before mid-July can harm nesting birds and young. NR personnel recognize that mowing of Lakehurst clear zones at the TEST runway and Maxfield may be maintained at 7”-14” outside of the grassland bird breeding season of April 15th–July 31st. However, this mowing regime is not recommended by Natural Resources staff since tall warm season grass discourages strike-risk species around airfields, e.g. Canada geese, gull species. Mowing will be set at April 15-August 15 for areas outside the airfield fence and TEST runway clear zones that is known habitat for grasshopper sparrows.

Grassland restoration for these sparrows will include warm season native bunch grasses, such as little bluestem, big bluestem, poverty grass, broom-sedge, switchgrass, and side-oats gramma, along with a mixture of pollinators and some scattered shrubs. No pollinators shall be used in any native warm season grass restoration that is done inside the airfield fence. Natural Resources staff will continue to conduct surveys for these species. Nesting areas should be marked as off limits to vehicular and foot traffic when it does not compromise the JB MDL mission and in compliance with the BASH program. Management activities for these species will be coordinated with JB MDL Natural Resources.

Grass height testing is scheduled from 2019 – 2024. This project is to conduct research on the Test Runway for bird use and occupation by numerous grassland bird species, including NJ-listed Threatened and Endangered species such as grasshopper sparrow and upland sandpiper, on approximately 300 acres of grasslands. It will divide the runway into an east half where grass will be maintained at 7-14” and the west half where grass will not be mowed during the April 15-July 31 breeding season and then will be mowed down to 7 inches one time per year in the fall or winter.

Surveys using point counts at 32 locations will be conducted to determine the number of birds utilizing the short grass areas versus the number favoring tall grass areas. USFWS has endorsed this project, in 2020, USFWS continued this project and utilized their own personnel to conduct the surveys. Project will conclude in 2024.

## Bald eagle (*Haliaeetus leucocephalus*)

A nesting pair of Bald eagles was discovered on the Dix Area in the spring of 2000 in a large pitch pine located in a pitch pine/scrub oak forest in the Impact Area. This pair had remained at Dix and has successfully raised sixteen eaglets as of 2015. In the winter of 2017, the nest tree fell down and the eagles have not nested in this area since then.

A Bald Eagle nest was discovered in 2018 on JB MDL Lakehurst approximately 1,400' from the southwest end of the Maxfield airfield runway 6. The Natural Resources office obtained a USFWS nest depredation permit to remove this nest by cutting down the host tree during the off-season. Due to the close proximity of the nest to the runway, and the potential for a BASH incident, base NR personnel supported and executed this removal. This area will be monitored to see if the eagle pair remains and tries to re-build in adjacent trees or moves further from the airfield. Should the eagles return, USDA-WS will be notified to initiate harassment activities to discourage the eagles from re-nesting.

Prior to August 2007 this species was listed as Federally threatened. The bald eagle continues to be protected under the Federal Bald and Golden Eagle Protection Act (16 U.S.C. 668a-d) and the Migratory Bird Treaty Act (40 Stat. 755 as amended; 16 U.S.C. 703-112). The bald eagle also remains a State-listed species under the NJ Endangered and Non-game Species Conservation Act (N.J.S.A 23:2 A et seq.), which carries protection under the State Land Use Regulation Program. These Federal and State laws prohibit taking of bald eagles. For the continued protection of bald eagles and to ensure compliance with Federal and State laws JB MDL has:

- Created buffer areas. Following NJ Endangered and Non-game Species Program guidelines, buffer areas were created to limit activities and reduce eagle disturbance. Though the nest site is within the Impact Area, current range firing activities do not impact within the ½ mile buffer with safety restrictions in place. Management activities in these buffer areas such as target placement and firebreak maintenance are delayed until the fall of the year to avoid disturbing nesting eagles.
- Monitored eagle activity. This includes frequent nest site visits during the nesting season, initiation of a foraging habitat survey, and cooperation with NJ Fish and Wildlife biologists during activities such as eaglet banding.
- Continue to comply with bald eagle management guidelines issued through USFWS NJ Ecological Field Services Office in Galloway, New Jersey.

## Barred owl (*Strix varia*)

Barred owls are listed as a threatened species in New Jersey. They live and breed in large, unbroken stands of mature lowland, upland deciduous, or mixed coniferous/deciduous forests. In 2007, an in-house habitat assessment for the barred owl on the Dix Area was performed and owl call back surveys were completed in suitable areas in 2007-2009. The survey found 13 barred owls on the Dix Area, including 4 sets of owls calling as a breeding pair.

The survey was performed on the Lakehurst Area in 2010. The survey results showed four owls at Lakehurst, two of which called as a breeding pair. A singular calling owl was noted in a swamp just west of Towway 11, while the remaining owls were off base across base boundaries on State land. The results from this survey are found in the Barred Owl Biological Assessment and Monitoring Protocol (Armento, 2008).

To manage for this species, large un-fragmented tracts of mature forests with a minimum crown closure of 70% should be maintained. Natural Resource staff plan on continued monitoring of this species.

### Upland sandpiper (*Bartramia longicauda*)

Since 2010, one to three pairs of upland sandpipers, State-listed as endangered, are estimated to be breeding at the McGuire Area. During the 2019 McGuire grassland bird survey, USFWS personnel estimated that 3 breeding pairs, and possibly 4 breeding pairs, were noted on the McGuire airfield. Grassland bird surveys conducted at the Lakehurst Area since 1999 noted an average of nine upland sandpipers, most of which are located in the Drop Zone (a.k.a. Jump Circle), an exceptional natural area in the Lakehurst section of JB MDL. Within the Drop Zone, approximately 3 to 6 breeding pairs have been observed annually. The upland sandpiper is State-endangered and is considered critically impaired for breeding populations. The base may be the only known site in the State that still supports breeding populations. Formerly known as the upland plover, the upland sandpiper is a slender brown shorebird of dry, inland fields with a thin neck, long tail, and cryptic coloration. A bird of open countryside, the upland sandpiper inhabits grasslands, fallow fields, and meadows that are often associated with pastures, farms, or airports. Upland meadows and short grass grasslands, containing vegetation 3 to 16 inches tall, provide habitat for nesting upland sandpipers. Such grasslands may include the following species: timothy (*Phleum* sp.), bluegrass (*Poa* sp.), needlegrass (*Stipa* sp.), bluestem (*Andropogon* sp.), quackgrass (*Argopyron* sp.), Junegrass (*Koeleria* sp.), and bromegrass (*Bromus* sp.). Habitats that contain a mix of tall and short grasses and forbs provide both foraging and nesting habitat.

Unlike grasshopper sparrows which may have two broods per year, upland sandpipers only have one brood during the breeding season. However, JB MDL management for upland sandpiper will be essentially the same as grasshopper sparrow management. No mowing or burning in protected known upland sandpiper habitat will occur from April 15-July 31 on Maxfield and TEST runway, but April 15-August 15 in the Drop Zone and other grasslands outside the airfield fence.

## Reptiles

### Timber rattlesnake (*Crotalus horridus*)

The timber rattlesnake is the only venomous reptile found on JB MDL. They have dark brown to black blotches on the body section just behind the head that move down the body to become unbroken lateral cross bands. They also have a shovel shaped head and tail. This snake has three different color phases: black, yellow, and intermediate. Timber rattlesnakes in southern NJ are typically found in pinelands habitats consisting of pitch pine, short-leaf pine, scrub oak, blackjack oak, and blueberry. Dens are usually found in cedar swamps and along stream banks. These snakes are active from April to October.

Historically there is a single record of a timber rattlesnake occurring in the Dix Area from 1940 according to the NJDEP Natural Heritage Program Database. Surveys for this species were conducted in 1996 by the NJDEP but no timber rattlesnakes were found (NJ Natural Heritage Program 1996). A timber rattlesnake was found dead on the road on the Dix Area Ranges in 2009. There have been several unconfirmed reports of timber rattlesnake (*Crotalus horridus*) at the Lakehurst Area. None, however, were found in the 1995-1996 Lakehurst reptile survey or in periodic survey board checks conducted over the past several years. Natural Resource staff will continue to search for this snake while conducting other monitoring projects. In 2010 a Phase I study of the pine snake, corn snake, and timber rattlesnake on the Dix Area was completed by Tetra Tech EC and HA. In 2019-2020, HA conducted a snake survey which included timber rattlesnakes; however, no timber rattlesnakes were found by HA. However, the base Conservation Law Enforcement Officer (CLEO) photographed what he thought was a northern pine snake crossing a road in the Dix section in July 2020 but was actually verified by HA as a timber rattlesnake. Management recommendations from this study will be considered by the Natural Resources staff.

HA personnel have permission from New Jersey Fish and Wildlife to implant timber rattlesnakes they may encounter with transmitters in order to track them and determine hibernacula and nest sites, as well as foraging range.

## Corn snake (*Elaphe g. gutatta*)

The corn snake is also known as the red rat snake. It is a snake highly variable in coloration, ranging from brown to light orange or red. The corn snake inhabits mature, upland pine-dominated forests that contain uprooted trees, stump holes, and rotten logs. Soils typically include sands and loams. Corn snakes are active from late April to November. This species has been documented at the Lakehurst Area of JB MDL. The individual found was an immature female and it is assumed to have hatched in or near the area it was found, indicating that there is likely a breeding population on the Lakehurst Area. The only record of a corn snake occurring on the Dix Area was in 1959 according to the NJDEP Natural Heritage Program Database. The area where this species was found has significantly changed and is no longer considered suitable.

Surveys for this species were conducted on the Dix Area in 1996 by the NJDEP but no corn snakes were found (NJ Natural Heritage Program 1996). In 2006, a nest of hatched eggs that resembled corn snake eggs in both quantity and morphology were found on the Dix Area but the eggs could not be definitively identified as those of a corn snake by the NJDFW Endangered and Nongame Species herpetologist. In 2010 a Phase I study of the pine snake, corn snake, and timber rattlesnake on the Dix Area was completed by Tetra Tech EC and HA. In 2019-2020, HA was successful in finding several corn snakes in the study areas, including gravid females on both the Lakehurst and Dix section of the base. In addition, a corn snake nest was found on Lakehurst and is the first one documented there. HA personnel have permission from New Jersey Fish and Wildlife to implant corn snakes with transmitters in order to track them and determine hibernacula and nest sites, as well as foraging range. Management recommendations from this study will be considered by the Natural Resources staff.

## Northern pine snake (*Pituophis m. melanoleucus*)

Northern pine snakes have been sighted at a number of locations within the outer coastal plain areas of JB MDL. They prefer pine-oak forest types growing on very infertile sandy soils such as Lakehurst or Lakewood sands and occur equally in disturbed and undisturbed sites. Small openings created by fires on these sites often create adequate den and nesting sites. In addition, these snakes are often found at road edges, railroad beds, field margins, and other open areas.

Pine snakes are active from April to October and nest from mid-June to mid-July. During a three-year study on the Lakehurst Area, 350 northern pine snakes were captured and released (Zappalorti and Torocco 1997). This number includes 238 new hatchlings that were hatched in a laboratory in 1995 and 1996 and released at their nest site. During this study, seven distinct nesting areas were identified. Female pine snakes were found to excavate tunnels in dry upland forest openings with sandy soils. Northern pine snakes hibernate from mid-fall to mid-spring in natural cavities. Hibernacula and nest sites are used repeatedly by individuals and by successive generations of pine snakes. To maintain and protect these snakes, limiting military training that causes small, growing season fires and limiting the unauthorized use of off-road vehicles on the sand roads should be continued. Denning and nesting areas should be delineated as off limits to vehicular and foot traffic. In 2010 a Phase I study of the pine snake, corn snake, and timber rattlesnake on the Dix Area was completed by Tetra Tech EC and HA. In 2019-2020, HA conducted a snake survey that included northern pine snakes. During this survey, several northern pine snakes were captured, including gravid females found on both the Lakehurst and Dix section of the base. HA personnel have permission from NJDFW to implant northern pine snakes with transmitters in order to track them and determine hibernacula and nest sites, as well as foraging range. Management recommendations from this study will be considered by the Natural Resources staff.

# Amphibians

## Pine Barrens tree frog (*Hyla andersonii*)

The Pine Barrens tree frog (*Hyla andersonii*) is the only rare amphibian species known to occur at JB MDL. The Pine Barrens tree frog is small, 1 1/8 to 1 3/4 inches, with distinctive purple and whitish lateral stripes on the sides and dark feet (Conant and Collins 1998). In NJ, Pine Barrens tree frogs occur only in the Pinelands in low areas with standing acidic water. They are found in pitch pine lowlands, pine oak and oak pine stands, Atlantic white cedar swamps, red maple swamps, and abandoned blueberry fields. At the Lakehurst Area this species was heard calling during night surveys at 14 sites including the fire ponds, wetland stream corridors, and a mixed hardwood-Atlantic white cedar swamp (Zappalorti and Torocco 1997).

During the Fort Dix Military Reservation Rare Species Survey conducted in 1996, four (4) colonies of Pine Barrens tree frogs were located. A 2010 in house survey conducted by NR staff on 59 areas on Dix identified 33 areas with calling tree frogs. The Pine Barrens tree frog is a major indicator species for the Pine Barrens ecosystem. Management activities that favor water-quality protection and habitat preservation will benefit not only the Pine Barrens tree frog, but the Pinelands ecosystem occurring on JB MDL.

The Department of Defense Partners in Amphibian and Reptile Conservation (DoD PARC) network developed the following guidance to help in the preservation and protection of reptiles and amphibians:

- Conducting periodic (approximately every five years) herpetofauna inventories and surveys.
- Monitoring at-risk and state-listed or federally-listed amphibian and reptilian populations.
- Maintaining or restoring natural hydrological processes through water table and stream flow maintenance and preserving natural hydrological regimes, such as inundation and desiccation cycles.
- Protecting natural drainages from degradation through invasive species vegetation clearing, equipment disinfection, and erosion prevention.
- Restoring and re-vegetating disturbed and degraded herpetofauna habitats.
- Determining the need to control or exclude non-native amphibian and reptile populations.
- Reducing impacts to herpetofauna associated with roads by closing non-essential roads, enacting seasonal controls, and enforcing speed limits.
- Conducting projects to maintain habitat connectivity and encourage reptile population movement (e.g., providing safe crossings for reptiles on roadway projects).
- Maintaining natural upland habitat buffers for migrating amphibians around wetlands.
- Developing educational programs or materials about local amphibians and reptiles.
- Developing educational materials to inform installation personnel of venomous reptile species.
- Using prescribed burns to better simulate the natural fire regime.
- Maintaining a training-free buffer zone around creeks, wetlands, lake/pond edges, etc.
- Minimizing the operation of heavy equipment/vehicles on hillsides to prevent erosion.
- Conducting a long-term population monitoring program to track population changes of Species of Greatest Conservation Need.

# Mammals

## Northern Long-Eared Bat (*Myotis septentrionalis*)

The northern long-eared bat (NLEB) is a medium-sized bat about 3 to 3.7 inches in length, but with a wingspan of 9 to 10 inches. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, Myotis, which are actually bats noted for their small ears (Myotis means mouse- eared).

The northern long-eared bat is found across much of the eastern and north central United States. The northern long-eared bat is federally listed as a threatened species under the ESA, due to a drastic decline in population due to white-nose syndrome. If this disease had not emerged, it is unlikely the northern long-eared bat would be experiencing such a dramatic population decline. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast, an area that includes the core of the northern long-eared bat's range where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99% in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, the westward advance of the disease has continued unchecked in the past fourteen years. It is now well documented in the eastern Great Plains (USFWS).

JB MDL has completed acoustic monitoring surveys in 2012, 2014 and 2017 encompassing 63 miles of roadway and trails on the Lakehurst and Dix sections of JB MDL. The acoustical surveys also identified the presence of acoustical call files associated with northern long-eared bats along the southern border of the Lakehurst section of JB MDL and the northern border of the Dix section of JBMDL.

Mist Net Surveys conducted in 2015 (CTR Wildlife Consulting) and 2018 (USFWS) confirmed a consistent presence of big brown and eastern red bats on the base, along with a few hoary bats. Both mist net surveys did not find any northern long-eared bats, little brown bats or tri-colored bats. Both surveys also showed that big brown bats were by far the most commonly caught species. During the 2018 survey, an unknown Myotis species escaped the mist net before it could be identified. Ten days after the conclusion of the 2018 mist nest efforts, a northern long-eared bat was discovered roosting on the side of an engineering building on the Lakehurst side of the base. Mist netting with the USFWS continued in 2019, and sampling sites also included the forested wetlands located south of the engineering building previously mentioned. The goal would be to place a transmitter on a target species (northern long-eared bat, little brown bat or tri-colored bat) and use radio telemetry to locate roosts.

The USFWS Conservation Measures for the NLEB guidelines will be used to aid in conservation efforts for the NLEB. These guidelines have been added as Appendix M.

Continued monitoring and surveys will be conducted in order to determine presence/absence and, if possible, obtain foraging information for different bat species which may eventually be listed as threatened or endangered. In particular, efforts will be directed toward little brown bat and tri-colored bat, two species that were formerly quite common but have suffered huge population declines due to white- nose syndrome.

## Table 11. State Listed Threatened and Endangered Plants Identified on JB MDL

| Scientific name | Common name | Federal status | State Status | State rank | Global rank | Occurrence |
|---|---|---|---|---|---|---|
| *Asimina triloba* | Pawpaw | NL | E | S1 | G5 | Documented Dix |
| *Eleocharis tenuis var. verrucosa* | Slender Spike-rush | NL | E | S1.1 | G5T3T5 | Species present Dix, not subspecies |
| *Galium triflorum* | Fragrant Bedstraw | NL | E | S2 | | Documented Dix |
| *Helonias bullata* | Swamp-pink | LT | E | S3 | G3 | Documented Dix |
| *Hypericum adpressum* | Barton's St. John's-wort | NL | E | S2 | G3 | Documented Dix |
| *Juncus caesariensis* | New Jersey Rush | NL | E | S2 | G2G3 | Documented Dix |
| *Maianthemum canadense var. interius* | Western False Lily-of-the-valley | NL | E | S1.1 | G5T4 | Species present Dix, not subspecies |
| *Panicum dichotomum var. yadkinense* | Spotted-sheath Panic Grass | NL | E | SH | G4Q | Species present Dix, not subspecies |
| *Pinus resinosa* | Red Pine | NL | E | S1.1 | G5 | JB MDL |
| *Rhexia aristosa* | Awned Meadow-beauty | NL | E | S1 | G3G4 | Genus present Lakehurst, species not identified |
| *Rhexia mariana var. ventricosa* | Showy Meadow-beauty | NL | E | S2 | G5T4T5 | Genus present Lakehurst, species not identified |
| *Rhynchospora glomerata* | Clustered Beaked-rush | NL | E | SH | G5T5? | Documented Lakehurst |
| *Rhynchospora knieskernii* | Knieskern's Beaked-rush | LT | E | S2 | G2 | Documented Lakehurst |
| *Schwalbea americana* | Chaffseed | LE | E | S1 | G2G3 | Potential Dix and Lakehurst |
| *Scirpus longii* | Long's Woolgrass | NL | E | S2 | G2G3 | Documented Dix |
| *Tridens flavus var. chapmanii* | Chapman's Redtop | NL | E | SH | G5T3 | Documented Dix and Lakehurst |
| *Utricularia biflora* | Two-flower Bladderwort | NL | E | S1 | G5 | Documented Dix and Lakehurst |

## Table 12. State Plant Species of Concern Identified on JB MDL

| Scientific name | Common name | Federal status | State Status | State rank | Global rank | Occurrence |
|---|---|---|---|---|---|---|
| Amiathium muscitoxicum | Fly Poison | NL | SC | S2 | G4G5 | Documented Dix |
| Andropogon glomeratus var. hirsutior | Hairy Beardgrass | NL | SC | SH.1 | G5T5 | Species present Lakehurst, not subspecies |
| *Andropogon gyrans var. gyrans* | Elliott's Beardgrass | NL | SC | S2 | G5 | Documented Dix |
| *Arethusa bulbosa* | Dragon Mouth | NL | SC | S2 | G5 | Documented Lakehurst |
| *Aristida dichotoma var. curtissii* | Curtis' Three-awn Grass | NL | SC | S2 | G5T5 | Documented Dix and Lakehurst |
| *Aristida virgata* | Wand-like Three-awn Grass | NL | SC | S2 | G5T4T5 | Documented Lakehurst |
| *Calamovilfa brevipilis* | Pine barren Sandreed | NL | SC | S3 | G4 | Documented Dix and Lakehurst |
| *Callitriche palustris* | Marsh Water-starwort | NL | SC | S2 | G5 | Documented Dix |
| *Carex barratti* | Barratt's sedge | NL | SC | S3 | G3 | Documented Dix and Lakehurst |
| *Celtis tenuifolia* | Dwarf Hackberry | NL | SC | S2 | G5 | Documented Dix |
| *Desmodium strictum* | Pineland Tick-trefoil | NL | SC | S2 | G4 | Documented Dix |
| *Elatine minima* | Small waterwort | NL | SC | S3 | G5 | Documented Dix |
| *Eupatorium album var. vaseyi* | Vasey's Boneset | NL | SC | S2 | G5T3T5 | Documented Lakehurst |
| *Gentiana autumnalis* | Pine Barren Gentian | NL | SC | S3 | G3 | Documented Dix |
| *Gentiana saponaria var. saponaria* | Soapwort Gentian | NL | SC | S3 | G5T5 | Documented Dix |
| *Gymnopogon ambiguous* | Bearded Skeletongrass | NL | SC | S3 | G4 | Documented Dix |
| *Helianthemum bicknellii* | Hoary Frostweed | NL | SC | S3 | G5 | Documented Dix |
| *Juncus greenei* | Greene's Rush | NL | SC | S2 | G5 | Documented Dix |
| *Listeria australis* | Southern Twayblade | NL | SC | S2 | | Documented Dix and Lakehurst |
| *Lobelia canbyi* | Canby's Lobelia | NL | SC | S3 | G4 | Documented Dix |
| *Muhlenbergia torreyana* | Pine Barren Smoke Grass | NL | SC | S3 | G3 | Documented Dix and Lakehurst |
| *Myosotis verna* | Spring Forget-me-not | NL | SC | S3 | G5 | JB MDL, Unknown location |
| *Osmunda cinnamomea var. glandulosa* | Glandular Cinnamon Fern | NL | SC | S2 | G5TNR | Documented Lakehurst |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Panicum amarum var. amarulum* | Southern Seabeach Grass | NL | SC | S3 | G5T3T5 | Documented Lakehurst |
| *Paspalum dissectum* | Mudbank crowngrass | NL | SC | S2 | G4? | Documented Dix |
| *Pinus taeda* | Loblolly Pine | NL | SC | S2 | G5 | Documented Dix and Lakehurst |
| *Pityopsis falcata* | Sickle-leaf Golden-aster | NL | SC | S3 | G3G4 | Documented Dix and Lakehurst |
| *Platanthera ciliaris* | Yellow Fringed Orchid | NL | SC | S2 | G5 | Documented Dix |
| *Prenanthes autumnalis* | Pine Barren Rattlesnake-root | NL | SC | S2 | G4G5 | Documented Dix |
| *Quercus michauxii* | Basket Oak | NL | SC | S3 | G5 | Documented Lakehurst |
| *Rhynchospora cephalantha* | Large-head Beaked-rush | NL | SC | S3 | G5 | Documented Dix |
| *Rhynchospora pallida* | Pale Beaked-rush | NL | SC | S3 | G3 | Documented Dix and Lakehurst |
| *Rubus recurvicaulis var. inarmatus* | Arching dewberry | NL | SC | S1 | G4 | Documented Dix |
| *Schoenoplectus smithii* | Smith's Club-rush | NL | SC | S2 | G5? | Documented Dix |
| *Sisyrinchium arenicola* | Sand-plain Blue-eyed Grass | NL | SC | S1? | G5? | Documented Lakehurst |
| *Solidago stricta* | Wand-like Goldenrod | NL | SC | S3 | G5 | Documented Dix |
| *Sphagnum spp.* | Sphagnum | NL | SC | | | genus present Dix and Lakehurst, species not identified |
| *Spiranthes tuberosa* | Little Ladies'-tresses | NL | SC | S3 | G5 | Documented Dix |
| *Utricularia gibba* | Humped Bladderwort | NL | SC | S3 | G5 | Documented Dix, Potential Lakehurst |
| *Uticularia inflata* | Large Swollen Bladderwort | NL | SC | S3 | G5 | Documented Dix |
| *Utricularia purpurea* | Purple Bladderwort | NL | SC | S3 | G5 | Documented Dix and Lakehurst |
| *Vulpia octoflora var. glauca* | Slender Six-weeks Grass | NL | SC | SU | G5T5 | Documented Dix |

| **Status and Occurrence Key** | | **NatureServe State (S) and Global (G) Conservation Codes** | |
|---|---|---|---|
| Endangered | E | Critically Imperiled | S/G1 |
| Threatened | T | Imperiled | S/G2 |
| Not Listed | NL | Rare/Vulnerable | S/G3 |
| Special Concern | SC | Apparently Secure | S/G4 |
| | | Secure | S/G5 |
| | | Infraspecific taxon ranked differently than full species | |

### Migrating Birds and Other Species of Concern

In addition to the species listed in Appendix B: JB MDL Threatened and Endangered Species Fauna Register, birds migrating on the Atlantic Flyway have the potential to use JB MDL as a stopover on their migratory route. However, large flocks of migratory birds pose a significant threat to aviation safety, and as such should be discouraged from utilizing the airfields.

Natural Resource personnel will continue to conduct baseline and occurrence surveys for threatened and endangered species at JB MDL.

**Table 13. List of Birds Protected under the Migratory Bird Act**

| Common Name | Genus | Species | Subspecies | Federal Status | State Status | State Rank | Global Rank | Occurrence |
|---|---|---|---|---|---|---|---|---|
| American Bittern | *Botaurus* | *lentiginosus* | | MNB | Ebr, SCnb | S2B | G4 | DD, DL |
| Bald Eagle | *Haliaeetus* | *leucocephalus* | | BGEPA | Ebr, Tnb | S1B, S1N | G5 | DD, DL |
| Eastern Meadowlark | *Sturnella* | *magna* | | MNB | SCbr, SCnb | S3B, S3N | G5 | DD, DL, DM |
| Grasshopper sparrow | *Ammodramus* | *savannarum* | *pratensis* | MNB | Tbr | S3B, S3N | G5 | DD, DM, DL |
| Henslow's Sparrow | *Ammodramus* | *henslowii* | | MNB | E | S1B, S1N | G4 | PD, PM, DL |
| Northern Goshawk | *Accipter* | *gentilis* | | MNB | Ebr, Ecnb | S1B, S3N | G5 | PD |
| Northern Harrier | *Circus* | *cyaneus* | | MNB | Ebr, SCnb | S1B, S3N | G5 | DD, DM, DL |
| Red-headed Woodpecker | *Melanerpes* | *erythrocephalus* | | MNB | T | S2B, S2n | G5 | PD |
| Red-shouldered Hawk | *Buteo* | *lineatus* | | MNB | Ebr, SCnb | S1B, S2N | G5 | DD, DL |
| Sedge Wren | *Cistothorus* | *platensis* | | MNB | E | S1B, S1N | G5 | PD |
| Upland Sandpiper | *Barramia* | *longicauda* | | MNB | E | S1B, S1N | G5 | PD, PN, DL |
| Veery | *Catharus* | *fuscenscens* | | MNB | SCbr | S3B | G5 | DD, DL |

| Status and Occurrence Key | | NatureServe State (S) and Global (G) Conservation Codes | |
|---|---|---|---|
| Documented | D | Critically Imperiled | S/G1 |
| Potential to Occur | P | Imperiled | S/G2 |
| McGuire | M | Rare/Vulnerable | S/G3 |
| Dix | Di | Apparently Secure | S/G4 |
| Lakehurst | L | Secure | S/G5 |
| Endangered | E | Infraspecific taxon ranked differently than full species | T |
| Threatened | T | | |
| Not Listed | NL | | |
| Special Concern | SC | | |
| Breeding | br | | |
| Non-Breeding | nb | | |
| Bald and Golden Eagle Protection Act BGEPA | | | |
| Migratory Nongame Bird of Management Concern MNB | | | |

The USFWS is evaluating species that are or were known to occur in New Jersey to determine if listing under the ESA is warranted (U.S. Fish and Wildlife Service 2018a). Please note that only species known to occur or that may possibly occur at JB MDL are presented below.

**Table 14. Species Under Review for Federal Listing**

| Scientific Name | Common Name |
|---|---|
| **12-Month Finding** | |
| *Clemmys guttata* | Spotted Turtle |
| *Danaus plexippus* | Monarch butterfly |
| *Glyptemys insculpta* | Wood turtle |
| *Perimyotis subflavus* | Tricolored bat |
| *Pseudemys rubriventris* | Red-bellied turtle (cooter) |
| **Discretionary Status Review** | |
| *Atrytone arogos* | Eastern beard grass (arogos) skipper |
| *Callophrys irus* | Frosted elfin |
| *Myotis lucifugus* | Little brown bat |

The categories of review are:

12- Month Findings: This is when the USFWS has received petitions to list species under the ESA. For each of these species, the USFWS has issued a positive "90-day finding', which is their determination that substantial information exists in the petition and their files which indicate that listing may be warranted. The next step would be a status review for each species.

Discretionary Status Reviews: In addition to the petitioned actions listed above, the USFWS evaluates species to determine if listing under the ESA is warranted. These species are also included in the 7-year Workplan (USFWS 2019a).

These species do not currently receive any substantive or procedural protection under the ESA, and USFWS has not yet determined if listing of any of these species is warranted. However, Natural Resources personnel are aware that the following species are being evaluated for possible listing:

## Spotted turtle (*Clemmys guttata*)

The spotted turtle has been petitioned for listing under the Endangered Species Act (ESA), and is currently 'Under Review' for listing by the USFWS. Adults are typically 3.5 to 4.5 inches (8.9 to 11.4 cm) in length. Spotted turtles have a smooth black carapace (top shell) with scattered round yellow spots and a tan-to-yellow plastron (bottom shell), which may have large brown-to-black patches. The head and neck are black and may have reddish-orange to yellow blotches that end behind the eye and do not continue to the jawline. The forearms may also be bright orange, a feature that can fade seasonally. Males typically have brown eyes, brown jaws and slightly concave plastrons. Females typically have orange eyes, orange jaws and flat plastrons. Hatchling turtles usually have one yellow spot on each plate. Adults may lose carapace spots over time but usually retain some markings on the head and neck. Spotted turtles are found in slow moving, shallow waters with a soft bottom of marshy vegetation that may include sphagnum moss and cattails.

These shallow water ecosystems include bogs, marshes, swamps, ponds and streams. Spotted turtles rely on wetlands for overwintering, mating, foraging, and thermoregulating. They often use stream and river channels for dispersal and movements (up to 1.5 km: Joyal et al 2001) between wetlands in response to changes in habitat quality and availability. The spotted turtle nests on land, laying 2-8 eggs once or twice a year (Conserve Wildlife Foundation of New Jersey 2019). Spotted turtles are omnivores, feeding on a variety of invertebrates (insects, worms, slugs, snails, crayfish, spiders and millipedes) and aquatic plants (Tyning 1990). During the summer and winter months, most will burrow into the mud or leaf litter and remain inactive for extended periods, particularly during periods of low rainfall. Predators of spotted turtles and their eggs include raccoons, dogs, snapping turtles, skunks, and foxes (Ernst 1976). The maximum life span of adults is at least 40 years and research suggest that they may live as long as 110 years (Ruther et al 2017; Litzgus 2006).

Spotted turtles have late maturity (7 to 18 years) and low annual reproductive potential (Ernst 1975). Mating typically occurs in the late winter and spring (March-May) and eggs are laid on land from late May-early July, depending on the population location. Natural Resources staff currently map the locations where spotted turtles have been located on the Lakehurst portion of the base, and include the date found and sex of the turtle.

NR staff will follow, whenever practical, the Department of Defense Legacy Resource Management Program, "Recommended Best Management Practices for the Spotted Turtle on Department of Defense Installations", developed by the DoD PARC group. This guidance is located in Appendix P.

### Monarch Butterfly (*Danaus plexippus plexippus*)

Monarch butterflies are closely associated with milkweed plants (Asclepias spp.) on which the adults lay their eggs, caterpillars forage on leaves, and adults feed on the nectar of milkweeds and other flowers. The toxins of milkweed make monarch butterflies undesirable to predators. In 2015, the New Jersey Endangered and Nongame Advisory Committee recommended a Special Concern status for this species, but no formal rule proposal has been filed to date in New Jersey (Conserve Wildlife Foundation of New Jersey 2015). In a June 20, 2014 memorandum, President Obama called on Federal agencies to "develop…plans to enhance pollinator habitat, and subsequently implement, as appropriate, such plans on their managed lands and facilities, consistent with their missions and public safety" (Obama 2014).

Milkweed and other suitable native plant species will be considered in proposed vegetation plantings in areas of the base that will not pose a conflict with the mission of the base (e.g., away from the airfields).

### Wood turtle (*Glyptemmys insculpta*)

The wood turtle was State-listed as threatened in 1979. Aquatic habitats are required for mating, feeding, and hibernation, while terrestrial habitats are used for egg laying and foraging. Remotely-located freshwater streams, brooks, creeks, or rivers provide essential habitat. Open fields and thickets of alder (*Alnus serrulata* and *A. viridis*), greenbrier (*Smilax spp*.), or the non-indigenous multiflora rose (*Rosa multiflora*) are favored basking habitats. Lowland, mid-successional forests, agricultural fields and pastures may also be utilized (New Jersey Endangered and Nongame Species Program, undated).

The only record of a wood turtle occurring on JB MDL was on the Dix Area in 1959 according to the NJ Natural Heritage Program Database. Records for wood turtles have been recorded from nearly every county in New Jersey but breeding records for this species are confined primarily to Monmouth and Ocean counties (NJ Natural Heritage Program, 1996). Surveys for this species were conducted on Dix in 1996 by the NJDEP, but no wood turtles were found (NJ Natural Heritage Program 1996). NR staff will continue to look for this turtle while conducting other monitoring projects, although there are currently no plans to survey for or manage specifically for this species.

## Tricolored Bat (*Perimyotis subflavus*)

In 2013, the New Jersey Endangered and Nongame Advisory Committee recommended listing the tricolored bat, formerly called the eastern pipistrelle, as endangered in the State of New Jersey. However, no formal rule proposal has been filed to date (Conserve Wildlife Foundation of New Jersey 2014a).

This species is typically seen foraging over or near water. Day roosts are provided by tree crevices and loose bark, while hibernation occurs in caves and abandoned mines. Tricolored bats are vulnerable to White-nose Syndrome caused by the fungus *Pseudogymnoascus destructans*, resulting in mortality rates that exceed 90% in infected caves and mines. Tricolored bats are one of the first bat species to enter hibernation in the fall, and the last to emerge in the spring. They mate in large swarms just prior to hibernation, from late August to October, and in spring as well. Gestation averages around 44 days, and twin pups are born between May and June. Maternity colonies with different roosts average around 15 mother bats with their pups. Tricolored bats live for four to eight years, and some up to 14 years.

Natural Resource personnel have conducted mist nest surveys in 2015, 2018 and 2019 for this and other species of bats. During these surveys, no tricolored bats were captured. Natural Resource personnel will continue monitoring and conducting surveys for this species in order to determine presence/absence, and if possible, foraging and nesting data.

## Red-bellied turtle (*Pseudemys rubriventris*)

The red-bellied turtle is larger than most freshwater turtles, with an adult size of 10 to 12 inches and weighing up to 10 pounds. This aquatic species is primarily found in large water bodies including lakes, ponds, marshes, slow-moving rivers and creeks. Red-bellied turtles prefer deeper water with sandy or muddy substrate and require aquatic vegetation. This species also depends on abundant basking sites and spends a great deal of time perched on logs and downed trees. The two sexes are differently patterned and colored. Females reach sexual maturity at 15 to 20 years. In late spring and early summer, females select nesting sites in sandy soil, usually within 100 yards of a pond. The nest's 5 to 17 eggs incubate for up to 80 days.

Currently, threats to this species include loss of habitat through development, reductions in site and water quality, and threats from exotic species. Road mortality is an issue for females traveling away from water to lay eggs. Also, nest predators such as raccoon and fox increase with forest fragmentation and can significantly decrease nesting success of this species. In the past, fires frequently burned the Pine Barrens habitat occupied by this turtle, leaving ponds and suitable nesting habitat with adequate heating from the sun. Sunnier conditions at ponds provide additional nesting opportunities.

## Arogos skipper (*Atrytone argos*)

This Lepidopteran (moths, skippers, and butterflies) has found one of its remaining strongholds in the reedgrass savannahs of the Impact Area of the Dix Ranges. The species is considered critically imperiled on a global scale and many of the remaining populations are in NJ. It prefers grasslands with warm season grasses for its larval stage and wildflowers with available nectar during July and August. These grassland savannahs are created in the Impact Area due to repeated summer fires that result from ordnance firings into this area. Dix has actively managed for this species since it was discovered in 1995.

A highly limiting factor for this species on JB MDL would be if nectar sources became limited. NR staff plans to continue monitoring sites where the skipper was found to determine extent and population trends. This work will include recording fire history in the areas where Arogos occurs and monitoring the red root (*Lachnanthes tinctoria*) population on the sand roads as red root is believed to be a prime nectar source. An Arogos skipper survey was conducted in the Impact Area of the Dix Ranges on July 23, 2020. No Arogos skippers were noted, but several Dion skippers and a Brown skipper were identified. It should be noted that due to the high volume of ordnance testing/training conducted in the Impact Area, the window for surveying is sometimes very limited. The July 2020 survey lasted less than 3 hours conducted on one day. Arogos skippers may still be present in the Impact Area, but a survey based over several days or weeks and at various times would be a more representative survey and potentially could yield more promising results. An additional survey was conducted on the Lakehurst portion of the base on August 5, 2020. No Arogos skippers were noted, but seven Brown skippers were identified in just over a 3 hour period. Prescribed burns and a mowing regime maintaining suitable grassland areas at an early successional stage will continue on the Lakehurst portion of the base.

In addition to the Arogos skipper, a number of other rare Lepidoptera occur in the impact area of the Dix Area due to the regular occurrence of growing season fires that result from ordnance firings into this area.

Many of these other species are not currently listed as endangered or threatened even though many are considered to be quite rare. Some of these species could potentially be listed in the future if their populations were to decline. If any of these species were to become Federally-listed, there could be restrictions put on training in areas where they occur.

To address this concern, NR staff will continue to survey and monitor populations of these species to ensure that they remain healthy and viable to try to prevent them from becoming listed.

## Frosted Elfin (*Callophrys irus*)

This species has the potential to occur on JB MDL due to its habitat preference. According to a floristic survey conducted by the Center for Environmental Management of Military Lands (CEMML, 2012), wild indigo (*Baptista tinctoria*) has been identified and vouchered on the Fort Dix section of the base. In New Jersey, wild indigo is the major food and host plant of this species. Frosted elfins are closely associated with their host plants and are virtually never seen more than 20 meters from stands of the food plant. Frosted elfins require early successional stages of vegetation to survive. The habitat is composed of dry clearings and open areas that are natural or of human origin, such as power-line right of ways, sand or gravel pits, roadsides, railways and airports. According to the USFWS (2018b), habitat is considered suitable for frosted elfin when:

- The overall site condition is semi-open canopy (6 to 50 percent canopy cover).
- A mosaic of canopy cover and vegetation types is present (e.g., thickets, open glades, forest patches, herbaceous openings).
- Nectar species for frosted elfin adults are relatively abundant.
- Host plants (wild indigo) are relatively abundant.

Larvae feed on the flowers and fruits of the host plants, and the adults feed on the nectar. This species was listed as threatened in New Jersey in 2001 (Conserve Wildlife Foundation of New Jersey 2010b). Natural Resources staff will consider funding a survey to determine presence/absence of frosted elfin and the density of *Baptisia tinctoria* at Dix, and also examine the potential for this species and host plant to occur on Lakehurst.

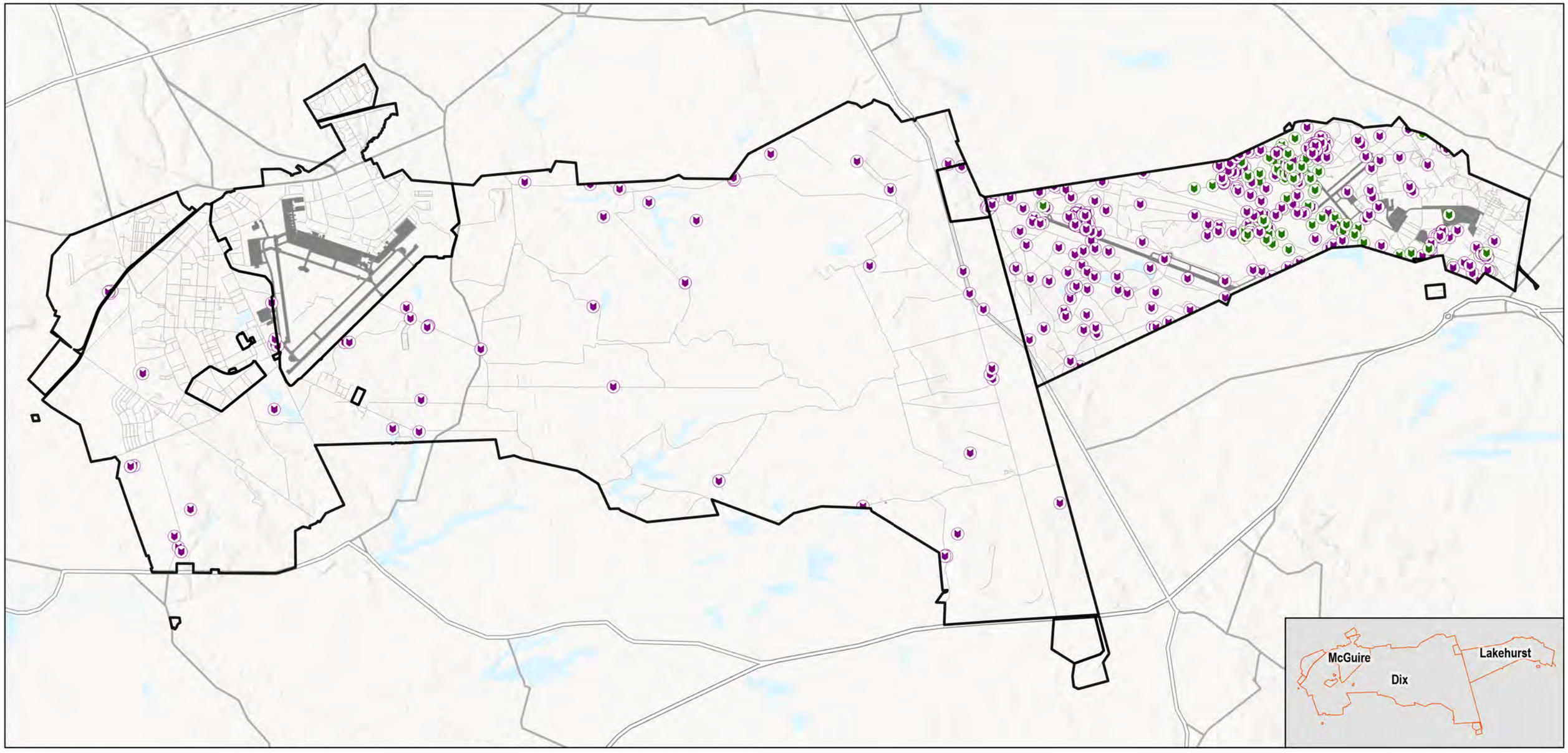
## Little Brown Bat (*Myotis lucifugus*)

The little brown bat mainly resides in forested lands along riverbanks or near other water sources, foraging over water bodies and meadows. This species is one of the few northeastern bats to regularly roost in man-made structures like barns, attics, eaves, and steeples. Day roosts are typically in tree crevices, beneath loose bark, or in buildings, but may be found in rock and woodpiles as well. Female little brown bats form large maternity colonies numbering sometimes in the hundreds or even the thousands, if space allows. Male bats are mainly solitary.

Little brown bats mate from August into the fall. Females arrive at their maternity colonies around mid-May, and pups are born in late May or June. Females give birth to just one pup per year. The species has a vast range but has been severely impacted by White-nose Syndrome. Mortality rates exceeding 95 percent have been documented at winter dens across 25 states and five Canadian provinces (Conserve Wildlife Foundation of New Jersey 2014b). There are currently no Federal Register documents by the USFWS on the status of the little brown bat.

Natural Resource personnel have conducted mist nest surveys in 2015, 2018 and 2019 for this and other species of bats. During these surveys, no little brown bats were captured. Natural Resource personnel will continue monitoring and conducting surveys for this species in order to determine presence/absence, and if possible, foraging and nesting data.

# Special Status Species

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Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

- Kingdom: Animalia
- Kingdom: Plantae
- Roads
- Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

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**Effects of Climate Change on Threatened and Endangered Species at JB MDL**

Calculated climate conditions on JB MDL show increases in both annual temperature and precipitation in all climate projections. These alterations have potential to directly and indirectly impact the populations of various T&E species found on the joint base. Increases in both temperature and precipitation have potential to alter salinity levels in streams, increase rates of evapotranspiration, facilitate invasive species encroachment, and result in alterations to hydrology, prey availability, and reduction of wetlands. These threats together have potential to eradicate T&E species from JB MDL.

Seven of the bird species at JB MDL were identified as highly vulnerable to climate change under at least one scenario. Though the reasons for a high vulnerability rating varied by species, there were a few general categories of potential impacts of expected changes in precipitation and temperature. American kestrel and red-shouldered hawk nesting attempts might become earlier and or less frequent, respectively, in response to warming spring temperatures. The other five species with high vulnerability are expected to experience increased mortality (bobolink, grasshopper sparrow, upland sandpiper), decreased abundance (bobolink, Northern harrier), decreased nest success (grasshopper sparrow, Northern harrier, pied-billed grebe), and be affected by increased salinity of required fresh water habitat (pied-billed grebe) as a result of climate change. Upland sandpiper is particularly vulnerable because JB MDL is one of the last confirmed breeding sites in New Jersey for the species. Species which were rated as moderate or low vulnerability had either indirect impacts to habitat and foraging opportunities (American bittern, horned lark, osprey, savannah sparrow, Eastern whip-poor-will, bald eagle, Eastern meadowlark, great blue heron, Henslow's sparrow, brown thrasher, wood thrush), unlikely impacts to thermoregulation (osprey, bald eagle), high uncertainty in direct impacts (vesper sparrow, Eastern whip-poor-will, barred owl, winter wren), potential phenological mismatch (veery, broad-winged hawk, common nighthawk), or occupy a highly variable habitat space and have demonstrated plasticity in response to changing temperatures (Cooper's hawk). Six species identified as of conservation concern for JB MDL were not evaluated because they are most likely to be present on base during migration only (black-throated blue warbler, black-throated green warbler, hooded warbler, Nashville warbler, northern parula, and sanderling).

T&E plants, invertebrates, and reptiles found on JB MDL will all be affected similarly through alterations of their habitat, resulting in the habitat becoming less suitable due to higher temperatures and changes to hydrology. These species are dependent on specific hydrological conditions that have been historically found on the base, and an overall loss of water in the system has potential to reduce the number of wetlands that many of these species inhabit. Flooding frequency may increase with potential to destroy subterranean dens and habitat utilized by several reptilian species. Frequent fluctuations in water table levels may cause inconsistent water availability negatively impacting the swamp pink- reducing populations of the species on the base.

In general, expected climate conditions have potential to extirpate or limit populations of various T&E species on JB MDL. Weather will likely become less predictable and more severe, making management a greater challenge. It is crucial that natural resource managers focus on the management of habitats required by T&E species, specific prey populations, and individual populations outlined above and how they may be altered with projected climate conditions.

Habitats change and disruption to food availability are two major climate-related threats to all species at JB MDL. Habitat requirements, such as need for refugia, for some species may change as they employ behavioral adaptations. Prey populations or forage abundance may also be affected by changes in temperature and precipitation. Seasonal cues for prey or forage emergence may change resulting in a

mis-match between food availability and food needs of threatened and endangered species. Populations of some threatened and endangered species are further imperiled by life stages that are sensitive to temperature and precipitation changes projected in the climate scenarios.

### *2.3.5 Wetlands and Floodplains*

**Definition of Wetlands**

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

Wetlands are an important natural system because of the diverse biological and hydrological functions they perform. These functions can include water quality improvement, groundwater recharge, pollution treatment, nutrient cycling, erosion protection, and stormwater storage. In addition, wetland areas provide vegetation and wildlife habitat, including those utilized by many species protected by state and federal regulation.

Wetland types are typically categorized using the USFWS document Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). The purpose of this document is to describe wetland and deep-water habitats using ecological parameters, arrange them into a system useful to resource managers, furnish units for mapping, and provide uniformity of concepts and terms. This classification system is used by the USFWS when categorizing wetland types to develop the National Wetland Inventory (NWI), a series of topical maps that show wetlands and deep-water habitats of the U.S. The classification system consists of a hierarchy that follows the following order: System, Subsystem, Class, Subclass, and modifying terms.

Within the JB MDL boundaries, Palustrine Systems can be found as the primary type. The Palustrine (P) System includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: area less than 20 acres, active wave-formed or bedrock shoreline features lacking, water depth in the deepest part of basin less than 6.56 feet at low water, and salinity due to ocean-derived salts less than 0.5 parts per thousand. There are no Subsystems associated with this System, but seven Classes are included – Rock Bottom (RB), Unconsolidated Bottom (UB), Aquatic Bed (AB), Unconsolidated Shore (US), Moss-Lichen Wetland (ML), Emergent Wetland (EM), Scrub-Shrub Wetland (SS), and Forested Wetland (FO). The Palustrine wetland areas on JB MDL include the following classes: EM, FO, and SS (Cowardin et al., 1979).

<u>Emergent Wetlands</u>

The emergent wetland class is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for the majority of the growing season in most years. These wetlands are usually dominated by perennial plants and include all water regimes except subtidal and irregularly exposed (Cowardin et al., 1979).

The emergent class contains two subclasses, persistent (EM1) and non-persistent (EM2). Emergent wetlands delineated at JB MDL are represented by the persistent emergent (PEM1) subclass. Persistent emergent wetlands are dominated by species that normally remain standing at least until the beginning of

the next growing season. Most of the PEM1 wetlands located at JB MDL were found in the mowed area around the airfield. Common species found in this cover type include switch grass (*Panicum vergatum*), Canada St. John's wort (*Hypericum canadense*), sundews (*Drosera* spp.), cranberry (*Vaccinium macrocarpon*), southern bog clubmoss (*Lycopodium appressum*), least spikerush (*Eleocharis acicularis*), and several other rushes (*Juncus* spp.) (Cowardin et al., 1979).

Scrub-Shrub Wetlands

Scrub-shrub wetlands include areas dominated by woody vegetation that is less than 20 feet tall. The vegetation is comprised of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions (Cowardin et al., 1979). In the Palustrine system, they are often found in association with an emergent wetland or as a component of a larger forested wetland system. When they occur in these associations, they are usually described as a mixed class community and can be highly variable in structure and species composition.

There are five subclasses of scrub-shrub wetlands: broad-leaf deciduous (SS1), needle-leaf deciduous (SS2), broad-leaved evergreen (SS3), needle-leaved evergreen (SS4), and dead (SS5). Scrub-shrub wetlands on JB MDL belong to the Palustrine system and the broad-leaved deciduous (PSS1), needle- leaved evergreen (PSS4), and broad-leaved evergreen (PSS3) subclasses. Scrub-shrub wetlands that include Atlantic white cedar as a major component are denoted as PSS8. Many of the PSS1 wetlands are found in association with pitch pine (PSS1/4), Atlantic white cedar (PSS1/8), broad-leaved evergreen (PSS1/3), or forested communities (PSS1). Common species in the PSS1 communities include sweet pepperbush (*Clethra alnifolia*), red maple (*Acer rubrum*), witherod (*Viburnum cassinoides*), highbush blueberry (*Vaccinium corymbosum*), fetterbush (*Leucothoe racemosa*), staggerbush (*Lyoinia mariana*), and cranberry.

PSS4 wetlands are often found in association with PSS1 and PSS3 wetlands. Shrub-sized pitch pine (*Pinus rigida*) is the dominant needle-leaved evergreen species in these communities, though lesser amounts of sheep laurel (*Kalmia angustifolia*), highbush blueberry, and fetterbush also occur. Leatherleaf (*Chamaedaphne calyculata*), inkberry (*Ilex glabra*), and sheep laurel are the major broad- leaved evergreen species in the PSS3 communities (Cowardin et al.,1979).

Forested Wetlands

Forested wetlands are found where moisture is relatively abundant and are characterized by a woody overstory canopy that is greater than 20 feet in height. They typically have understory vegetation comprised of both shrub and herb layers. In the absence of disturbance, this community type will maintain itself over time. As with Palustrine scrub-shrub communities, Palustrine forested communities are also variable in both structure and species composition.

Relative landscape position, underlying soil type, and hydrologic regime normally dictate this variability; however, many other factors contribute. Frequency of fire and timber harvesting practices can be particularly important in determining the structure and composition of the community. Forested wetlands occur only in the Estuarine and Palustrine Systems. Only Palustrine forested wetlands were delineated within the project area. There are five subclasses of forested wetlands: broad-leaved deciduous (FO1), needle-leaved deciduous (FO2), broad-leaved evergreen (FO3), needle-leaved evergreen (FO4), and dead (FO5).

Three subclasses of Palustrine forested wetlands were identified within the project area: broad-leaved deciduous (PFO1), needle-leaved evergreen forests (PFO4), and Atlantic white cedar (PFO8). These community types often occurred as mixed class communities. Many of the PFO1 areas occur in mixed communities with pitch pine (PFO1/4) or Atlantic white cedar (PFO1/8).

Hardwoods that occur primarily include red maple and black gum (*Nyssa sylvatica*) with lesser amounts of gray birch (*Betula populifolia*) and sweetbay (*Magnolia virginiana*). Common shrub species include highbush blueberry, sweet pepperbush, sheep laurel, fetterbush, leatherleaf, red chokeberry (*Aronia arbutifolia*), swamp azalea (*Rhododendron viscosum*), maleberry (*Lyonia ligustrina*), winterberry (*Ilex verticillata*), and dangle-berry (*Gaylussacia frondosa*). The herbaceous layer includes sphagnum moss (*Sphagnum* spp.) teaberry (*Gaultheria procumbens*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*) and on occasion, tawny cotton-grass (*Eriophorum virginicum*). Dominant canopy species in the PFO4 wetlands include pitch pine with red maple and Atlantic white cedar as co-dominants. Understory and herbaceous species in the PFO4 and PFO8 communities were similar to those found in the PFO1 community type.

In addition to the USFWS wetland classification scheme, the previously described NJDEP vegetation classification scheme adapted from Anderson et al. (1976) includes wetland classifications.

**Extent of Wetlands at JB MDL**

Wetlands comprise a little less than 22% of the total land area at JB MDL. 9,353 acres of the total 41,776 acres are mapped as wetlands.

Description of Wetlands at Lakehurst Area

Some recent wetlands studies conducted at Lakehurst have included:

- 1981: USFWS used 3/77 aerial photos to map wetlands as part of the National Wetlands Inventory (NWI).
- 1989: USDA Soil Conservation Service (now the NRCS) mapped wetlands under contract to NAES.
- 1994: NJDEP mapped wetlands via new aerial photographs.
- 1996: In October, Dames and Moore A&E ground-truthed the NJDEP map for the eastern 1/3 of the base (east of Westfield).
- 2000: Geo-Marine ground-truthed the NJDEP map for the western 2/3 of the base.

A total of 900 acres are classified as wetlands at Lakehurst. The 900 acres of wetlands make up about 12% of the total land area at Lakehurst and about 2% of the land area at JB MDL. Wetlands at Lakehurst were mapped following the Cowardin Wetland Classification Codes (Cowardin et al. 1979). Wetlands delineated at Lakehurst belong to the palustrine system. Emergent wetland (PEM), scrub-shrub wetland (PSS), and forested wetland (PFO) were delineated on the Lakehurst Area of JB MDL.

A complete list of the community types and acreages are presented in the wetlands table included in Appendix D: Wetlands Table. This table distinguishes the mixed class community types as well as two special modifiers used to further describe the wetlands at Lakehurst. One special modifier refers to areas that lie within an excavated basin or channel; whereas the other special modifier refers to areas that have been created or modified by a man-made barrier or dike designed to control the inflow of water.

Description of Wetlands at McGuire Area

Wetlands on the McGuire area total 238 acres and they make up about 7% of the total land area at McGuire and about 0.5% of the land area at JB MDL. A wetland survey was conducted in 2004 in the military family housing area. Eighteen wetlands were identified within the military family housing area during the field survey. The survey delineated wetlands totaling approximately 82 acres. Additionally, 13 stream reaches were identified that total approximately 13,304 linear feet.

Results of the field effort classified the majority of the wetland habitats as forested wetlands adjacent to intermittent or perennial streams. The remaining wetland habitats were classified as emergent or scrub-

shrub (PEM or PSS), and the majority of these wetlands were located along the margins of the forested wetland habitats. A wetland survey in 2006 conducted to the south and west of Wrightstown-Cookstown Road identified 206.30 acres of wetlands. The majority of wetlands in the McGuire Area consist of palustrine emergent (PEM1) habitats in the central triangle of the airfield, between the runways, and along the southeastern boundary fence. Palustrine forested (PFO) wetlands occur primarily in the northeastern section of the study area. Palustrine scrub-shrub habitats occur primarily in association with South Run and were designated as palustrine scrub-shrub wetlands. Palustrine scrub-shrub/forested habitats also occur in the northeastern section near the eastern boundary of the McGuire Area.

Description of Wetlands on the Dix Area

Wetlands on the Dix area consist of 7,653 acres. The 7,653 acres of wetlands makes up about 25% of the total land area at Dix and about 18% of the land area at JB MDL. The National Wetlands Inventory classifies four basic types of wetlands on Dix: palustrine open water (POW), palustrine emergent (PEM1), palustrine scrub/shrub (PSS), and palustrine forested (PFO). The palustrine forested wetlands are the largest wetland type. It contains wetlands such as red maple-hardwood, Atlantic white cedar swamps, and pitch pine lowlands. In places, the pitch pine lowlands grades to a shrub/scrub forest, particularly in the Impact Area, where a savanna ecosystem is found as a result of the number of wildfires caused by exploding ordnance.

This savanna ecosystem harbors a number of rare species. Special management strategies will be used to maintain this ecosystem in its present early successional state, particularly through the continued use of prescribed burning. Mowing is not an option at this location due to the safety hazards posed by unexploded ordnance (UXO).

**Vernal Pools**

Vernal pools are ephemeral wetlands that are seasonally flooded for at least two months between March and September, do not have a permanently flowing outlet, and are devoid of breeding fish populations. The loss of these small, seasonal wetlands is a major concern for a variety of state, local and federal organizations in the northeastern U.S. Identifying and estimating the number of vernal pools within a given region is critical to developing long-term conservation and management strategies for these unique habitats and their faunal communities.

Regulations regarding vernal pools and their flora/faunal inhabitants are found under the Federal Clean Water Act and the ESA as well as the NJ Freshwater Wetlands Protection Act (N.J.A.C. 7:7A) and by the New Jersey Land Use Regulation Program (LURP). JB MDL uses the Freshwater Wetlands Vernal Habitat Protocol from the NJ LURP to verify and certify vernal pools on the base. The objectives of this study on JB MDL are to locate, map, and certify vernal pools base- wide for the purpose of assisting with land use planning and environmental assessments, permit applications, documenting critical habitat areas for Federal and State-listed herpetofauna and maintaining an updated faunal list.

In response to the 2002 NJDEP call for assistance regarding vernal pool surveys, efforts to document and confirm vernal pools started on NAES Lakehurst in 2003 and on Ft. Dix in 2008. Ten sites were surveyed in 2003 on NAES Lakehurst and fifty-nine sites were surveyed for stage 1 status on Ft Dix in 2008-2009. The survey was initiated base-wide on JB MDL in 2012 and has categorized over 70 of these wetlands. Preliminary mapping of possible vernal pool sights was provided by the NJDFW. These sites and any other potential sites are visited during the appropriate season by JB MDL Natural Resource staff and verified using a stage 1 physical verification process and then revisited for a stage 2 pool certification using the obligate or facultative species method of certification.

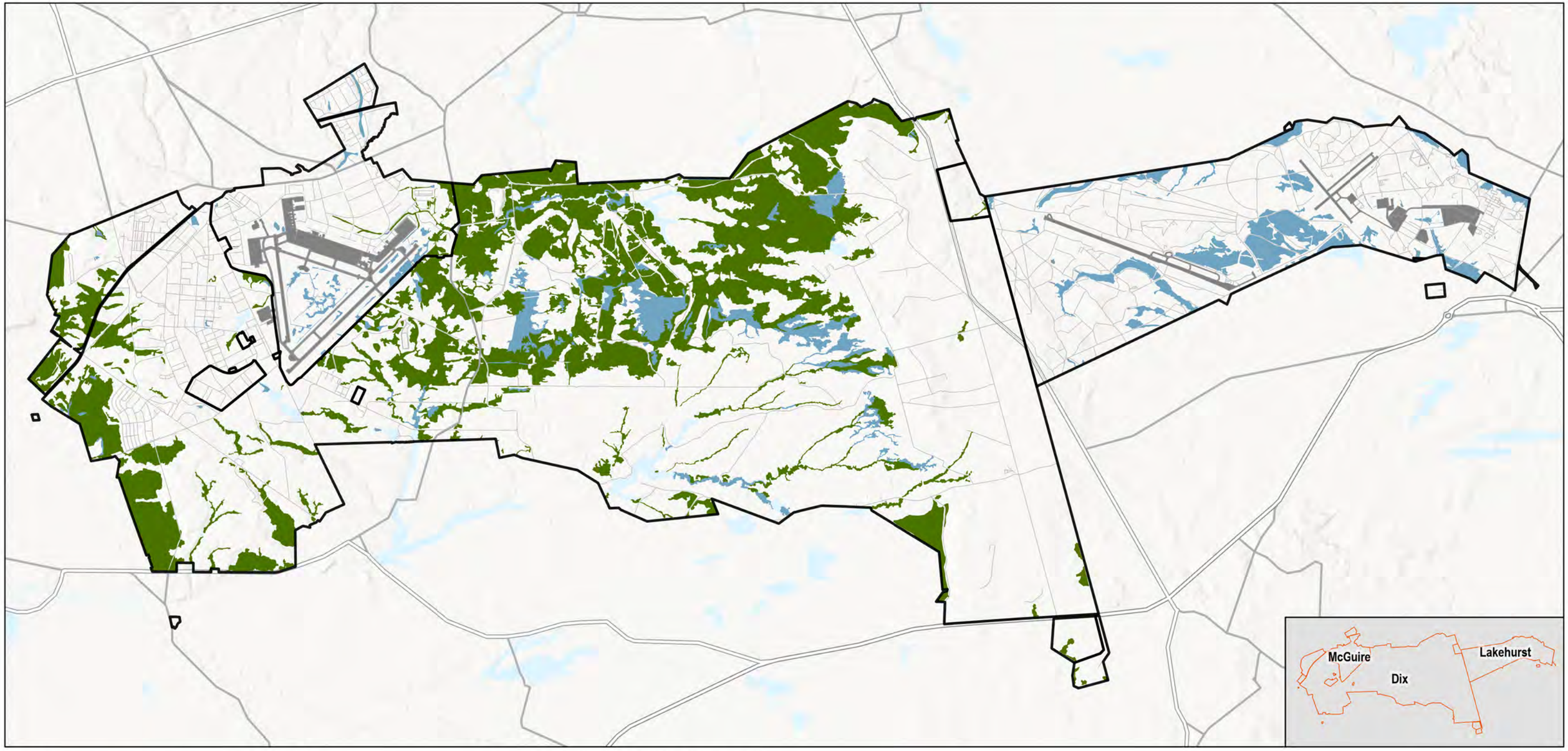
All vernal pool spatial data is stored in the Natural Resource GIS database. Datasheets and photo records are maintained with the Senior Biologist on staff.

### Wetlands Protection

In addition to protection afforded directly to wetlands, the Pinelands Comprehensive Management Plan (CMP) places a 300-foot restriction on development of lands adjacent to wetlands. Some restrictions are placed on other activities that have the potential to impact wetlands. Activities that are permitted in wetlands and their associated buffers, provided they do not cause significant adverse impact, are berry agriculture and horticulture of native Pinelands species, forestry, fish and wildlife management approved on a case-by-case basis, and low intensity uses such as fishing and hunting. Three hundred-foot buffers are shown for the various wetlands at JB MDL in Figure 6: Wetlands Map. A contract is currently being issued that will require an updated inventory of aquatic plants on Lakehurst under Project 8.3.1.3.1.

Military construction and other projects with the potential to disturb wetlands are reviewed individually with regard to wetland impacts and individual permits are sought as needed. Although permits may be obtained that allow for the filling of wetlands, in accordance with EO 11990, Protection of Wetlands, federal agencies may do so only after finding no practicable alternative.

# Wetlands

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- Woody Wetlands
- Emergent Herbaceous Wetlands
- Roads
- Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

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### *2.3.6 Other Natural Resource Information*

A list of the various survey and monitoring reports for JB MDL is contained in Appendix O and maintained in the NR office.

## *2.4 Mission Impacts on Natural Resources*

### *2.4.1 Natural Resource Constraints to Mission and Mission Planning*

Environmental laws and natural resource management impact training activities on the installation. JB MDL is required to follow local, state and federal laws concerning their activities. A list of these laws include: the NJ State Soil and Sediment Control Law (chapter 251), the NJ State Wetlands Law, the Federal Clean Water Act, the Endangered Species Act, NEPA, the National Historic Preservation Act, and the NJ State Game Code.

The greatest constraint to development on the installation is the presence of wetlands and their accompanying buffer zones. A minimum 50-foot wetlands buffer is required by the NJDEP. Threatened and Endangered species are surveyed and monitored to ensure no issues arise due to mission and training requirements. Aircraft operations, artillery firing, and tactical training mainly take place on established areas.

Larger grasslands on JB MDL harbor significant numbers of State-listed threatened and endangered species which are grassland obligates. This habitat acreage continues to dwindle under increasing development pressures from new missions coming to JB MDL. Mowing is prohibited in protected areas during the nesting season to avoid the hazard to threatened and endangered species located in these areas. Training in the Drop Zone and Lakehurst airfield mowing is curtailed during the nesting season (April 15 – July 31). The Slow-Speed, Low Altitude Training Routes and Drop Zone Environmental Assessment dated Dec 1998 limits the Drop Zone (DZ) to 10 total drops during the course of the bird breeding season and only five of the drops could be heavy (i.e., pallets or skids) drops. Parachute drops with personnel are also limited, but not banned, during breeding season. The Parachutists must collect their gear and hike to one of the roads in the DZ for pickup. No vehicles are allowed off roads to perform pickups during nesting season unless a parachutist is injured.

A Federally-listed species, the bog turtle, is present in the extreme southeastern corner of JB MDL adjacent to Lakehurst Borough. This area is a protected wetland, so conflicts are not anticipated.

The DoD Environmental Restoration Program (ERP) is responsible for identifying Comprehensive Environmental Response, Compensation, and Liability Act releases, considering risks and assessing impacts to human health and the environment (including impacts to endangered species, migratory birds and biotic communities). The ERP program is responsible for developing and selecting response actions when it is likely that a release could result in an unacceptable risk to human health and the environment. When appropriate, the Natural Resources Program assists the Remedial Project Manager in identifying potential impacts to natural resources caused by the release of contaminants.

NR staff also participate, as appropriate, in the ERP decision making process by communicating natural resource issues on the installation to the Remedial Project Manager, attending Restoration Advisory Board meetings or reading the minutes, reviewing and commenting on ERP documents (e.g. Remedial Investigation, Ecological Risk Assessment), and ensuring that response actions, to the maximum extent practicable, are undertaken in a manner that minimizes impacts to natural resources on the installation and in the surrounding area.

Due to past land uses such as the proving grounds and the practice bombing range, a large portion of the installation has the potential to be contaminated with live unexploded or inert ordnance. The contaminated areas generally fall within a fan in the northern half of the Lakehurst area of JB MDL that extends from Maxfield westward to the western side of the catapult test runway and along the western ranges and Impact Areas on the Dix area. Explosive ordnance disposal (EOD) personnel must perform a site-specific sweep before land-disturbing activities are conducted. Less risk exists in other portions of the installation, though there is a small chance of contamination throughout most of the southern portion of the installation as well.

Maintaining civil infrastructure in an operable condition and maintaining adequate airspace for air refueling and strategic airlift operations are the primary resources required to sustain JB MDL's military missions. At Dix, if vegetation shifts due to climate change alter the forest canopy of the region, training realism for ground-based Army operations could be affected. However, this is not expected as vegetation models show only a small portion of land near the fenceline at Dix converting from temperate deciduous broadleaf forest to subtropical shrubland. Floodplain inundation is not expected to increase at JB MDL. The climate at JB MDL is expected to get wetter and hotter, which could have secondary effects on the mission such as vegetation shifts and species migrations leading to an increased regulatory environment.

Future impacts to the mission at JB MDL linked to climate change could include:

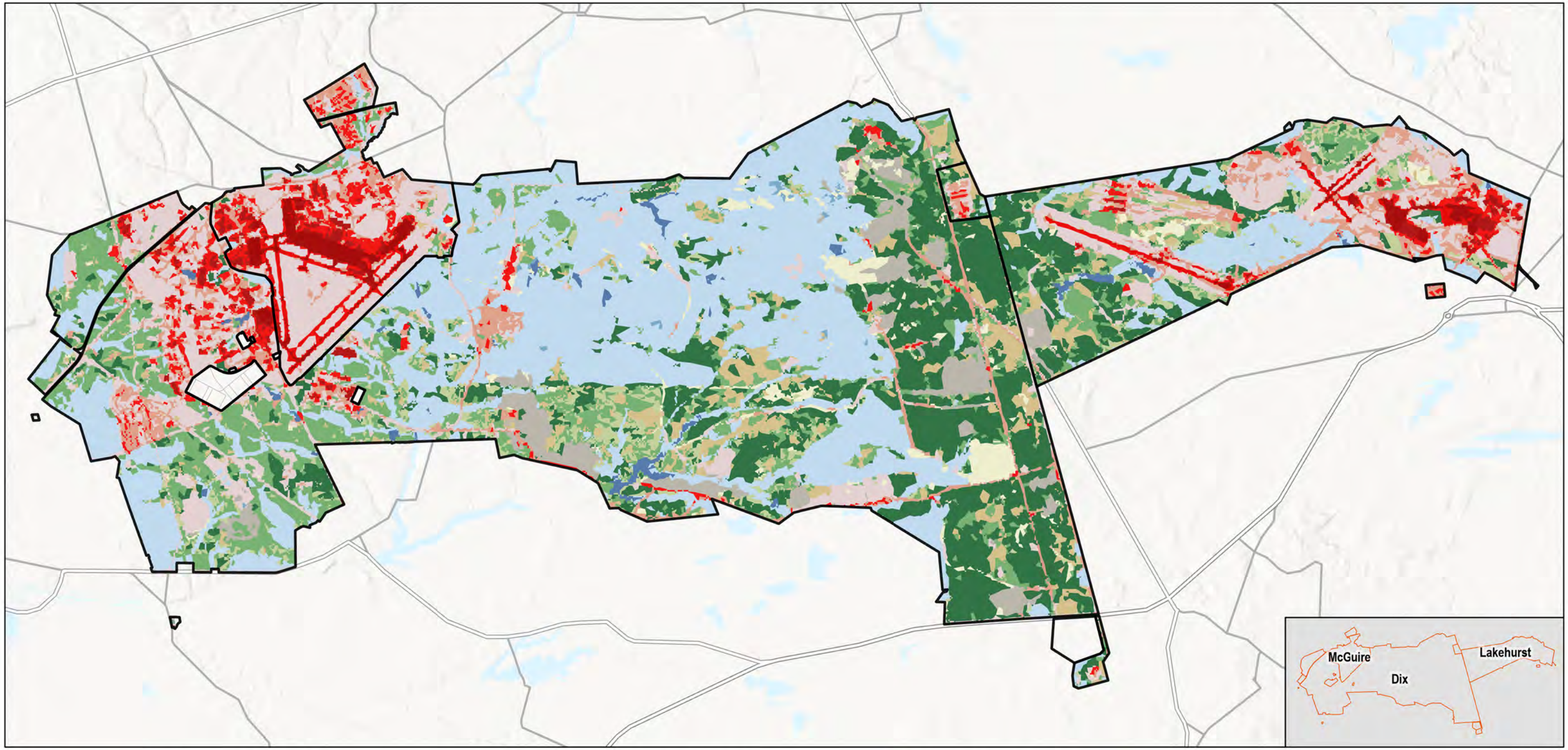
- increases in temperature and wind velocity leading to unsafe environmental conditions for the launch of current and planned weapons and equipment, resulting in increased maintenance requirements, requirements for new equipment, or decreased launch capacity (DoD, 2014).
- increased dust generation effecting equipment and visibility (DoD, 2014).
- increased wind velocities damaging vital mission infrastructure (Sydeman et al., 2014).
- increased drought potential (Glick, Stein, & Edelson, 2011).
- potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

In addition to these direct effects, climate change has the potential to disrupt the acquisition and transportation of materials required for the maintenance, construction, and storage of the equipment required for these systems (DoD, 2014).

### *2.4.2 Land Use*

As shown on Figure 7: Land Cover Map, JB MDL covers about 41,776 total acres, with a total of 5,511 acres of improved land, 4,654 acres of semi-improved land, and 31,830 acres of unimproved land.

# Land Cover

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Cooperative Agreement Number:
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W9126G-20-2-0004

N

Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space
- Emergent Herbaceous Wetlands
- Evergreen Forest
- Grassland/Herbaceous
- Mixed Forest
- Shrub/Scrub
- Woody Wetlands
- Open Water
- Roads
- Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

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### *2.4.3 Current Major Impacts*

There are several current installation mission activities that have potential major impacts on natural resources, though they each have a review and permitting process that limits potential environmental concerns.

**Training**

Certain types of training have the potential to heavily impact the environment. Training such as tank maneuvering, large weapon firings, bivouacking, and military vehicle training on steep terrains can cause soil erosion, soil compaction, sedimentation, and decreased water quality. Many range berms are not vegetated, leading to soil erosion, sedimentation, and potential water quality deterioration. These un-vegetated berms must be rebuilt periodically with heavy equipment. Additionally, certain unimproved roads in the Tactical Training (TAC) Areas are eroding along with unprotected pipe outlets from the Cantonment Area. These erosion problem areas are detailed in the JB MDL Erosion Inventory.

**Air Emissions**

Toxic air emissions can also have a major impact on natural resources. Permits are needed for operating numerous pieces of equipment that generate toxic air emissions, including generators, storage tanks, paint booths, boilers and other devices. JB MDL operates under three Title V, and several general, Clean Air Act permits that cover a majority of the base's air emission points. The discharge of wastewater from the base is covered under 3 individual NJ Pollutant Discharge Elimination System (NJPDES) permits and one utility agreement.

**Stormwater Drainage**

Stormwater discharge is also a major potential impact to natural resources. Stormwater is discharged from the base under one individual NJPDES and two general permits. The installation's storm water drainage system collects runoff from impermeable surfaces throughout the installation, which can inadvertently facilitate the transport of industrial pollutants into receiving waters. Stormwater management is therefore an important part of water quality protection at JB MDL. Installation personnel have prepared Stormwater Pollution Prevention Plans (SWPPP) that describes stormwater management standards, stormwater management controls, and best management practices used at JB MDL to maintain and protect water quality. The SWPPP was developed in accordance with the National Pollutant Discharge Elimination System, 40 CFR Part 122; New Jersey Storm Water Management Regulations NJAC 7:8, and NJPDES NJAC 7:14A.

The SWPPP also identifies the installation's stormwater discharge outfalls and describes the types of discharge and potential pollutants that occur at each. The installation's research, development, testing and experimental areas, operational and supply areas have the highest potential for industrial contamination of stormwater runoff to the storm sewer system because of the equipment, processes, and hazardous materials stored in these areas. Typical pollutants include oil, grease, solvents, lubricants, hydraulic oils, metals, and sediment.

**Installation Restoration Program**

The IRP also lists approximately 106 existing areas of concern for contamination of soil and ground water. Areas of concern included leaking underground storage tanks (USTs); improper disposal of hazardous materials; landfills for domestic, construction and pathological hospital wastes; petroleum, oil, and lubricant containing areas; and the golf course. Most of these sites have been investigated and were found not to be a concern. Most known USTs have been removed and the remaining tanks are registered with the State of New Jersey.

Occasionally unknown USTs are found during construction projects which are located over old barracks locations. These tanks are removed when found. All known contaminated sites are being studied or have remedial actions in progress.

**Noise**

High noise zones, airfield accident potential zones, and airfield clear zones represent other sources of potential concern to natural resource management. A previous Air Installation Compatible Use Zone (AICUZ) study delineated noise contours, airfield clear zones, and accident potential zones associated with the training and test facilities. Development areas outlined in the current installation zoning plan are compatible with the AICUZ and few restrictions apply to natural resources-related activities within any zones other than the clear zone. Care must be taken to site activities in areas with compatible noise levels (AFH 32 7084, Attachment 4). Noise associated with military training remains an important issue in the public relations efforts of JB MDL with towns near the installation. Although natural resources management initiatives are not directly implicated, forest management has the potential to affect noise levels. Reducing timber cover in areas between firing ranges and residential areas can contribute to noise transmission; increased vegetative cover can disrupt sound waves and mitigate noise.

Although much of the open land appears to have low utilization, many of the installation’s training and testing activities generate overlapping constraints including explosive substance safety distance AICUZ restrictions that limit land uses. Encroachment issues are monitored and rectified with purchased or preserved tracts to protect the AICUZ, see Figure 8: JB MDL AICUZ Area Map for details.

**Hazardous Materials**

The transport, handling, and storage of jet fuels, fuel oils, diesel fuel, gasoline, waste oil and hazardous substances is an integral part of the military mission and facility support at JB MDL. The installation is currently reducing and consolidating all storage capacity and use needs. Storage tanks are primarily Above Ground Storage Tanks (AST) constructed either with double walls or within secondary containment dikes.

Information on the storage and handling of oils and hazardous substances is provided in detail as part of the installation's Discharge Prevention, Containment and Countermeasures and Discharge Cleanup and Removal Plans (DPCC/DCR), the Spill Prevention, Containment and Countermeasure plan (SPCC), and the Integrated Contingency Plan. These plans show the locations of storage areas, tank farms, secondary containments, material loading/unloading areas, and list the types and capacities of stored materials. The plans document the installation's efforts in protecting stormwater and environmentally sensitive areas from accidental discharge contamination. Environmentally sensitive areas, such as water resources used by a water supply, wetlands and wetland transition areas, and the habitats of federal and state endangered or threatened species, receive the highest priority for protection.

**Ground Water**

Ground water occurs throughout the sediments of the NJ Coastal Plain, though the yield varies considerably from formation to formation. The Cohansey Sand and Kirkwood Formations are aquifers having a good capacity for ground water, though they are seldom used except for private domestic supplies. Though the proportion of residential users of ground water from the Kirkwood-Cohansey Aquifer is projected to increase from the current 13% to 28% of all residential users in South Jersey by 2020. The Wenonah Formation and the Mount Laurel Sand aquifers occur beneath JB MDL and are capable of producing a good yield of ground water.

The Navesink, Hornerstown, and Manasquan confining layers (aquitards) separate these formations from the overlying Kirkwood Formation. In Burlington and Ocean Counties, the most productive aquifers are the Potomac, Raritan and Magothy (PRM) Formations. The outcrop of the PRM Formations occurs approximately ten miles to the northwest of JB MDL. Based on a dip of 25 to 45 feet per mile, these formations would be expected to begin at a depth of between 250 and 450 feet beneath the northwestern portion, and between 410 and 740 feet beneath the southeast portion of JB MDL. The Merchantville and Woodbury confining layers overlie the PRM aquifers. Ambient ground water quality is considered good, although in many areas, iron and manganese removal is necessary to achieve potability.

As part of the Installation Restoration Program (IRP) groundwater surveys are used to obtain a complete contamination list, project contamination pathways, analyze the fate of various ground water contaminants, and plan for required ground water remediation. The most active areas historically had the greater number of documented contaminated sites and potential areas of concern while less active or unused areas had relatively few.

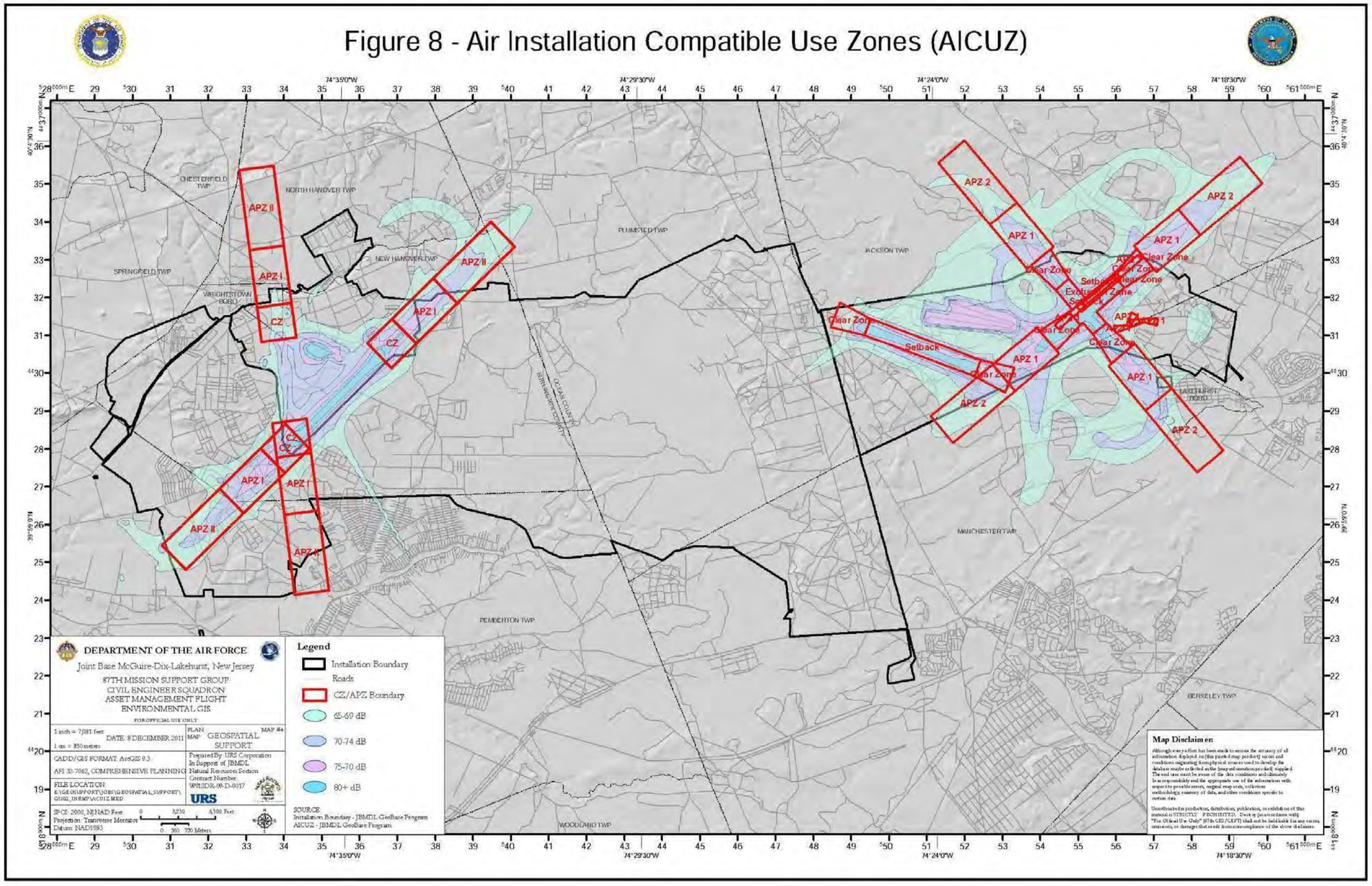



**Figure 8. JB MDL AICUZ Area Map**

### *2.4.4 Potential Future Impacts*

There is always a need for facilities and mission upgrades. Impacts to natural resources may occur from improperly sited facilities or poorly planned projects. It is the goal of the JB MDL Natural Resources Program to lessen the impact of construction projects and training missions on the natural environment on JB MDL. The JB MDL Natural Resources Program reviews planning documents to ensure minimal loss of grassland habitats from airfield expansion, new construction, and mandated mowing practices. Forested areas are also monitored for erosion. Projects are planned to utilize open range footprints, minimize disturbance, apply best management practices, and comply with the Sustainable Range Program (SRP).

The Integrated Training Area Management (ITAM) program is a core component of the SRP and is responsible for maintaining training land to help the Army meet its training requirements. To accomplish this mission, ITAM relies on the following four components:

- TRI (Training Requirements Integration) - Provides a decision support capability based on the integration of training requirements, land conditions, range facilities, and land management requirements.
- LRAM (Land Rehabilitation and Maintenance) - Repairs, maintains, and reconfigures training lands to meet maneuver training requirements.
- RTLA (Range and Training Land Assessment) - Acquires and assesses land condition data to provide information supporting decisions that maximize the capability and sustainability of training land to support maneuver training.
- SRA (Sustainable Range Awareness) - Develops and distributes educational materials to users of training lands to avoid unnecessary training damage.

These components combine to provide the means to understand how the Army's training requirements impact land management practices, what the impact of training is on the land, how to mitigate and repair the impact, and communicate the ITAM message to soldiers and the public.

Other potential future impacts include changes to travel routes and feeding patterns in areas where new fencing limits corridors along base boundaries or in areas that were once open. Impacts to wildlife populations are monitored in areas where vehicular traffic has increased.

The list below displays some major projects, planned for the period of this INRMP, that need to be evaluated, or have been evaluated for natural resource impacts:

- Construction for New Army National Guard parking lot
- Gravel improvements for training roads (underway)
- Construction of Battle Command Center/Non-Commissioned Officer Academy
- Road Improvements
- Stormwater outfall site replacement
- New Lakehurst commercial gate
- Army training area on west side of Lakehurst
- Solar panel farm east of the Lakehurst Engineering complex

Impacts to natural resources may include loss of habitat, soil erosion, soil compaction, sedimentation, and increased vehicular traffic causing casualties to wildlife.

### *2.4.5 Natural Resources Needed to Support the Military Mission*

The management actions identified for the JB MDL Natural Resource Program (NRP) are intended to help installation commanders manage natural resources effectively to ensure installation lands remain available and in good condition to support the installation's military mission and to ensure compliance with relevant environmental regulations. These actions incorporate the principles of ecosystem management and are consistent with standards identified by the NJDEP. The mission on JB MDL requires airfield clear zones be maintained to serve as buffers for aircraft and training exercises. If these areas are allowed to advance into scrub/shrub habitat the visual quality of the airfields would be depleted, and birds may be attracted to the airfields. The establishment and maintenance of warm season grasses is the preferred cover. By keeping grass stands healthy they will continue to provide long-term conservation benefits. Well established native grasslands typically do not need ongoing insecticide or herbicide treatment for weed control, which generally precludes the need for an intensive maintenance plan.

A critical component to the mission at JB MDL is the areas which are utilized for catapult launching, testing and development. The grasslands in the Test Runway clear zones comprise approximately 300 acres of predominantly warm season grasses. At the Jet Track Test Site, a total area of approximately 120 acres is maintained and cleared of pioneering trees, to ensure appropriate line of sight and safety zones for equipment and installation personnel. Natural resources management in these areas is largely determined by operational constraints. Nearly all of the land in this area is maintained in support of the airfield operations and the other testing missions.

The Drop Zone (a.k.a. Jump Circle) is an exceptional natural area in the Lakehurst section of JB MDL. This is the only DoD-owned drop zone for hundreds of miles. This area hosts parachute drops for personnel and formerly hosted cargo drops. The Drop Zone is 312 acres, about 15% of which is wetland. It is the site of an ESA-protected federally listed plant, Knieskern's Beaked-rush (US-Threatened, NJ- Endangered), and three other plants which are NJ Species of Special Concern: Sickle-leaved golden aster, Three-awn grass and Torrey's dropseed. It is a documented breeding site for at least four state-listed T&E wildlife species: Upland Sandpiper (NJ-Endangered), Grasshopper Sparrow (NJ-Threatened), Horned Lark (NJ-Threatened) and Northern Pine Snake (NJ-Threatened). It is a confirmed foraging area for Corn Snake (NJ-Endangered). Three other T&E species that have been occasional confirmed breeders in the past are Northern Harrier (NJ-Endangered), Henslow's Sparrow (NJ-Endangered) and Vesper Sparrow (NJ- Endangered). The Drop Zone is also a confirmed breeding site for two NJ (avian) Species of Special Concern: Eastern Meadowlark and Nighthawk. This is the most reliable location in the state of New Jersey to see Upland Sandpiper, a critically endangered bird in NJ. There are between three to six breeding pairs each year in the Drop Zone. The large open space (312 acres) at the Drop Zone also provides an ideal site for communications testing by Army research contractors.

Natural vegetation is required to serve as cover and concealment for individual training. This could be a dense or open forest, depending on the exercise. Forest areas are used for land navigation training, so both open and dense forest stands provide an important variable for this exercise. Military maneuvers and convoy training require a system of roads and trails. These roads must be on soils that resist erosion and are passable most of the year. The near level, sandy nature of the soils on JB MDL meets this requirement. The level soils on the installation reduce erosion. The sandy soil texture on roads compacts well, creating a hard surface for vehicle movement. In addition, the sandy soils in their natural un-compacted state percolate water quickly, thus, allowing troop movement soon after a rain.

The installation forests provide valuable buffer zones for the urban assault training that occurs at the three Military Operations in Urban Terrain (MOUT) villages around the base.

These buffers are also important for training at the Forward Operating Base (FOB) which would otherwise be visible from a major State highway passing along the southern boundary of the installation. Forests also provide shade and cover for 29 bivouac sites on the Dix Area of JB MDL.

There is also a need for capable land to handle the 60 firing ranges found on JB MDL. The range area forms a broad U-shaped configuration on three sides of the impact area. Weapons fired on these ranges are all aimed at the impact areas. The total area of ranges and impact area is 13,765 acres. Most of this is impact area where entry is restricted due to safety concerns. Thus, the impact area receives the least amount of human traffic. The constant firing into this area impacts the ecosystem by creating small craters and by causing wildfires. These impacts have created unique habitats for rare, threatened and endangered species.

The natural resources program also maintains five nature trails and 17 lakes that are frequently used by many military families for recreational activities.

## 3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and its "Plan, Do, Check, Act" cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, U.S. Department of Defense Instruction (DoDI) 4715.17, *Environmental Management Systems*, AFI 32-7001, *Environmental Management*, and international standard, ISO 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively managing associated risks, and instilling a culture of continuous improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

## 4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management-related roles and responsibilities are described in appropriate sections of this plan.

| **Office/Organization/Job Title** (Listing is not in order of hierarchical responsibility) | **Installation Role/Responsibility Description** |
|---|---|
| Installation Commander | JB MDL Wing Commander evaluates planned mission activities and considers the effect of those actions on base natural resources. |
| JB MDL's 787 CES | Staff provides the input, data and support needed to maintain an effective natural resources program. |
| JB MDL Forces Support Squadron (FSS) | Provides support to the environmental department for events such as Kiddie Fishing derbies, Earth Day events and base picnics. |

| | |
|---|---|
| AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS) | AFCEC provides technical expertise to assist base level natural resources management; provides support to base level natural resources management through expertadvice and management recommendations, as well as the programming and execution of natural resources management support projects |
| Installation Natural Resources Manager/POC | JB MDL's NRM is responsible for administering the natural resources program through developing and implementing the INRMP, collecting and interpreting data, adjusting management practices, building community partnerships, briefing leadership, and generally ensuring the installation's natural resources continue to support the military mission. |
| Installation Security Forces | JB MDL 87 SFS enforces base access policies and patrols the installation and roadways. |
| Installation Unit Environmental Coordinators (UECs) | UECs serve as the EMS conduit between the environmental function and their unit regarding matters dealing with hazardous waste and hazardous material issues. |
| Installation Wildland Fire Program Manager | JB MDL Wildland Fire Program Manager is responsible for the JB MDL Wildland Fire Management Plan, Site Specific Burn Plans, and oversees prescribed burning and assists with wildland fire on the installation to support the military mission and protect the surrounding communities. |
| Pest Manager | Pest control specialists are responsible for trapping and relocating pests, preventing insect infestations and controlling weed growth. |
| Range Operating Agency | Oversees range activities, scheduling and maintenance of the various ranges on the base. |
| Conservation Law Enforcement Officer (CLEO) | The CLEO duties include enforcing hunting and fishing regulations, as well as trespassing, vandalism and dumping violations. |
| NEPA/Environmental Impact Analysis Process (EIAP) Manager | The EIAP Manager will utilize a systematic approach when assessing environmental impacts of government activities and propose an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. |
| NJ Forest Fire Service and USFWS-Wildland Support Module | When requested will assist with prescribed burning operations and wildland fire suppression. |
| USDA-WS | Supports the installation Bird/Aircraft Strike Hazard program to promote aviation safety. |

| | |
|---|---|
| 305 AMW Safety | Supports aviation safety policy, promotes mishap prevention programs for all aviation assets and establishes proactive safety programs on two airfields, one at McGuire and one on Lakehurst. |
| The New Jersey Division of Fish and Wildlife (NJDFW), Endangered and Nongame Species Program (ENSP) | The NJDFW ENSP conducted the installation's original rare species survey and provided State-wide digital data for vegetation and land use classifications and critical rare species habitats. |
| US Fish and Wildlife Service | USFWS provides technical assistance with plans on fish and wildlife issues, is a signatory agency on this INRMP, conducts threatened and endangered species and critical habitat consultation under Section 7 of the ESA, and provides fish and wildlife census surveys and law enforcement. |
| Herpetological Associates (HA) | HA performs snake and reptile surveys under contract when needed. |
| USACE | USACE acts as a consulting agency on wetlands issues and source for Cooperative Ecosystem Studies Unit funding and survey projects. |
| NJDEP Division of Watershed Management | The NJDEP Division of Watershed Management assists with watershed management plans and advises on stormwater best management practices. |
| USDA | USDA Natural Resources Conservation Service (NRCS) acts as a consulting agency on soil conservation issues and native plant materials.<br>The USDA Forest Service provides Gypsy Moth monitoring.<br>USDA Animal and Plant Health Inspection Service assists in monitoring and supplying traps for forest pests. |
| Volunteer organizations | The Boy Scouts, New Jersey Audubon, Partners in Flight, and JB MDL Conservation Club provide a variety of services to the installation such as educational projects, bird surveys, maintenance and cleanup events and bluebird box monitoring projects. |

## 5.0 TRAINING

USAF installation NRMs/POCs and other natural resources support personnel require specific education, training and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

*Installation Supplement – Training*

| NR Management Area | Description of Requirement |
|---|---|
| DoD Conservation | *NRMs at Category I installations must take the course, DoD Natural Resources Compliance, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval School, Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov).* |
| | *Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses.* |
| | *All individuals who will be enforcing fish, wildlife and natural resources laws on USAF lands must receive specialized, professional training on the enforcement of fish, wildlife and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center (http://www.fletc.gov/).* |
| Safety Compliance | *Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.*<br><br>*Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.* |
| General information | *The DoD supported publication Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers (http://DoDbiodiversity.org) provides guidance, case studies and other information regarding the management of natural resources on DoD installations* |

Natural resources management training is provided to ensure that base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. Below are key NR management-related training requirements and programs:

The base maintains the following NR training requirements:

- Licensed pest controller
- Airfield driver license
- National Wildfire Coordinating Group-carded Prescribed Fire Burn Boss 2
- Commercial Driver's License for dozer transport vehicle (air brakes)
- Certified Wildlife Biologist (CWB)
- Certified Forester (CF)

## 6.0 RECORDKEEPING AND REPORTING

### *6.1 Recordkeeping*

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Management System (AFRIMS) records disposition schedule (RDS). Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook and in referenced documents.

*Installation Supplement – Recordkeeping*

The base NR personnel maintain all survey records within the NR office. These include wetland delineations, and surveys for bats, birds, aquatic environments, reptiles, flora, butterflies, mammals, climate and environment. GIS layers are maintained with updated survey data.

### *6.2 Reporting*

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Media Manager and Subject Matter Specialists should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

*Installation Supplement –Reporting*

NR personnel gather data and develop annual reports through the EESOH-MIS program regarding natural resource goals and objectives, staffing, funding and future projects.

NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

*Installation Supplement –Natural Resources Program Management*

# 7.0 NATURAL RESOURCE PROGRAM MANAGEMENT

## *7.1 Fish and Wildlife Management*

### *Applicability Statement*

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

### *Program Overview/Current Management Practices*

Fish and wildlife resources at JB MDL function as an integral part of the region's ecosystem. Existing populations are shaped by many environmental factors including vegetation, fire, moisture regimes, physical barriers, water quality, and human activity. An important function of the Natural Resources Program is to maintain and enhance habitats that support a full spectrum of native Pinelands wildlife species, including fish, birds, mammals, herpetofauna, and invertebrates listed in Appendix B: JB MDL Flora/Fauna List. The basic objectives of fish and wildlife management at JB MDL are to:

- Manage fish and wildlife species and their habitats within the constraints of the military mission.
- Conserve and promote conservation of game and non-game fish and wildlife and their habitats, particularly habitats of State- or Federal-listed rare, threatened, or endangered species.
- Balance wildlife population levels with habitat carrying capacity.
- Provide for recreational opportunities for base personnel and their dependents and community members.
- Conducting periodic population estimates for other wildlife species, including eastern gray squirrel, bobwhite quail, wild turkey, migratory birds, ducks, deer and geese provides valuable information to assist in management of these species.

JB MDL also has a large number of reptile and amphibian species. These populations will be managed as closely as possible to the guidelines found in the "Management and Conservation of Reptiles and Amphibians in Military Installations" developed by DoD PARC.

A complete fisheries survey of the installation's lakes and ponds was conducted in years 2014-2015 and 2015-2016. It was needed to provide a better understanding of current fish populations and improve management of the fisheries program. The contract included specific requirements to document any findings of black-banded sunfish, mud sunfish, pirate perch, banded sunfish and American brook lamprey. However, current practices of stocking largemouth bass and trout will continue in support of the recreational fishing program. Creel data will also be recorded and summarized annually for each lake. Creel and general fishing data should include the species and number of fish caught, their weight and length, and length of time spent fishing.

JB MDL NR staff participates in a conservational approach to wildlife monitoring and surveillance. Active surveillance for known diseases is crucial in wildlife management and public health. Wildlife diseases that are introduced could decimate local wildlife populations that have no prior exposure and hence no immunity to the disease. Population declines in wildlife species may disrupt the balance of the local ecosystem. Wildlife diseases could also be disastrous for populations of species of concern or species highly valued by humans. Wildlife will be monitored for diseases such as Epizootic Hemorrhagic Disease and Chronic Wasting Disease in the whitetail deer population. Bats and amphibians will be watched for any sign of White Nose Syndrome and Chytrid Fungus (Bd) respectively. A full description of these diseases can be found in Appendix J: Animal Diseases.

JB MDL was one of 70 military installations to participate in the 2018 national sampling effort on Snake Fungal Disease conducted by the DoD Partners in Amphibian and Reptile Conservation. Swabs were taken from four captured northern pine snakes and sent to the collaborating lab at the University of Illinois. The sampling effort ended in December 2018, and sampling data revealed Snake Fungal disease was not present in the four samples collected.

JB MDL also participated in a 2013 DoD national sampling effort for chytrid fungus, Batrachochytrium dendrobatidis (Bd). The disease it causes (chytridiomycosis) has been devastating amphibian populations globally. Bd was found to exist on some of the amphibians sampled on the Base. JB MDL will continue to participate in national surveys and exchange data with state and federal agencies.

In the past, open areas designed to maximize forest edge effect were seeded with wildlife food crops. More current research suggests that these planted crops are not as beneficial to wildlife as once thought. NR personnel are now advocating a more natural approach regarding these open areas.

Approximately half of these open areas will be maintained, preserving the edge effect, but instead of planting grain crops as a wildlife food source, the areas will be seeded once with native warm season grasses only. The areas will be maintained by mowing and burning them once a year in the late fall and winter to keep pioneering trees from overtaking the areas. The natural balance of wildlife species will be healthier if only natural vegetation is available as a food source. The remaining areas will be left to naturally regenerate.

NR personnel have overseen the improvement of natural habitat for grassland bird species by planting native warm season grasses. Habitat could be further improved if large, open and unused areas in the developed portions of the installation altered their mowing regime from the current weekly schedule to a less frequent schedule. This option would not only be beneficial to wildlife but would reduce maintenance costs.

Nesting habitat has been enhanced for bird species by the construction and maintenance of artificial nest boxes for cavity-dwelling species that inhabit the installation. The bluebird nest box program has been very successful. Nest boxes for owls and wood ducks have recently been installed. Bat boxes have also been installed, but as of yet, have not been successful in forest habitat. Natural Resources personnel would like to try bat boxes on buildings in the more urban areas of the installation.

**Climate Change**

Fish and wildlife management on JB MDL is not likely to change greatly with regards to climate change. Current fish and wildlife management issues are likely to persist in the future such as presence of invasive/pest species, BASH concerns and habitat management. Rising temperatures and increased precipitation are not likely to drive away invasive and pest species such as feral cats and the Norway rat. Fish and wildlife surveys should be conducted on a regular basis. Monitoring of native species will be important to determine how a changing climate affects them. Changing climactic conditions also present opportunities for invasive species to flourish and push out native species. Monitoring of invasives will continue to be important and management plans should be flexible enough to adapt to changing wildlife concerns (Hellmann et al., 2008).

Increasing temperatures under all climate scenarios will likely have a negative impact on amphibian, macroinvertebrate and fish species inhabiting JB MDL. As water temperatures rise in lentic systems, dissolved oxygen content will lower, resulting in decreased habitat quality particularly for larval amphibians and macroinvertebrates. Increasing water temperature will also raise the chances of algal blooms occurring, further depleting dissolved oxygen content and habitat suitability (Paerl et al., 2011).

Climate change will likely favor vectors for diseases such as mosquitoes and ticks (Süss, Klaus, Gerstengarbe, & Werner, 2008). Minimization of stagnant water in and around cantonment areas will help to reduce mosquito related infections.

Tick populations in urban settings can be restricted by keeping lawns mowed and by preventing overabundances of hosts such as deer, hogs and rodents.

### *7.2 Outdoor Recreation and Public Access to Natural Resources*

#### *Applicability Statement*

This section applies to all USAF installations that maintain an INRMP. JB MDL is required to implement this element.

#### *Program Overview/Current Management Practices*

The objective of Outdoor Recreation is to provide outdoor recreational experiences through programs and facilities for the military, civilian employees, their families, and the local population. These programs and facilities support the military mission by improving the quality of life on the installation. Outdoor recreation opportunities are provided to the maximum extent possible within the constraints of the military mission and capability of the natural resources. Outdoor recreation helps foster public understanding and awareness of the environment through educational programs.

Outdoor recreation available at JB MDL includes hunting, fishing, shooting, picnicking, bird watching, nature study, playgrounds, and camping, which are dependent on the natural environment. Management of developed or constructed facilities, such as the golf course is overseen by FSS and is not included in this INRMP.

Other offices at JB MDL assist with natural resources management. These offices include Outdoor Recreation, Security Forces and the CLEO. Outdoor Recreation assists with wildlife management by reporting permit and harvest numbers to NR personnel. The CLEO and Security Forces are responsible for the enforcement of game, pollution, and environmental laws. All administration of the program will be reviewed by NR.

The JB MDL Outdoor Recreation program sponsors several hunter safety courses. These include general hunter safety, sportswomen and the outdoors, trapper education, and skeet shooting education. A portion of all these courses deals with environmental concerns. Besides the formal environmental education programs in which Environmental personnel participate, the installation regularly hosts visits from birding groups, environmental groups, and biologists interested in seeing and studying the rare species and unique ecosystems at JB MDL.

**Climate Change**

Outdoor recreation and public access to natural resources on JB MDL is unlikely to be affected by climate change. Access to outdoor areas for low impact activities such as shooting, picnicking, bird watching, nature study, camping and use of the golf course should continue without any impacts. Higher impact activities such as hunting and fishing will need to be continually assessed for the health of those game and fish communities, making wildlife surveys important, not only for maintaining healthy ecosystems, but for ensuring continued outdoor recreation.

**Areas Suitable for Outdoor Recreation Activities**

JB MDL has 18,677 acres of undeveloped area suitable for outdoor recreation, while hunting and fishing is limited to areas not in use by training operations. Hunting and fishing are popular activities on the installation. In a typical year, there are around 12,000 hunter man-days on the installation. The most popular game is white- tailed deer. Over 800 fishing permits and 500 hunting permits are issued per year for shotgun, muzzleloader, and bow hunting. In addition, small game such as rabbits, turkeys, and squirrels are hunted. Hunting and fishing protocols and regulations are overseen by the NR staff.

The hunting and fishing program provides the most popular outdoor recreation activities on the installation. Special family hunting and fishing programs each year include “Free Fishing Days” in June and April, “Take a Kid Hunting Day” in November, and a special youth pheasant hunt each year around Thanksgiving. Conducting periodic fish and wildlife censuses and collecting and analyzing annual harvest and creel data help ensure the sustainability of a quality hunting and fishing program at JB MDL.

Turkeys, which were released on the installation in 1986 and 2002 have thrived and are hunted in the spring. Sport fishing occurs on a few the man-made lakes on the installation. Of these, five lakes are stocked with trout and bass. Hunting and fishing fees generate approximately $20,000 per year.

**Hunting, Fishing, Trapping Program Organization and Management**

JB MDL hunting, fishing, trapping and dispersed outdoor recreation programs are compatible with the installation mission and help achieve many natural resource goals. The Natural Resources Program is responsible for the direction and oversight of all hunting and fishing programs. User fees collected fund the outdoor recreation programs. Fees are used to provide stocking, as needed, and to purchase goods and services required to implement the programs (Appendix F: JB MDL Hunting and Fishing Rules).

JB MDL hunters are now required to use the NJDFW automated reporting system when they successfully harvest a deer. Updated electronic reporting and tagging of game has been implemented on JB MDL.

Hunting, fishing, and trapping on JB MDL are controlled by access categories and open to the public where access allows. Two entities exist as Approved Private Organizations (APOs): JB MDL Rod and Gun Club and JB MDL Conservation Club.

Membership requirements are stated in the By-Laws of each club, which follows JB MDL Natural Resource policy and Joint Base Hunting and Fishing Rules Appendix F. Club membership is not a prerequisite and is not required to hunt on base.

Deer is the largest game hunted on JB MDL. See Table 15: Deer Harvest Numbers for 2001-2019 for deer harvested from 2000 to 2019 on former Fort Dix areas, Deer Management Zone (DMZ) 37, and the former NAES Lakehurst, DMZ 53. Deer season lengths and bag limits are set in consultation with NJDWF to ensure that deer populations do not exceed the carrying capacity of JB MDL.

**Table 15. Deer Harvest Numbers for 2001-2019**

| Year | Zone | Fall Bow | Permit Bow | Youth Day | 6-Day Firearm | Per- M/L | Per- Shotgun | Winter Bow | Total |
|---|---|---|---|---|---|---|---|---|---|
| **2018/2019** | **37** | 79 | 73 | 4 | 17 | 51 | 6 | 46 | 276 |
| | **53** | 14 | 10 | 0 | 5 | 8 | 2 | 4 | 43 |
| **2017/2018** | **37** | 85 | 74 | 1 | 12 | 48 | 1 | 52 | 273 |
| | **53** | 12 | 6 | 0 | 4 | 8 | 1 | 2 | 33 |
| **2016/2017** | **37** | 50 | 63 | 1 | 17 | 43 | 1 | 33 | 208 |
| | **53** | 11 | 9 | 0 | 2 | 8 | 6 | 4 | 40 |
| **2015/2016** | **37** | 58 | 54 | 3 | 11 | 34 | 1 | 27 | 188 |
| | **53** | 14 | 3 | 0 | 3 | 5 | 5 | 4 | 34 |
| **2014/2015** | **37** | 52 | 52 | 0 | 9 | 27 | 2 | 40 | 182 |
| | **53** | 15 | 10 | 0 | 2 | 6 | 9 | 6 | 48 |
| **2013/2014** | **37** | 74 | 98 | 1 | 13 | 30 | 9 | 24 | 249 |
| | **53** | 29 | 23 | 0 | 8 | 15 | 20 | 10 | 105 |
| **2012/2013** | **37** | 67 | 47 | 0 | 18 | 67 | 2 | 21 | 222 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **53** | 21 | 6 | 0 | 2 | 15 | 7 | 7 | 58 |
| **Year** | **Zone** | **Fall Bow** | **Permit Bow** | **Youth Day** | **6-Day Firearm** | **Per- M/L** | **Per- Shotgun** | **Winter Bow** | **Total** |
| **2011/2012** | **37** | 83 | 61 | 2 | 7 | 83 | 7 | 15 | 258 |
| | **53** | 8 | 11 | 0 | 2 | 7 | 5 | 2 | 35 |
| **2010/2011** | **37** | 68 | 49 | 2 | 5 | 100 | 0 | 26 | 250 |
| | **53** | 9 | 7 | 0 | 4 | 13 | 5 | 2 | 40 |
| **2009/2010** | **37** | 78 | 49 | 1 | 13 | 72 | 2 | 28 | 243 |
| | **53** | 6 | 4 | 1 | 2 | 19 | 6 | 2 | 40 |
| **2008/2009** | **37** | 76 | 50 | 1 | 13 | 97 | 2 | 28 | 267 |
| | **53** | 20 | 7 | 2 | 3 | 22 | 14 | 2 | 70 |
| **2007/2008** | **37** | 62 | 54 | 1 | 19 | 90 | 1 | 22 | 249 |
| | **53** | 22 | 8 | 0 | 2 | 10 | 8 | 3 | 53 |
| **2006/2007** | **37** | 55 | 50 | 0 | 14 | 107 | 0 | 20 | 246 |
| | **53** | 16 | 6 | 0 | 1 | 13 | 12 | 6 | 54 |
| **2005/2006** | **37** | 75 | 54 | 0 | 23 | 126 | 7 | 9 | 294 |
| | **53** | 19 | 14 | 1 | 4 | 27 | 35 | 6 | 106 |
| **2004/2005** | **37** | 34 | 30 | 0 | 13 | 94 | 1 | 7 | 179 |
| | **53** | 12 | 12 | 1 | 2 | 25 | 30 | 8 | 90 |
| **2003/2004** | **37** | 29 | 25 | 2 | 13 | 100 | 2 | 3 | 174 |
| | **53** | 15 | 15 | 5 | 14 | 25 | 33 | 9 | 116 |
| **2002/2003** | **37** | 29 | 11 | 3 | 22 | 97 | 6 | 2 | 170 |
| | **53** | 14 | 20 | 2 | 8 | 24 | 7 | 6 | 81 |
| **2001/2002** | **37** | 18 | 8 | 0 | 0 | 39 | 1 | 4 | 70 |
| | **53** | 10 | 11 | 1 | 4 | 11 | 5 | 4 | 46 |
| **2000/2001** | **37** | 29 | 23 | 0 | 23 | 116 | 0 | 4 | 195 |
| | **53** | 18 | 6 | 0 | 8 | 26 | 8 | 5 | 71 |
| | | | | | | | | **Total** | **5356** |

Note: Table divided into two distinct zones based upon NJ State hunting areas.

## Hunting and Fishing Policy, Regulations and Fee Structure and Permitted Access

In accordance with the Sikes Act, fees collected from the sale of hunting and fishing permits on military installations are used to support the recreational and conservation programs. At JB MDL, fees are used to support fish and pheasant stocking, maintenance and upkeep of fishponds, and other natural resources projects. Permitted hunting, fishing, and trapping will follow all Federal and State Laws with purchasing, seasons, and bag limits. Natural Resources personnel will continue to work with NJDFW to establish season dates and bag limits. All hunting, fishing, trapping, and outdoor recreation activities will be conducted in accordance with AFMAN 32-7003 Section 3.32, “Hunting, Fishing, Trapping and Outdoor Recreation Programs”.

The following categories of participants are recognized in a three-level pricing system used on JB MDL; fees are subject to annual review and/or changes (see Table 15: JB MDL Hunting, Fishing, and Trapping Permit Fees):

Tier One: Active duty enlisted military E5-E9 (includes Reserves and National Guard) and their dependents, Veterans Administration (VA)-recognized 100% disabled veterans (Active Duty E1- E4 and dependents and disabled veterans are free).

Tier Two: Active duty military officers and their dependents, DoD civilians employed on JB MDL, retired military, disabled veterans with less than 100% VA-recognized disability, DoD retired civilians with retiree ID card, non-DoD federal employees with access to the installation.

Tier Three: Contract employees with access to JB MDL and members of the general public.

**Table 16. JB MDL Hunting, Fishing, and Trapping Permit Fees**

| LEVEL | FISHING | HUNTING | PHEASANT (LKE Only) | TRAPPING |
|---|---|---|---|---|
| Tier One | $25 | $25 | $60 | $25 |
| Tier Two | $30 | $30 | $60 | $30 |
| Tier Three | $40 | $40 | $70 | $40 |
| Under age 16 with NJ License | N/A | Free | Free | Free |

***Fees subject to revision***

Three categories of access for hunting and fishing are enforced on JB MDL:

- Open Areas-these are locations that are open to the general public if they have purchased the appropriate base permit, such as the Dix Range Area section of the base.
- Restricted Areas- these are areas that are only open to active military and civilian employees, such as the Dix cantonment area and McGuire area. The Lakehurst area is also restricted, but retired military and retired DoD civilian employees do have access to this area.
- Off Limits Areas-no hunting or fishing allowed such as Impact Area, Test Tracks, Airfields, etc.

**Demand for Hunting, Fishing, and Non-consumptive Natural Resources**

JB MDL has a high demand for hunting, fishing, and trapping permits. These activities are a major form of outdoor recreation in the area. Hunting measures are important for population control, which is essential to mission performance and safety (minimize vehicle collisions).

**Outdoor Education and Wildlife Interpretation**

NR personnel provide wildlife watching areas with five interpretive trails and seventeen lakes. Many lakes provide suitable habitat for wildlife, including both resident and migratory species. Environmental awareness is instrumental in creating conditions needed to conduct natural resources management. Awareness involves education and open communication with the public on natural resource issues. Most of this work is done through outreach with the public and educational programs. Awareness is essential to enforcement and strategic to protection of diverse resources. Natural Resources personnel historically have spear-headed conservation education through Earth Day, Public Lands Day, and other activities targeted at children and the military.

There are eight nature trails/jogging paths on JB MDL. See Figure 9: Recreational Nature Trails Map. Developed trails offer opportunities for nature study and recreation for base personnel, school groups, and the general public (by invitation for events such as Earth Day). Laurel Pond has two trails encompassing a total of a mile and a quarter (with 1/3-mile extensional loops) with examples of vegetation and wildlife viewing areas. Bass Lake has a one-mile long interpretive trail, encircling Bass Lake with 27 numbered stops, twelve benches, and two picnic areas. An educational brochure, developed by the NRM, explains interesting natural phenomena that may be seen at each numbered stop. Periodic mowing and maintenance on the trail are performed by NR staff.

A fourth trail, the Misty Hollow trail, is located in the northwestern portion of McGuire and goes through a woody area located near the Falcon Courts North housing area. However, more work is needed to upgrade this trail as an interpretive educational tool.

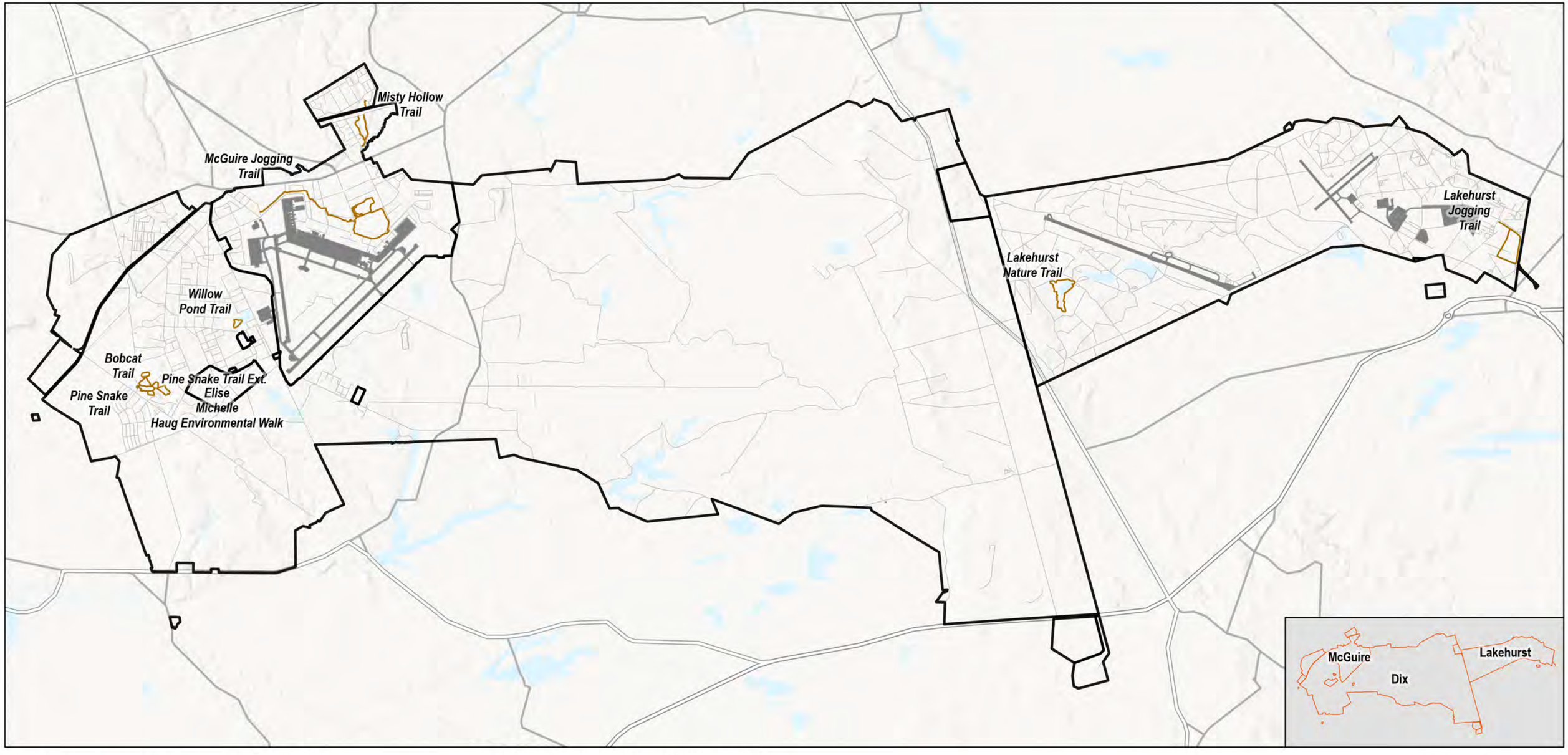
## Camping

Camping is offered at five locations on the base. Island and Willow Pond (Dix) offers a small area for vehicular and tent camping; Freedom Park, a FSS administered recreational area, has a group campground for Boy Scout troops and other private organizations; Bass Lake and Laurel Pond are used by Boy Scouts for primitive camping as well. All Recreation areas will be controlled by CE.

## Firewood Gathering/Base and Handicapped Access

The Tactical Areas on the installation are not open to the public, except for hunting and firewood gathering with a permit. The Dix Cantonment Area and the McGuire area currently have fencing around the perimeter and are limited to individuals with base access. This fence line also incorporates Tactical Areas 1D, 1E, 31A, 31B, 31C, 32A, 32B, 32C, 33, 35A, 35B, and 35C. Access to any fenced area and the listed tactical areas are controlled by the Security Forces. Handicapped access is provided at Range 14 and three lakes at JB MDL: Laurel Pond, Hipps Folley, and Island Pond. Range 14 is the shooting range mostly used by the general public. Outdoor Recreation has equipped this range to allow for handicapped shooting. Programs to instruct disabled individuals on how to shoot and hunt are also conducted.

# Recreational Nature Trails




FOR OFFICIAL USE ONLY


**Prepared By:**
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Cooperative Agreement Number: W9126G-14-2-0018 - W9126G-20-2-0004


N

Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

Recreational Nature Trail
Roads
Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

Document Path: F:\z_ISS JBMDL_JBMDL\JBMDL Pro Workspace\JBMDL Pro Workspace.aprx

**Policy on Off-Road Vehicle (ORV) and Mountain Bike Use on Installation Lands**

Currently, there are no designated paths for mountain biking or All-Terrain Vehicles. However, Laurel Pond can be utilized as a foot or bike path. Bikes are not permitted around Bass Lake Nature Trail. The current Hunting and Fishing instructions ban ORVs from going off-road.

### *7.3 Conservation Law Enforcement*

*Applicability Statement*

This section applies to all USAF installations that maintain an INRMP. The installation is required to implement this element.

All individuals enforcing fish, wildlife, and natural resources laws on USAF lands must receive specialized, professional training on the enforcement of fish, wildlife, and natural resources (AFMAN 32-7003). This training may be obtained by acquiring certification as a state fish and wildlife conservation law enforcement officer or by successfully completing the Natural Resources Police Training Program course at the Federal Law Enforcement Training Center. Correspondence courses and standard Security Forces training do not meet the requirements of the Sikes Act.

A USFWS CLEO started on JB MDL in 2019. The duties will include enforcing hunting and fishing regulations as well as trespassing, vandalism and dumping violations. The CLEO is supervised by an USFWS representative. The CLEO's schedule can be modified to fit the base's needs (change hours, change days), which allows for optimum use of the CLEO to utilize them where and when they are most needed. **The Conservation Law enforcement officer is to be deemed essential in the case of any emergencies locally, state or federal.**

*Program Overview/Current Management Practices*

Many aspects of natural resources management require effective conservation law enforcement if they are to be successful. Programs such as hunting and fishing, sensitive species protection, and cultural resources protection are dependent upon effective law enforcement.

The following operations are important to enforcement on JB MDL:

- Patrol and surveillance of Training Areas in support of Range Control.
- Enforcement of JB MDL regulations and State and Federal game laws.
- Checking licenses, hunter safety cards, and permits.
- Investigation of violations of State and Federal natural resources laws.
- Enforcement of the Archeological Resources Protection Act; and
- Enforce regulations against the unauthorized operation of motorized vehicles.

JB MDL is an exclusive jurisdiction where NJ enforcement authorities cannot write a summons. The summons must be written by Security Forces or the CLEO. The source of authority stems from federal law and DoD/USAF instructions. Violations are adjudicated by Federal Magistrate Court. Violations of JB MDL regulations (not based on State or Federal law) are punishable by either non-judicial or administrative actions by commanders or supervisors.

**Concealed Weapons**

Carry permits or concealed carry permits of any state are not recognized as authority to allow a person to carry a weapon on JB MDL at any time. Possession of handguns on JB MDL is prohibited.

**Miscellaneous Unlawful Activities**

a. No littering or dumping on JB MDL.
b. No camping unless in authorized area with proper authorization from Outdoor Recreation.
c. Unleashed animals are prohibited except for authorized hunting and training.
d. Take of all plants, fungi, animals, and their parts on any part of JB MDL is prohibited.
e. Introducing any plant, fungi, or animal is prohibited. This includes bringing in seed source or transplanting/translocating any plant, fungi, or animal.
f. Entry to JB MDL for purposes of locating, possessing, or removing artifacts or antiquities without written permission from Headquarters 787 Civil Engineer Squadron and a valid Archeological Resources Protection Act permit is prohibited.

### *7.4 Management of Threatened and Endangered Species, Species of Concern and Habitats*

#### *Applicability Statement*

This section applies to USAF installations that have threatened and endangered species on USAF property. This section is applicable to JB MDL.

#### *Program Overview/Current Management Practices*

Because of its location within the Pinelands National Reserve along with its diversity of habitat and large land area, JB MDL supports and/or has the ability to support many rare, threatened, and endangered plant and animal species, recognized by the Pinelands Commission, and NJ and federal agencies.

**Status of Threatened and Endangered Species Inventories**

JB MDL Natural Resources staff periodically conducts surveys to gather occurrence data about T&E species that exist or have the potential to exist on the installation. These surveys are usually updated on a five to ten-year rotation. Planning level surveys can be considered the base level of data collection and more conclusive surveys are performed for individual T&E species to meet the goals of this INRMP. Although past surveys to find Federally-listed T&E plants on JB MDL have included large-scale efforts on the Dix (1993-94, 2011-12), Lakehurst (1987-88, 2001, 2005-6) and McGuire, renewed efforts are in progress. Mr. Richard Radis is currently doing surveys on the Lakehurst section of JB MDL for any possible G2 or G3 species. In 2019, seven staff members from the NJ Heritage Program were issued base passes to conduct intense searches for American Chaffseed and any other rare plants they may encounter.

**Ongoing Threatened and Endangered Species Monitoring Programs**

There are a number of ongoing monitoring programs on JB MDL to assist with completing planning level consolidated surveys and to enhance knowledge of threatened and endangered species occurrence for NEPA compliance and project planning. Some of the programs are:

- Continued monitoring of bald eagle nest sites.
- Grassland bird census done annually on Lakehurst using established sample points.
- Diurnal raptor and barred owl surveys completed every 3-5 years.
- Random survey checks, especially from April 15 - June 15, around abandoned cranberry bogs at Lakehurst where bog turtles were found in the past.
- Random roadside survey checks for pine snake, corn snake, and timber rattlesnake from June-October.
- Random survey checks in appropriate habitat during growing season for endangered plants.
- Vernal pool certifications using the NJ LURP standards.

- Calling surveys for Pine Barrens tree frog on a 3-5-year rotation.
- Monitoring for arogos skipper in the Dix savannahs during July and August; monitoring for frosted elfin and the host plant on Dix and Lakehurst.
- Conduct additional surveys in appropriate habitats for Kneiskern's Beaked-rush, American Chaffseed, Swamp Pink and Three-awned Grass.
- Mist net survey for Northern long-eared bat, Little brown bat and Tri-colored bat.

**Current Biological Opinions for Threatened and Endangered Species and their Terms and Conditions**

JB MDL does not currently have any biological opinions for threatened and endangered species.

JB MDL will implement conservation agreements, management plans, and recovery plans for listed species in accordance with ESA Section 7, as required. Current consultations include the Airfield Safety Zone Vegetation Clearing. JB MDL is currently working with USFWS on mist netting efforts for northern long-eared bat. All of these consultations were informal since no biological opinion was rendered.

**Managing Habitats of Concern**

To provide better management of State-listed T&E species, breeding season mowing in grassland bird breeding areas is prohibited. Operational restrictions in the Drop Zone were previously discussed in Section: Natural Resource Constraints to Mission and Mission Planning. Passive Integrated Transponder tags are inserted into northern pine snakes and recaptures are monitored.

Development pressures on base grasslands and forests are reducing habitat. There is also pressure to mow airfield grasslands during breeding season to comply with USAF safety instructions. There are 4,540 acres of grasslands on JB MDL and of that acreage, 53% are in good condition, 11% are in fair condition and 36% are in poor condition based on a determination by NR personnel.

JB MDL lies within the Pinelands National Reserve and, as such, has similar habitats of concern. One such area is the reed grass savannahs in the Dix Impact Area. Frequent fires from range training have provided the appropriate fire regime for JB MDL to have one of the largest remaining reed grass savannahs on the east coast. Reed grass thrives in areas subjected to frequent fires.

**Migratory Bird Treaty Act**

On September 5, 2014, the DoD and the USFWS renewed a MOU to promote the Conservation of Migratory Birds, in accordance with Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds." This MOU describes specific actions that should be taken by JB MDL NR staff to advance migratory bird conservation; avoid or minimize the take of migratory birds; and ensure all DoD operations, other than military readiness activities, are consistent with the Migratory Bird Treaty Act. The full Migratory Bird Treaty Act and MOU can be found in Appendix G: Migratory Birds Treaty Act.

The MOU does not authorize the take of migratory birds. This MOU specifically pertains to this INRMP and natural resources management on JB MDL within the following specific category of JB MDL activity: natural resource management activities, including, but not limited to, habitat management, erosion control, forestry activities, agricultural outleasing, conservation law enforcement, invasive weed management, and prescribed burning.

A goal of the JB MDL natural resources program is to provide enforcement of the ESA, the Migratory Bird Treaty Act, the Sikes Act, and all other applicable state and federal natural resources legislation to the maximum extent possible while ensuring the successful accomplishment of the respective military missions

on-base. Natural Resources personnel will follow the responsibilities outlined in the Migratory Bird Treaty Act and corresponding MOU by promoting collaborative projects, following migratory bird permitting requirements, incorporating conservation measures into plans, identifying migratory bird species that could pass through the installation, and provide recreational opportunities for watchable wildlife at JB MDL. The office will also maintain a seasonal restriction on tree cutting for projects occurring between April 1 and September 30 to avoid impacts to migratory birds protected under the Migratory Bird Treaty Act (http://www.DoDpif.org/). According to the USFWS, NJ supports the second highest concentration of migratory birds in North America due to its location midway on the Atlantic Flyway. However, large flocks of migratory birds pose a significant threat to aviation safety, and as such should be discouraged from utilizing the airfield.

JB MDL cooperation with the Migratory Bird Treaty Act and MOU between DoD and USFWS will help alleviate the military impact on protected species (US FWS, 2011). JB MDL will also strive to adhere to the Unified Facilities Criteria involving the installation of compliant streetlights, which are configured to point downwards so as not to interfere with migrating birds at night.

JB MDL Natural Resources personnel participate in the DoD Partners in Flight (PIF) program which sustains and enhances the military mission by maintaining healthy landscapes and training lands through a proactive, habitat-based conservation management strategy. The key component to DOD PIF's work is its partnerships at a regional, State, national and international level, through the following programs:

- Bird Conservation Planning
- Important Bird Areas (IBA)
- Coordinated Bird Monitoring (CBM)
- North American Bird Conservation Initiative

The DoD PIF program consists of a cooperative network of natural resource personnel and others that spans across U.S. military installations. DoD PIF supports the military mission by providing a focused and coordinated approach for the conservation of resident and migratory birds and their habitats throughout JB MDL, including all migratory, resident, game, and non-game birds. Any bird monitoring work on JB MDL shall be structured in accordance with the CBM program issued by DoD PIF. Data collection for any bird monitoring shall be conducted in compliance with Avian Knowledge Network (AKN) requirements. A checklist of migrating birds in NJ is maintained by the NJDFW at their website http://www.nj.gov/dep/fgw/chkbirds.htm.

**Climate Change**

A primary focus of the suggested adaptation strategies is to address challenges and opportunities of transitioning to a climate resilient future and producing a positive, cost-effective "no-regrets" transition agenda. Adaptation strategies should be oriented towards longer-term security and sustainable practices and results. Suggested strategies are based on current strategies and practices augmented with strategies and knowledge that address emerging climate challenges. Based on identified vulnerabilities for projected climate periods, both retrospective and prospective adaptation strategies are suggested. Retrospective adaptation strategies include: a) resistance strategies that aim to reduce direct impacts of climate change and b) resilience strategies that aim to secure the capacity to cope with the effects of climate change by ensuring that critical ecological processes continue to function. If possible, prospective transformation strategies focused on preventing climate change impacts are suggested. In some cases, missing knowledge made assessment difficult and reduced confidence in vulnerability determination. These gaps are highlighted as areas that need to be addressed before adaptation strategies can be developed.

Management actions taken to protect threatened and endangered species will be influenced by the speed

at which the climate changes, the nature of the climatic changes and the ability of the species to respond to those changes. Our understanding of species' response to changing climate is not yet sufficient to be able to predict how an individual species will respond. In addition, the response of sub-populations of a single species may vary. Species can exhibit behavioral, plastic and genetic response to environmental conditions.

Genetic variation within a species has been associated with exposure to environmental conditions, however, populations may not be able to undergo selection for preferred traits if environmental conditions change rapidly (Hoffmann & Sgrò, 2011). Behavioral changes, such as hostplant or food source switching, and plastic responses, such as changes in body size associated with longer growing seasons, have already been observed (Iwamura et al., 2013; Ozgul et al., 2010). Many current management activities are appropriate for increasing resilience or facilitating adaptation to climate change. An ecosystem approach that prioritizes functional diversity, maintenance of habitat, habitat variability and connectivity can help support genetic diversity that may be important for adaptation and can help species migrate to more favorable habitats. However, when approaching the uncertainty that is inherent with managing species under changing environmental conditions, additional analysis and planning is required.

Research into actionable science used for biodiversity conservation in changing conditions has developed several key principles. Historic patterns used for management decisions are likely to be insufficient for future management challenges (Bierbaum et al., 2013). Proactive approaches that anticipate change can help extend the period over which species can adapt to changing climate and avoid catastrophic declines associated with stochastic events that act on an already stressed ecosystem.

### *7.5 Water Resource Protection*

#### *Applicability Statement*

This section applies to USAF installations that have water resources. This section is applicable to this installation.

#### *Program Overview/Current Management Practices*

JB MDL has several plans that outline how the base strives to protect its watersheds, including this INRMP. Although the plans are separate documents, they are coordinated with each other and all emphasize the elimination of pollution sources into surface water or groundwater systems. These management plans seek to reduce or eliminate contaminants to the environment to prevent degradation or damage to natural ecosystems and impacts to wildlife. Consequently, these management plans are inextricably linked to the INRMP by the common goal of reducing pollution to improve base ecosystems, increase environmental compliance, protect public health, and improve quality of life.

The management of JB MDL's golf courses is a natural resources-related program that creates non-point source pollution within the JB MDL watersheds. The golf course has prepared a Golf Course Environmental Management Plan (GEMP) which outlines management practices that improve upon their past level of environmental stewardship. Practices that reduce fertilizer and herbicide usage and improve water conservation are central to the GEMP. Other sources of contamination at the golf course are being managed through the ERP.

All of JB MDL's environmental plans and programs, such as the GEMP and ERP, are interrelated and well-integrated to ensure that actions and management practices do not conflict, and all strive toward the common goal of improving environmental resources. There are concerns regarding groundwater contamination associated with storage of chemicals, fuels, and oils.

These concerns are not covered within this INRMP, but they are included within other environmental plans and programs at JB MDL, such as the Spill Prevention Control and Countermeasures Plan, ERP,

and the Hazardous Materials Management Plan.

**Regional Issues Related to Watersheds affected by theinstallation**

JB MDL spans the Barnegat Bay, Crosswicks, and Rancocas watersheds. The Barnegat Bay watershed has seen significant development over the last 10 years and has suffered negative impacts from contaminated run-off from suburban areas. Fertilizer run-off is changing the quality of the water in the bay. Rancocas Creek also suffers from a decrease in quality from development. For more information on the Barnegat Bay, Crosswicks Creek and Rancocas watersheds, go to:

- www.nj.gov/dep/barnegatbay/bbfh.htm
- www.savebarnegatbay.org
- www.rancocasconservancy.org

**Wastewater/Stormwater Management Issues**

The storm water drainage system collects runoff from impermeable surfaces throughout the installation, which can inadvertently facilitate the transport of pollutants into receiving waters. Stormwater management is therefore an important part of water quality protection. There are three Stormwater Pollution Prevention Plans (SWPPP), one for each section of the base, that describes stormwater management standards, stormwater management controls, and best management practices used to maintain and protect water quality.

The SWPPPs were developed in accordance with the National Pollutant Discharge Elimination System, 40 CFR Part 122; NJ Storm Water Management Regulations NJAC 7:8, New Jersey Water Pollution Control Act N.J.A.C 7:14, NJPDES, NJAC 7:14A and several other State and Federal water pollution control regulations. The SWPPPs also identify the stormwater discharge outfalls and describe the types of discharge and potential pollutants that occur at each. The base has one surface water permitted discharge on Lakehurst catapult test site. The discharge is covered under NJPDES permit no. NJ0004642.

**Water Quality Monitoring and Sampling Points**

Lakehurst, Dix and McGuire each have their own stormwater permits. JB MDL performs water quality monitoring at the industrial outfall on Lakehurst and at the stormwater outfalls associated with the stormwater permit on McGuire. All outfalls have been in full compliance with permit limits for decades. The outfalls from Lakehurst, Dix and McGuire flow into the Toms River, Rancocas Creek and Crosswicks Creek watersheds, respectively.

**Cooperative Programs with other Governments or Private Organizations**

JB MDL works with many other organizations to conserve properties surrounding the installation to prevent encroachment as well as to protect watershed quality. JB MDL has met in the past with interested parties and potential partners regarding the encroachment issue. The cooperative program has involved US military installations, state and local government organizations, and state non-government organizations in NJ.

NJ Department of Consumer Affairs Smart Growth, NJ State Agriculture Development Committee, NJDEP Green Acres, Ocean County Planner, Burlington County Municipalities, Pinelands Preservation Alliance, The Nature Conservancy, Trust for Public Land, NJ Conservation Foundation, NJ Audubon Society and USFWS all participated in the event.

JB MDL has previously partnered and interacted with these organizations through the Readiness and Environmental Protection Initiative program to protect water resources in the area. To date, JB MDL has participated in the conservation of approximately 5,000 acres surrounding the facility.

## *7.6 Wetland Protection*

### *Applicability Statement*

This section applies to USAF installations that have existing wetlands on USAF property. This section is applicable to JB MDL.

### *Program Overview/Current Management Practices*

It is the goal of JB MDL's NR staff to encourage healthy, functional, resilient wetlands. It is the goal to maximize floral and faunal diversity in wetland habitats through water quality protection and manage for no net loss of wetland and watershed acreage, functions, and values. Watershed protection directly affects surface water quality and the value of aquatic habitats. JB MDL currently protects its surface water resources through compliance with a number of federal, state, local and USAF environmental regulations that require the base to have detailed spill control and response procedures and to implement storm water pollution prevention best management practices. The objective of these regulations is to prevent pollutants from entering the watershed, thus protecting surface waters. Specific watershed protection measures used by the base include spill clean-up equipment at industrial locations, implementing integrated pest management programs, and reduction of fertilizer applications.

**Wetlands Regulations**

Primary statutes that regulate activities in wetlands at JB MDL include the Federal Clean Water Act (CWA) (33 USC § 1251), and the 1987 NJ Freshwater Wetlands Protection Act.

Under Section 404 of the CWA, discharge of dredged and fill material into waters of the U.S., including wetlands, is prohibited unless a permit is issued by the USACE or NJDEP which has primacy. NJ has multiple general permits which are available for use by the base in order to accomplish its mission. These permits and requirements for wetlands in NJ can be found at NJAC 7:7A.

**Storm Water Quality**

The use of pesticides, herbicides, and fertilizers creates another potential source of contamination in storm water. Though these chemicals are not routinely used as part of grounds maintenance at JB MDL, small quantities may be applied to ornamental trees and shrubs or personal gardens in residential areas. However, chemical treatments are widely used at the JB MDL golf courses and are applied by a licensed pest controller. Pesticides are applied outdoors on a request basis only for mosquitoes and ticks since West Nile Virus and Lyme disease are concerns in the area. Areas sprayed include Freedom Park, picnic areas, and particular testing areas in remote sections of the base.

A certified pest controller must approve the use of all pesticides at JB MDL and only pre-approved pesticides may be used. To avoid contamination, areas around wellheads, wetlands, and waterways must be identified and avoided during all fertilizer applications and herbicides and pesticides are only applied in accordance with label directions, which are law.

**Erosion and Sediment Control**

Because of the relative flatness of the area and high permeability of the soils, erosion and sedimentation are not major water quality issues at JB MDL. However, activities that remove vegetation and disturb the soil greatly increase the risk of erosion and sedimentation and require protective measures.

Proposed construction projects that disturb more than one acre of soil must obtain authorization under NJPDES Permit No. NJ0088323.

All construction projects at JB MDL must have site specific soil erosion and storm water management plans that address runoff control during and after construction. Erosion and sediment control plans are submitted to 787 CES/CEIEC for review prior to the construction activity taking place. Frequent site visits during construction help ensure compliance with sediment erosion and control plans and that best management practices are being implemented.

In addition, any activity disturbing more than one acre of land requires a certified soil erosion and sediment control plan from the appropriate Soil District. The procedures and practices included in these plans must be in accordance with the Standards for Soil Erosion and Sediment Control under Chapter 251, P.L. 1975, the Soil Erosion and Sediment Control Act, and the CWA.

**Climate Change**

According to the USEPA (www.epa.gov/wetlands), wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods during the year, including during the growing season. Wetlands are an important natural system because of the diverse biological and hydrological functions they perform. These functions can include water quality improvement, groundwater recharge, pollution treatment, nutrient cycling, erosion protection, and stormwater storage. In addition, wetland areas provide vegetation and wildlife habitat, including those utilized by many species protected by state and federal regulation. Vegetation structure within wetlands ranges from open to bottomland hardwoods.

Wetland ecosystems at JB MDL will be particularly vulnerable to the increase of temperature, which could increase evaporation rates in these areas. Wetland systems are vulnerable to changes in quantity and quality of their water supply, and it is expected that climate change will have a pronounced effect on wetlands through alterations in hydrological regimes (Erwin, 2009).

Wetland and open water ecosystems will face increases in air and surface water temperatures, alterations in the magnitude and seasonality of precipitation and run-off and shifts in reproductive phenology and distribution of plants and animals (Parmesan and Yohe, 2003). These ecosystems are naturally resilient, provide linear habitat connectivity, link aquatic and terrestrial ecosystems, and create thermal refugia for wildlife, all characteristics that can contribute to ecological adaptation to climate change. Because wetland systems and the projected impacts of climate change are highly variable geographically, there is a pressing need to develop a place-based understanding of climate change threats to riparian ecosystems. Furthermore, until a more recent basewide wetlands delineation at JB MDL can be accomplished, any future project that may affect wetlands will require a project specific wetland delineation and evaluation of possible impacts.

## *7.7 Grounds Maintenance*

### *Applicability Statement*

This section applies to USAF installations that perform ground maintenance activities that could impact natural resources. This section is applicable to JB MDL.

### *Program Overview/Current Management Practices*

The urban forest tree resource on JB MDL is managed by the Landscape Maintenance COR in conjunction with 787 CES/CEIEA. The maintenance contract specifies an amount of money spent on tree maintenance and the contractor supplies labor and equipment for tree maintenance, as funding allows. McGuire and Lakehurst currently have the same landscape maintenance contractor, while Dix has a separate contractor and COR.

787 CES/CEIEA has completed an urban tree inventory for McGuire and made it available to the McGuire area Landscape Maintenance COR. 787 CES/CEIEA monitors urban trees and makes recommendations to the Landscape Maintenance COR on trees requiring pruning or removal. Street trees are recommended for treatment (i.e. removal or pruning requirements) based upon health and condition to limit any potential hazard issues. Maintenance of urban trees will be enhanced by identifying weak trees, trees hanging over roads, buildings, or wires and hazardous trees, such as those trees having large dead branches hanging over roadways, parking lots or sidewalks.

Any urban trees requiring removal are reviewed by 787 CES/CEIEA and inspected for nesting activity during the migratory bird breeding season of April 1 through September 30. Any project requiring removal of a large number of trees that may be impractical to inspect for nesting activity should not be scheduled during the migratory bird nesting season.

787 CES/CEIEA also assists with monitoring urban trees for emerging pests such as Gypsy Moth, Emerald Ash Borer, Spotted Lanternfly and Asian Long-horned Beetle. Findings are reported to JB MDL Pest Management for implementation of appropriate control measures.

Businesses doing tree care work in NJ are required to comply with the Tree Expert and Tree Care Operators Licensing Act: NJAC.45:15C.

### *7.8 Forest Management*

#### *Applicability Statement*

This section applies to USAF installations that maintain forested land on USAF property. This section is applicable to JB MDL.

#### *Program Overview/Current Management Practices*

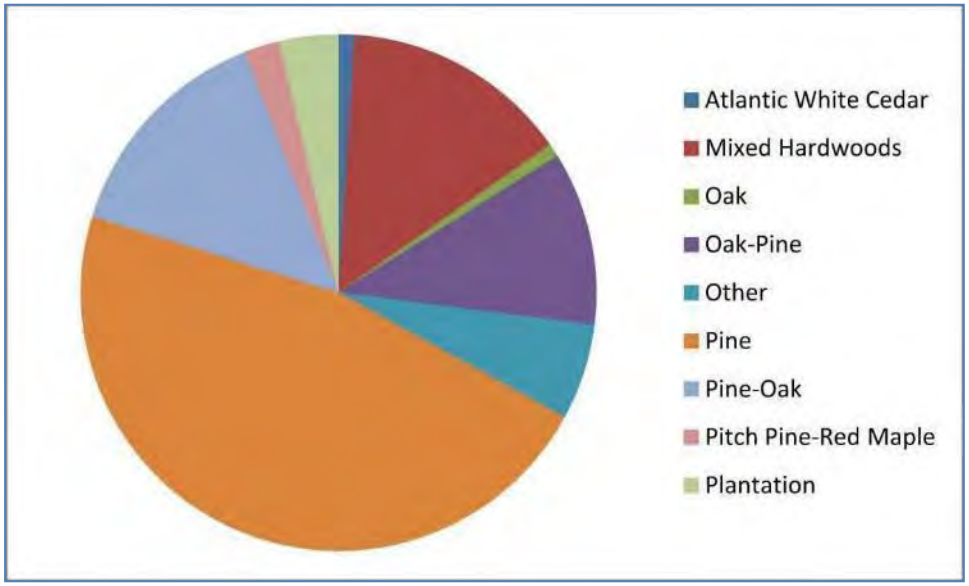
Forest management is an important issue at JB MDL. Of the total of 41,776 acres on the installation, 29,311 are wooded, which includes 24,609 on Dix, 4,230 on Lakehurst and 324 on McGuire. Of the 29,311 wooded acres, 18,267 acres are considered potentially commercial forest, where forest products could be harvested. A large part of the remaining forested acreage of about 8,080 acres exists in the training impact area where no forest management activities occur other than prescribed burning to reduce the potential of catastrophic wildfire.

**Forest Cover Types**

General forest cover types found on the installation are included in Table 17: Forest Cover Type Summary and the distribution can be seen in Figure 10: Forest Stand Map.

**Table 17. Forest Cover Type Summary by Frequency**

| Forest Cover Type | Dix (ac.) | Lakehurst (ac.) | McGuire (ac.) | Total (ac.) | % |
|---|---|---|---|---|---|
| Pine | 11946.25 | 1633 | 16.87 | 13596.12 | 46.62 |
| Mixed Hardwoods | 3522.14 | 360.76 | 294.53 | 4177.43 | 14.32 |
| Pine-Oak | 3193.12 | 959.18 | 12.98 | 4165.28 | 14.28 |
| Oak-Pine | 2369.94 | 801.41 | 0 | 3171.35 | 10.87 |
| Other | 1751.52 | 0 | 0 | 1751.52 | 6.01 |
| Plantation | 864.1 | 217.47 | 0 | 1081.57 | 3.71 |
| Pitch Pine-Red Maple | 649.04 | 0 | 0 | 649.04 | 2.23 |
| Atlantic White Cedar | 201.11 | 83.14 | 0 | 284.25 | 0.97 |
| Oak | 111.37 | 126.98 | 0 | 238.35 | 0.82 |
| **Total** | **24608.59** | **4229.94** | **324.38** | **29162.91** | |
| **%** | **84.38** | **14.50** | **1.11** | | |




The forest management program at JB MDL initiates and conducts activities that maintain and enhance the ecological integrity of forested areas while supporting the military mission by manipulating the vegetation of the forest resource to meet management objectives. The objectives at JB MDL include: provide and improve training resources, reduce the risk of catastrophic wildfire, provide soil and watershed protection, provide wildlife habitat, protect rare and T&E species habitat, protect ecologically unique and sensitive natural areas, provide areas for outdoor recreation, and facilitate the sale and utilization of forest products where possible.

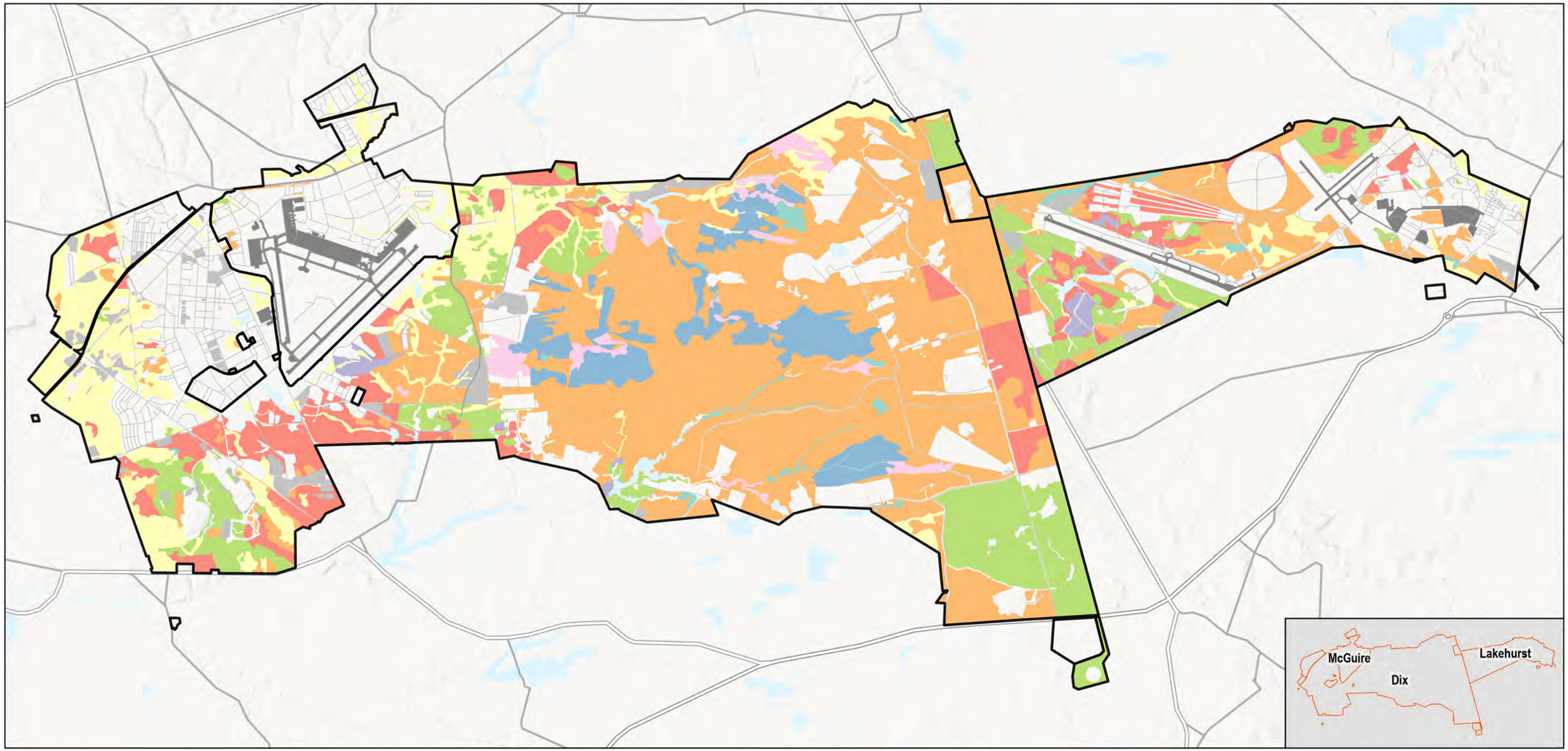
Atlantic White Cedar Stands - 284 acres. The stands of Atlantic white cedar (*Chamaecyparis thyoides*) comprise less than 1% of the total forested acreage of the installation. They grow naturally in pure stands in wetland areas.

Most of the natural stands of Atlantic white cedar in NJ were harvested years ago and have not regenerated. Efforts at JB MDL to convert old cranberry bogs along the base boundary into Atlantic white cedar plantations have been partially successful. Because of the relative rarity of Atlantic white cedar and their wetland habitat, the installation tries to protect these remaining stands.

Mixed Hardwood Stands - 4,177 acres. The upland portion of this cover type is a successional forest that came into being when much of the western portion of the installation was not used for intensive training after the Vietnam War. A mix of hardwoods and oaks colonized the upland areas. Soils here are generally productive, so with proper management, these stands can support saw timber quality trees. Unfortunately, many species on site lack commercial value. Less desirable species should be thinned out to allow oaks to dominate the stands (i.e., Timber Stand Improvement).

Trees such as sassafras, black cherry, and red maple should be cut for firewood. Mixed hardwood stands should be targeted as a primary area for firewood cutting. These stands also contain grapevines, which are harvested by gatherers. No special management is done for the grapevine. Mixed hardwoods are also found in wetland areas of the installation, where they consist mostly of red maple, sweetgum and black gum. Because of the generally wet soils, only limited harvesting should be considered.

# Forest Stand

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Cooperative Agreement Number:
W9126G-14-2-0018 -
W9126G-20-2-0004

N

Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

- Atlantic White Cedar
- Mixed Hardwoods
- Oak
- Oak-Pine
- Other
- Pine
- Pine-Oak
- Pitch Pine-Red Maple
- Plantation
- Roads
- Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

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Oak Stands on Good Sites - 238 acres. These stands may contain saw timber quality oaks, which potentially could be harvested in the future. Due to the susceptibility of oaks to be killed by gypsy moth defoliation, affected stands may be harvested to salvage these trees before they become unusable. The next generation of trees on these sites may already exist in the forest in the form of advanced regeneration, sprouts from cut trees, or natural regeneration after a harvest.

Pine – Oak Stands - 4,165 acres. These stands contain a mixture of pitch pine and oaks with the pine predominating. Pine – Oak stands generally do not exist on productive enough soils to produce saw grade oak timber. Instead, they produce a large quantity of oak firewood, generally more than the local market can use. Many oak trees die during periodic gypsy moth infestations as the result of repeated defoliations. The firewood cutting program is a popular program in the local community and puts standing dead oaks to use. These stands do not require intensive management. Oak trees cut down will sprout providing the next generation of oak firewood in about 30 years. The remaining pine plantations may potentially produce pulpwood in the future.

Oak – Pine Stands - 3,171 acres. These stands are similar in composition to pine – oak stands except that oaks are predominate over the pines. These stands contain oak firewood and some pitch pine. Oak can be harvested and managed in the same fashion as previously mentioned. The pines can be utilized for saw timber or pulp. Due to poor local pine saw timber and pulp markets, income from these potential forest products will not pay for harvesting or replanting these sites. However, pine saw timber or pulpwood should be offered for sale if these sites are converted to other uses to try to offset the cost of clearing the site. Future pine pulpwood markets may improve to the point where value is greater than harvesting and reforestation costs.

Pitch Pine Stands - 13,644 acres. These stands contain pitch pine saw timber or pulpwood and exist on sites with poor, sandy soil. These stands should be managed like the pine portion of the oak/pine stands listed above. Consider converting these stands to improved pitch pines or shortleaf pines, when the opportunity arises and manage for fire risk.

Pitch Pine Low Land Stands - 649 acres. Pitch pine mixed with hardwoods occurs in wet sites with poor soils and is a transition area between pure pitch pine stands and bogs or open water areas. Trees in these areas are generally inaccessible for harvesting operations due to wet soils and are not usually of sufficient size or quality to have commercial value. Limited timber sales may occur in areas that must be cleared for military mission requirements.

Other - 1,752 acres. This cover type makes up about 6% of the forested area and consists of reed grass savannah. It is entirely within the impact training area. Frequent wildfires caused by exploding ordnance play a large part in maintaining this unique ecosystem. Due to the dangers involved with potential UXO issues, no active management beyond occasional prescribed burning is planned for these areas.

Plantations - 1,097 acres. JB MDL has 101 forest plantations; 94 on Dix and 7 on Lakehurst as seen in Table 16: Forest Cover Type Summary. They were planted between 1940 and 2002 and range in size from 1 acre to 80 acres. A summary of the plantations by species on JB MDL is shown in Table 18: Forest Plantations on JB MDL; Summary by Species.

**Table 18. Forest Plantations on JB MDL in order of decreasing abundance**

| Common Name | Species | Acres |
|---|---|---|
| White pine | *Pinus strobus* | 848 |
| Shortleaf pine | *Pinus echinata* | 80 |
| Loblolly pine | *Pinus taeda* | 45 |
| Hybrid poplar | *Populu spp.* | 33 |
| Mixed pine | *Pinus spp.* | 26 |
| Japanese larch | *Larix kaempferi* | 22 |
| Norway spruce | *Picea abies* | 17 |
| Pitch pine | *Pinus rigida* | 13 |
| Black locust | *Robinia* | 5 |
| Tulip poplar | *Liriodendron* | 3 |
| Red pine | *Pinus resinosa* | 3 |
| Red oak | *Quercus rubra* | 2 |

## The Current Status and Scope of Commercial Forestry Operations

Managing the forested land for commercial timber production is not one of the main stated management goals, although forest products may be sold as a consequence of land clearing for mission support purposes or at some point in the future when managed stands containing merchantable forest products are considered mature.

Four stands encompassing 53 acres were commercially harvested for saw timber in 2017-2018 Dix TAC 3 in support of the Air Force flying mission. $60,250 in revenue was received for the sale of 470,931 board feet of timber.

Selected trees or stands may be sold as firewood due to weakening or death caused by repeated defoliations by gypsy moth. Other sales may be conducted to realize forestry revenue for timber that is scheduled to be removed for installation construction projects. Every proposed construction project that involves the removal of trees is evaluated to determine if any market value of the tree resource exists. If trees are determined to have market value in quantity and quality, a sales prospectus will be prepared. Forest harvesting contracts will include a ban on harvesting between April 1 and September 30 in order to remain in compliance with the Migratory Bird Treaty Act and the USFWS NLEB protocol.

Due to their inherent slow growth, the poor quality of native species and low market value, an intensive timber production program at JB MDL is not considered practical. The primary objective is to support the military mission. The objective is not to create or maintain a sustained yield forest product operation. Harvesting selected trees or stands to improve forest health, enhance wildlife habitat, mitigate wildfire threats or restore a site to a more natural condition are, however, acceptable management practices. The production of timber products may result from such management activities but is not considered a primary management goal.

In October of 2011, JB MDL began implementing a cut-your-own firewood program. In this program, interested individuals can purchase a firewood cutting permit that allows them to self-harvest firewood from a designated area at a price of $20 per cord. In 2018, firewood cutting permits began being sold on-line through the “i-sportsman” website (https://www.JB MDL.isportsman.net).

Currently at Dix, this program is concentrated on the logging slash left in the previously harvested areas in TAC 3. It can also be used as a way to remove and utilize other areas of dead oaks. The firewood program has proven to be a very popular program among members of the base community and the local residents. The program also provides some income to the installation. Approximately 50 permits are sold each year representing the sale of 60 cords of firewood.

**The Existing Network of Forest Access Roads and Trails**

At present, JB MDL is more than adequately served by a system of forest access roads maintained in good condition for training purposes. They are used routinely as firebreaks and boundaries for prescribed burning activities. Additional temporary roads may be established to access the interior of a stand for silvicultural activities. These temporary roads shall not be improved in any way and shall be allowed to return to an undisturbed state once silvicultural activities in the area are complete.

**Acceptable Timber Harvesting Practices for the Installation**

Any of the following forest management systems could be applied to selected stands or areas on JB MDL.

Silvicultural systems that produce stand structures approaching the complexity and diversity in natural forests are most consistent with the tenets of ecosystem management and forest management goals at JB MDL. Key elements in developing complex, diverse forests include long rotations; retention of living trees, snags, and cavity trees; and protection from wildfire, insect outbreaks, and disease. Long rotations of at least 120 years for hardwoods and 80 years for pines are needed to develop structural complexity. The retention of living and dead trees of various species and sizes and woody debris are necessary to maintain structurally complex forests and provide refuge for organisms and biological processes in harvested areas. To optimize ecological benefits, retention trees and snags should occur in aggregated clumps that are distributed over the harvested unit. Structural retention can vary from 10 to 70% depending on the site requirements for regeneration of the desired species. Retention trees should be kept through the subsequent rotation to develop old-growth characteristics. Forest stands should be aggregated whenever possible to create larger patch sizes and minimize fragmentation. Silvicultural activities that may be employed at JB MDL include harvesting, thinning, site preparation, salvage and planting or seeding.

<u>Regeneration Harvests</u>

Though timber salvage or stand replacement harvests may periodically be required for forest protection or improvement, harvesting for profit is not considered a primary forest management activity at JB MDL. To maintain diversity and continue supporting the variety of natural ecosystems that occur on the base, several harvest and regeneration systems can be employed.

In areas where relatively pure stands of pine are desired, regeneration is usually accomplished by clear cutting and planting, direct seeding, or allowing natural seeding from adjacent stands. Advantages of planting are that improved genetic varieties can be used and the pines get a head start over any hardwoods that might be present on the site. Planting rates of 400 to 600 seedlings per acre are recommended. Direct seeding is a less expensive alternative, but generally results in overstocking, which is problematic for future growth and forest health. Natural regeneration from existing seed sources can often be relied on but may delay establishment of the desired species and eliminate the possibility of using improved stock. Retaining from 10 to 20% of the existing stand, including live trees, snags, and woody debris will help maintain biological processes and wildlife value of the area without impeding stand regeneration.

Thinning

Thinning is a forest management activity that is used to reduce overcrowding and susceptibility to disease and insect pests and to improve tree growth and vigor in forest stands. Reducing stand density also promotes the development of a shrub and herbaceous understory that benefits wildlife and can be used to increase species and structural diversity in the residual canopy. Pre-commercial thinning of small- diameter trees provides the most benefit to a stand but is commonly an expense because the market for timber products is lacking. Larger size timber products can often be marketed but may not have enough value to defray harvesting expenses. If thinning is delayed too long, particularly on droughty, nutrient poor sites, the residual trees may be slow to respond or may not respond at all to release (Smith 1986). Preventing overcrowding by selecting appropriate harvesting and regeneration methods during stand establishment would help avoid these costs and difficulties.

There are numerous thinning techniques that may be used to achieve different management objectives. Row thinning is often used in young stands that are densely crowded and have not been previously thinned. A forest brush mower or drum chopper can be used to destroy trees in strips so that the remaining trees have better growing conditions. This method is only used as a first thinning to open up a stand or improve accessibility for future, more selective thinning operations. Subsequent thinning operations can be used to improve tree spacing, remove poorly formed or diseased trees, or release selected crop trees. Trees marked for removal must be able to be felled and removed without causing damage to the residual trees. Thinning operations should take care to maintain a mix of pines and hardwoods, leave high quality crop trees (particularly oaks), and protect a 50-foot riparian buffer on each side of all streams and ditches.

Herbicide application is another effective method of releasing seedlings or crop trees from competing vegetation. Methods of use range from the spraying of selective herbicides over the entire planted area, spot spraying around desired trees, or injecting herbicides into individual trees selected for removal. Herbicides are commonly used in commercial plantations where there is high value associated with particular trees, on sites where non-native species are problematic, and for the release of a species of interest such as Atlantic White Cedar from competition. Herbicides in or near a wetland must be approved for such use and all herbicide applications must be conducted by a licensed pest controller at JB MDL.

These thinned stands provide better wildlife habitat and provide better training facilities than un-thinned stands. An un-thinned white pine stand contains little to no understory plants to serve as food and cover for wildlife. After the thinning, grasses and forbs colonize the understory of these stands, which provide food and cover for wildlife. These thinned stands are also easier to walk through, which permits additional training opportunities for foot soldiers.

Salvage Harvest

If a catastrophic loss of trees occurs because of a natural disaster such as a fire, tornado, hurricane, flood, ice storm, etc. or an insect infestation or disease, the trees in the affected area can be harvested with or without economic return. A concentrated, large number of dead trees in the wildland create an enhanced fuel load and wildland fire threat to the natural ecosystem and to the military mission and assets. In this case funds should be programmed to mitigate the hazard if no economic value exists.

**Site Preparation**

Site preparation is often as crucial to the establishment and regeneration of the desired species as any other forestry operation. The objective of site preparation is to create site conditions conducive to the establishment and growth of the desired species.

Various treatments of the forest floor can be used to expose different levels of mineral soil, which will influence species composition in the succeeding stand. The intentional disturbance of the forest floor through prescribed fire or mechanical disturbance are methods that strongly favor early successional species such as pines, gray birch, and poplars, while avoiding excessive disturbance and keeping an ample litter layer intact will favor the later successional oaks and hickories. If existing advanced regeneration is being relied upon for stand establishment, it is important that the site remain relatively undisturbed.

Many forest stands on JB MDL are overstocked and in poor condition. These stands, especially the direct seed stands at Lakehurst from 1970s reforestation efforts, have many problems typically found with high stem densities. The trees are stressed, a fact borne out in the early 1990s when the pine looper returned after a 17-year absence with an infestation that was heavily concentrated on the un-thinned direct seed stands. These dense stands also provide sub-standard wildlife habitat and constitute a major hazard in wildfire situations.

Some Basal Areas in these stands are over 200 square feet per acre. Many measure in the mid to high 100s. When possible, direct seed stands should be thinned down to a basal area of 60 square feet per acre. However, a seed tree cut may be the only option in very poor stands. Natural stands on JB MDL which have never been thinned, especially those that border neighboring State Wildlife Management Areas and State forests, should also be thinned to near 60 square feet per acre. While this may seem to be a heavy thinning, economic conditions make it a high probability that it will be the only thinning ever done to these stands. This makes a slight over-thinning more practical. These thinning efforts should first concentrate on boundary stands to make it easier to prevent any wildfires from leaving the base. Wildfires coming onto the base from adjacent State lands would also be easier to suppress. In order to promote stand diversity in oak, pine-oak and oak-pine stands, better stems of all species should be saved to increase the quality of future stocks. Saving better stems is possible because the usual harvest end-product from thinning is wood chips, so tree form is not important to the loggers. In addition to wildfire threat reduction and tree health improvement, wildlife habitat will also improve by increasing the spacing among trees and promoting the mast producing oaks.

The treatment of treetops, limbs, and other logging debris (slash) is another important aspect of site preparation. Slash may be left in place, if pulled 100 feet from roadways and lopped to two feet from the ground. Lopping reduces fire hazard by keeping the material moister and hastening decomposition. Scattered slash can also reduce the need for planting by providing a means of seed dispersal. Leaving slash in place is not practical when planting is planned as it hinders access to the ground. Leaving logging debris on site also increases the fuel load and has the potential to increase risk of wildfire. Burning is a common method of reducing slash. In broadcast burning, where slash is left distributed across the site within prepared fire lines, most of the existing vegetation can be destroyed and large amounts of mineral soil exposed. These conditions are appropriate for sites that are to be hand planted, direct seeded, or allowed to seed in naturally from adjacent stands. Slash may be piled and burned on sites where protecting advanced regeneration and avoiding soil disturbance are important. However, care must be taken to avoid causing disturbance with the bulldozer when piling the slash for burning. On-site chipping is another method of slash disposal. This method is most useful when the chipped material can be utilized for pulp, fuel, or mulch.

Direct Planting/Direct Seeding

Planting and seeding are two methods of reforestation that improve control over species composition and hastens stand establishment. Seeding, however, does not provide adequate control over stand density and spacing and is not generally recommended for use at JB MDL.

Historically, direct seeded stands on Lakehurst, where the practice was common in the 1960s and 70s, have resulted in overstocked, badly stunted pine stands. These stands constitute a severe fire hazard and are susceptible to forest pest problems. They also result in poor wildlife habitat. When a site is to be planted, to ensure consistency with the concept of ecosystem management and the Pinelands CMP Forestry Standards, regionally grown plants native to the Pinelands region will be used.

Two- and three-year old bare-root stock is most commonly planted. Bare-root planting should occur during a two- to -three-week period in early spring, just as plants are breaking dormancy. Because drying kills the tender roots, bare-root seedling roots must be kept visibly moist during the entire planting operation. Best results are obtained when planting is performed by trained, experienced personnel. Standards for tree planting have been developed by professional organizations such as the International Society of Arboriculture (ISA), the American National Standards Institute (ANSI) and State and Federal forestry agencies.

The International Society of Arboriculture website (http://www.isa- arbor.com/consumer/consumer.html) has in-depth tree planting and tree care information.

**Forest Management Issues and Concerns**

A major concern of forest management is the protection of wetlands and water quality. Because wetlands are extremely sensitive and are most valuable as functioning ecosystems when left undisturbed, it is generally not expected that forest product harvesting operations will be conducted in this type of habitat on JB MDL. If harvest operations become unavoidable because of mission or safety requirements, special precautions must be taken to protect water quality and avoid the deposition of logging debris, soil, or any other material in streams or bodies ofwater.

Special precautions include following streamside management zone best management practices and maintaining filter strips between all roads and trails and the wetland or waterway. During any harvest operation, the following best management practices will help provide water quality protection: 1. Avoid logging during wet seasons; 2. Locate temporary roads on ridges, not near streams or wetlands; 3. Keep road grades between 3% and 5%; 4. Skid uphill and winch logs to the trail; 5. Use water bars, dips, culverts and diversions to direct water from roads. Following a forest product harvest, temporary roads, logging trails, loading decks, and other exposed soil should be stabilized by planting a quick growing vegetative cover before being allowed to return to a natural state. Temporary logging roads should generally not be allowed to turn into permanent roads.

All harvesting activities shall conform to acceptable standards defined in “Timber Harvesting Guidelines for New Jersey”, published by the New Jersey Chapter – Society of American Foresters, New Jersey Forestry Association and the NJ Forest Service.

All applicable forestry and wetlands best management practices shall be implemented during harvest activities according to the “New Jersey Forestry and Wetlands Best Management Practices Manual” published by the NJ Bureau of Forest Management; 1995.

**How Forest Management Practices can be used to Achieve INRMP Goals**

The continued implementation of proper forest management practices will:

- Maintain a healthy, renewable forest resource which will provide JB MDL the capability to support existing and projected military training by range monitoring, damage minimization, mitigation, and rehabilitation.
- Open more land for military training use byenhancing line-of-site training opportunities. It will enhance mission realism through more training location options and more intensive mission plans.

- Help assure proper stewardship of public lands and provide economic benefits by providing renewable forest products, such as firewood, pulpwood, and timber, when such products can be produced in a sustainable fashion without negative impacts on the military mission or other natural resources.
- Help to improve the quality of life of the JB MDL community and the general public by providing quality natural resource-based recreational opportunities such as hunting, fishing, bird-watching, and homeowner firewood cutting.
- Help to protect sensitive species habitat and wetlands, by helping to maintain and improve the sustainability and native diversity of the JB MDL ecosystem.

## *7.9 Wildland Fire Management*

### *Applicability Statement*

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section is applicable to JB MDL.

### *Program Overview/Current Management Practices*

**History and Frequency of Fires**

Wildland fires have always been a common occurrence in the NJ Pinelands. Native American tribes used fire to improve hunting and protect settlements. When Europeans settled in this area, wildfires increased, therefore, early settlers learned to conduct prescribed burning to reduce fuels around cranberry bogs and villages. The presence of large Pine Barrens reed-grass savannas on JB MDL indicates that this area most likely experienced regular fires prior to Federal ownership of the land. The U.S. Army purchased the fire prone areas of JB MDL in the 1940s. Wildfires on the ranges and tactical areas have historically been a major concern at JB MDL because of the use of flares, tracers, and various munitions involved with operational training activities. About 22,062 acres of the installation are some type of pine forest, which are fire dependent systems. Most have burned sometime in the past 30 years, although many of these pine forests have burned several times during this period (See Figure 11: Hazard Suppression Map). In addition, some oak stands have burned in the past along with wetland hardwood stands. About 1,500 acres burn as wildfires at JB MDL annually. This varies considerably from year to year due to fire weather and training schedules as shown in Table 18: Recent Fire History below. Table 19: Major Fires shows the acreages and dates of major fires on the installation.

JB MDL has prepared a Wildland Fire Management Plan. Its principles and guidelines are from the DODI 6055.4.5, the AFMAN 32-7003 and PMS 310-1 the National Wildland Fire Qualification Subsystem Guide. These principles can be summarized as:

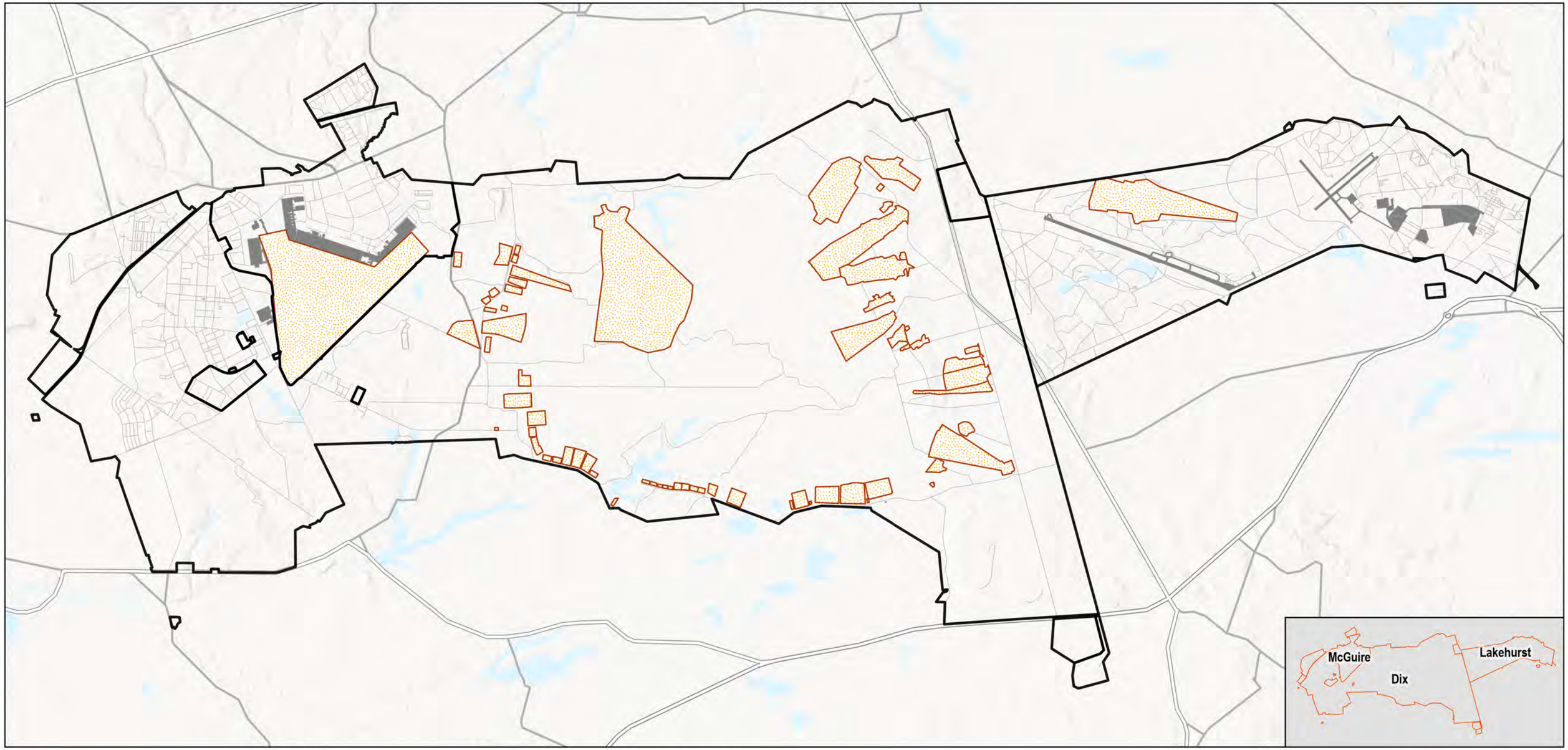
- Safety (firefighter and the public) is the first priority in every fire management activity.
- Wildfire is an essential ecological process and a natural change agent to be incorporated into the planning process.
- Fire Management plans, programs, and activities support land and resource management plans and their implementation.

Fire Management Plans and activities are based on the best available science. Objectives of the Wildland Fire Management program at JB MDL are:

- To reduce damage from wildfires to life, property, wildlife and vegetation.
- Increase training usage on the installation by decreasing the number of days training must stop due to actual wildfires or their risk.

- Maintain and enhance unique plant communities on the installation that support endangered species.
- Modify plant species composition and density to benefit training and management objectives.

# Hazard Suppression Area

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Cooperative Agreement Number:
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W9126G-20-2-0004

N

Coordinate System: WGS 1984 UTM Zone 18N
Projection: Transverse Mercator
Datum: WGS 1984
Scale: 1:75,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

Hazard Suppression Area
Roads
Installation Boundary

**Joint Base McGuire-Dix-Lakehurst**

**Natural Resources**

Document Path: F:\z_ISS JBMDL_JBMDL\JBMDL Pro Workspace\JBMDL Pro Workspace.aprx

**Table 19. Recent Fire History**

| Year | Wildfire Acreage | Prescribed Burn Acreage |
|---|---|---|
| 1999 | 1,201 | 2,335 |
| 2000 | 423 | 1,232 |
| 2001 | 1,906 | 291 |
| 2002 | 4,368 | 1,462 |
| 2003 | 219 | 512 |
| 2004 | 805 | 4,057 |
| 2005 | 520 | 576 |
| 2006 | 1,170 | 2,399 |
| 2007 | 640 | 1,080 |
| 2008 | 1,200 | 1,403 |
| 2009 | 320 | 1,365 |
| 2010 | 4,573 | 1,337 |
| 2011 | 179 | 1,422 |
| 2012 | 3,482 | 3,579 |
| 2013 | 175 | 539 |
| 2014 | 3,789 | 958 |
| 2015 | 486 | 1,451 |
| 2016 | 5,829 | 1,864 |
| 2017 | 1,945 | 1,952 |
| 2018 | 785 | 3,369 |
| 2019 | 688 | 4,630 |
| 2020 | 2,304 | 6,507 |
| **Average** | 1,762 | 1,625 |

**Table 20. Major Fires**

| Date | Acres |
|---|---|
| Jun. 2017 | 2,800 |
| Jul. 2016 | 3,200 |
| April 2014 | 2,600 |
| Jun. 2012 | 2,987 |
| Jul. 2010 | 2,640 |
| Jun. 2010 | 950 |
| Mar. 2006 | 1,170 |
| Aug. 2002 | 2,611 |
| May 2002 | 604 |
| Aug. 1997 | 1,106 |
| Aug. 1995 | 1,504 |
| Aug. 1995 | 847 |
| May 1992 | 2,824 |
| May 1992 | 994 |

## Wildfire Suppression and Prevention

Historically, JB MDL has followed a policy of suppressing and preventing wildfires since the 1950s. The earliest forest management activities were wildfire suppression and prescribed burns. Wildland fire management is the responsibility of NRM. NR personnel are primarily responsible for prescribed fire, and the installation Fire and Emergency Services personnel are primarily responsible for wildfire suppression. Recently, the installation has followed two policies concerning wildfires. Wildfires are rigorously fought in the Tactical Areas, especially near the installation‘s boundary. The Impact Area, however, is under a "let it burn" policy, when there is very little likelihood of life or property loss. To prevent wildfires, the installation uses controlled fires in fire prone areas in most of the tactical areas every four to seven years. The installation also conducts prescribed burns within the impact area at three to five-year intervals in locations where a mission-related fire has not occurred. Suppressing and preventing wildfires while maintaining firefighter safety is a balancing act. The Incident Commander or Burn Boss relies on weather information, training, and experience to fight fire effectively. Real time fire weather forecasts and improved fire models for the Pinelands are of great assistance to Incident Commanders.

JB MDL has partnered with the US Forest Service to install a weather tower on JB MDL. This tower has been operational since 2005. The frequency of fires in the impact area has provided unique habitats for many rare and T&E species. The largest occurrence of Pine Barrens reed-grass in NJ is located in the impact area as a result of the frequent fires. Several rare butterflies and moths inhabit this area. The “Habitat Management Plan for Rare, Threatened, and Endangered Species” (EA Engineering, 1996) recommends that this area continue to undergo frequent burns. The plan also suggests growing season prescribed-burns at a long frequency. Prescribed burning during the growing season, April through July, will result in more intense burning that will consume more forest litter which should maintain this unique habitat.

### The Threat of Wildfire to the Mission and Natural Resources

JB MDL is located mostly in the Pinelands of NJ, which is a very fire prone natural ecosystem. An uncontrolled or catastrophic wildfire has the potential to impact numerous training facilities and destroy infrastructure on the installation property. Wildfires do not respect property lines. There is a significant wildland urban interface exposure that puts numerous neighboring private properties at risk. A wildfire originating on installation property and moving into private properties and businesses would affect the lives of the public and could incur a huge financial liability for the Federal Government. An uncontrolled wildfire also has the potential to adversely affect certain unique habitats. For example, if an uncontrolled wildfire kills a stand of Atlantic white cedar (*Chamaecyparis thyoides*); it will probably not regenerate naturally into Atlantic white cedar again, causing that habitat to be lost. An uncontrolled wildfire also has the potential to destroy installation infrastructure used for training purposes such as bivouac areas, firing points and the FOB. During a large wildfire, there is also the slight potential for groups of people utilizing the training areas to become lost or disoriented in the process of evacuating the area, causing them to become trapped with the potential for injury or loss of life on one of the forest roads.

<u>Recommendations</u>

The JB MDL Fire Management Plan details a model showing which areas of JB MDL need prescribed burns for fuel reduction. JB MDL's partnership with the U.S. Forest Service has elevated the science behind the fire management decisions. In particular, the fire weather tower constructed on JB MDL provides real time fire weather. This allows JB MDL NR personnel to adjust prescribed fire management on the fly and to better fight fires with accurate real-time fire weather data. Observations from this tower and ongoing U.S. Forest Service research may potentially refine the National Fire Danger Rating System. NJ firefighting professionals have expressed concern that this system is not accurate for the Pinelands.

By refining this system, JB MDL fire fighters can better control wildfires and manage natural resources through the use of prescribed burns. This partnership should be continued for the next several years. Resources should be allocated to maintain the fire weather towers, fire fighting vehicles, and training dollars spent to ensure that fire fighters are properly trained and prepared.

Special Interest Area Protection

Special areas on the installation include rare and T&E species habitat, cultural resource sites, stream corridors and wetlands, areas around critical infrastructure and areas close to the installation perimeter. Fortunately, most of these sites are not in areas intensively used for training. Most of the Impact Area is impacted by training. However, it is the frequent fires caused by weapon practice in the Impact Area that have created the necessary habitat for rare species. Stream corridors and wetlands, however, are provided extra protection due to Pinelands regulations. These protections often prevent JB MDL from developing new facilities on or near streams and wetlands.

**Organizational Structure for Wildland Fire Protection and Wildfire Response Protocols**

The Joint Base Fire and Emergency Services Department is the primary response element for a reported wildland fire emergency. If necessary, during an extended event, qualified members of the NJ Forest Fire Service or US Forest Service may be utilized. The Joint Base Fire and Emergency Services Department consists of six stations, two primarily for wildland fires – one each on Dix and Lakehurst (plus an emergency station in development). The NJ State Forest Fire Service and US Forest Fire Service can be called if additional manpower or resources are needed. NR personnel maintain an additional wildland brush truck and a fire plow, which will respond and can plow a ground control line around a wildland fire and during a prescribed burning operation.

**Use of Prescribed Fire and Program Objectives**

Firefighter and public safety are the first priority in every fire management activity. JB MDL's Wildland fire management plan adheres to the National Wildland Fire Coordinating Group (NWCG) guidelines 310-1. AFMAN 32-7003 states clearly that "All military, civilian, cooperator, contractor and FES personnel involved in wildland fire activities must meet or exceed the training, certification and fitness standards appropriate for their expected level of involvement in wildland fire operations". AFMAN 32-7003 also states "For other wildland fire technical specialist positions not covered in PMS-310-1, utilize the NWCG Federal Wildland Fire Qualifications Supplement as a reference for how the technical specialist position is reflected in the Incident Qualifications and Certification System". Similar wording can be found in DODI 6055.6.E2.5.9. The Incident Command System is strictly followed at every wildland fire incident and at all prescribed burning evolutions. The Air Force Wildland Fire Center (AFWFC) may determine specific requirements based upon installation needs. The AFWFC determined JB MDL as a location for a WSM staffed with USFWS personnel to assist in prescribed burning activities. In 2017 a USFWS Wildland Support Module (WSM) was placed on JB MDL as an available assistance for prescribed burning, or if requested wildland fire suppression asset, on JB MDL.

Prescribed burning is conducted annually on Dix and Lakehurst and periodically on the airfield at McGuire. An average of 4,500 acres annually is intentionally burned; prescribed burning season is particularly restricted due to weather constraints. In NJ, prescribed burning is primarily used to reduce hazardous accumulations of forest fuels in order to reduce the threat of catastrophic wildfires. Because many of the plant communities in the Pinelands are fire-dependent, the use of prescribed fire at appropriate time intervals will help maintain the area's native plants and animals. Prescribed burning is also a valuable tool for reducing fire hazards and preventing woody encroachment in grasslands. Maintaining the airfield clear

zones and parachute jump circle in open grassland at Lakehurst and McGuire are essential to the installation mission, while also benefiting a number of T&E species that inhabit the areas. The primary purposes for prescribed burning in resources management are to:

- Reduce hazardous fuel accumulation.
- Site preparation for forestry activities.
- Grassland Management
- Improve wildlife habitat; and
- Control undesirable vegetation.

In pine forests in particular, high levels of forest fuels can accumulate quickly. Prescribed burning on a given site is normally repeated in four-year intervals. However, if monitoring shows that hazardous fuels accumulate more rapidly, the interval may be shortened; alternatively, if there is little accumulation, the interval may be lengthened. In hazardous fuels reduction, the goal is not to eliminate all ground cover and understory vegetation, but to break the continuous cover of fuels and eliminate a fire ladder to tree crowns. The resulting mosaic of burned and unburned forest will effectively reduce fire hazard and is more desirable from a wildlife perspective than a 100% loss of cover, as it provides more varied habitat.

Due to the fact that there may be a number of negative impacts associated with prescribed burns, it is important to try to limit the frequency of burns to the minimum number necessary to meet objectives. Frequent, low-intensity prescribed burning is primarily intended to reduce litter and shrub cover. Unintended consequences of this type of burning are the reduction of foods such as pollen, nectar, berries, leaves and cover that are available for invertebrates, birds, and small mammals. A reduction in these populations, which serve as the primary prey base for larger wildlife populations, can have unintended negative impacts if it occurs over a large scale. Therefore, head fire prescribed burns are limited to grasslands and Impact Areas. For specific burn plans refer to site specific burn plans required under AFMAN 32-7003. Limiting the size of burn patches and increasing the burn interval would allow time for shrubs, ground cover, and native invertebrates to recover between fires (Windisch 1995). A monitoring program that assesses site conditions before and after a prescribed burn can be used to detect conditions. If expected or desired conditions are not being met, a change in the burn frequency or intensity may be necessary.

Prescribed Burn Permit

The NJ Forest Fire Service administers a permit program for prescribed burning. A seasonal permit must be obtained prior to conducting a prescribed burn (NJ Title 13:9-20) and the Section Fire warden must be notified 24 hours prior to the day of ignition. A prescribed burning plan must be prepared in advance of ignition and must be approved by the Division Fire warden. Burn plans are written for each burn unit detailing the plan of action for the fire. A map is prepared that indicates each burn unit and the location of all fire lines, firebreaks, roads, adjacent properties, and other important landscape features.

Weather Conditions

Weather information is needed to determine how the smoke will disperse, as well as to determine the behavior of the fire. Regional fire weather conditions can be obtained from the National Weather Service for planning a burn; however, observations must also be obtained at the prescribed burn site or from the closest operating weather station to ensure ideal conditions. Extreme caution must be used when temperatures exceed 55°F because greater damage to plant life can occur during high temperatures. Higher temperatures may also indicate a strong sea breeze may arise from the east, which can be extremely dangerous. Wind velocities that are too low (below five miles per hour) are also dangerous and may result in excessive crown scorch.

Fire weather forecasts are available from the National Weather Service website: http://www.nj.gov/dep/parksandforests/fire/current-weather.html.

Firebreaks

An important element in wildland fire is the placement and maintenance of firebreaks. Streams, water impoundments, roads, and plowed lines can serve as firebreaks. Firebreaks should provide uninterrupted access around the burn perimeter for fire fighters and equipment. Internal fire lines have been established at increments of 330-foot (5-chains) or a maximum of 660-foot (10-chains) intervals in most burn units to facilitate burning and fire control. Fire lines are established with a tractor and fire plow, which cuts a track through the organic material down to the mineral soil. The lines are plowed in late November after leaf fall but before the ground freezes. Because the prevailing winds at JB MDL are westerly, the lines are oriented in a north-south direction.

Firebreaks, internal fire lines, and major access roads require annual maintenance to keep them functional and clear of vegetation. The installation maintenance contract maintains roads and firebreaks at JB MDL on an as needed basis and the plow lines for scheduled burn areas are re-cleared in late November by the Natural Resources forestry staff.

As an added safety precaution, heavy fuels including logs, slash and snags are also moved well inside or outside the burn area. These fuels burn for long periods of time and can throw embers and sparks across plowed lines creating a greater fire hazard.

Safety and Equipment

In accordance with AFMAN 32-7003 Wildland Fire Management Guidelines, all military, civilian, contractor and emergency services personnel involved in wildland fire management must possess certifications appropriate for their expected level of involvement in the wildland fire program. All DoD personnel must meet the National Fire Protection Association's (NFPA) professional qualification standard (NFPA Standard 1051) or National Wildland Fire Coordinating Group (NWCG) equivalent certifications.

Burn Execution

When weather and fuel conditions are determined to be acceptable, a test fire is set to confirm burning conditions and determine the burning index. The fire is then ignited along the western edge of the eastern-most firebreak. When the fire has burned 10 or more feet from the base line, the western edge of the next plowed line is ignited. One or two crew members remain at the base line to monitor conditions. This ignition sequence is continued, working to the west, until the unit is completed. Tie-in procedures, using flank fires (a fire line ignited parallel to the prevailing winds) are started in mid-afternoon (after 2 PM) to ensure the planned area is burned out before the end of the day. Head fires (fire lines ignited perpendicular to the prevailing winds) are not utilized, except when burning in grasslands or in the Impact Area. One or two crew members remain at the burn site until the fire is completely safe. A five or six person burning crew can burn 300 to 600 acres in a day using this procedure.

Burn Evaluation

A follow-up evaluation of the burn including an appraisal of the fuel consumption, smoke dispersal and tree scorch is performed to determine the effectiveness in meeting prescribed burn objectives and to help in planning future burns. The height of the scorch line is one indicator of the quality of the burn. For sapling size pines, less than 1/3 of the needles should appear scorched. A crown scorch in excess of this results in growth loss and stress, which increase the risk of insect and disease attack. On oak trees four inches diameter at breast height and greater, trunk scorch should not exceed three feet (New Jersey Bureau of Forest Fire Management 1995).

Smoke Management

Smoke management and air quality are major concerns in conducting prescribed burns. JB MDL is located in NJ, the most densely populated state in the nation and between two large metropolitan areas, Philadelphia and New York City. Prevailing winds are from the west, which generally blow smoke to the east into immediate areas that are not highly populated. The concentrated infrastructure area of the Lakehurst area separates forested areas from the town of Lakehurst and suburban and commercial areas farther to the east. However, there are populated areas immediately to the south and north of forested areas on JB MDL, including the towns of Browns Mills, Cookstown, and Wrightstown. Smoke may have the potential to impact operations on the airfields at McGuire and Lakehurst as well as local highways, especially County Rt. 539, which bisects the most heavily forested and fire prone area of the installation. Communication and coordination between Airfield Operations, the NJ State Forest Fire Service and local municipal emergency services prior to conducting any prescribed burning activities is important to avoid any problems with smoke.

Because visibility problems can interfere with air operations and vehicular traffic, all burns are coordinated with Airfield Operations and warning signs should be posted on roads that are likely to be impacted by smoke. In addition, adjacent property owners that may be impacted by smoke are informed of all planned burns. A mixing height between 1,700 and 6,500 feet above ground surface and transport wind speed from 9 to 20 miles per hour help ensure adequate smoke dispersal. Generally, burning should be completed before late afternoon or evening when temperature inversions and stable wind conditions are likely to inhibit smoke dispersal. Visibility is particularly important near the airfield.

Besides affecting visibility, smoke affects air quality by releasing significant amounts of carbon monoxide, particulate matter and volatile organic compounds, all of which are regulated by the USEPA. Current US EPA policy on emissions from prescribed burns emphasizes voluntary smoke management plans (Interim Air Quality Policy on Wildland and Prescribed Fire, April 1998). Burn plans must identify all adjacent smoke-sensitive areas and wind direction and speed, and smoke dispersal must be considered before conducting a burn. Using back fires as a firing technique is an important way to reduce smoke emissions.

Three to five times less particulate matter is produced with back and flank fires than head fires (New Jersey Bureau of Forest Fire Management 1995). Other fire management practices that minimize impacts from smoke include:

- Reducing excess woody debris through the mechanical removal of harvested trees and slash from sites before burning,
- Avoiding burning during pollution control alerts,
- Utilizing back fires as the primary firing technique.
- Scheduling burning during favorable weather conditions that allow for good smoke dispersal,
- Extinguishing smoldering stumps and snags quickly; and limiting the amount of land that is burned at one time.

## *7.10 Agricultural Outleasing*

### *Applicability Statement*

This section applies to USAF installations that lease eligible USAF land for agricultural purposes.

This section is not applicable to JB MDL.

*Program Overview/Current Management Practices*

In the 1990s, two attempts were made to lease out parcels at the Lakehurst area for agricultural purposes. The goal was to lease out areas to eliminate grounds maintenance costs while generating rental income for the DoD agricultural out-lease program. Lakehurst had been receiving small allotments of funding from this national account for several years during the decade for various natural resources management initiatives.

Two large fields totaling 30 acres were put up for lease near the engineering campus by the old commercial gate. The Runway 24 Approach Zone totaling 60 acres was also advertised. All areas were pre-treated with lime at the rate of two tons per acre to lower the acidity of the soils and make the lease more attractive to potential bidders. The hope was to attract a hay farmer onto the base to farm the land.

The initiative failed on both occasions due to a disappearing local farm economy and the well documented infertility and drought prone soils on the installation. These factors, combined with a huge increase in military use of the lands on Lakehurst, make further attempts at agricultural out-lease futile.

Dix has fairly productive soils on the western edge of the base. However, these areas are used for military training exercises which precludes the installation from considering them for agricultural out-lease.

### *7.11 Integrated Pest Management Program*

*Applicability Statement*

This section applies to USAF installations that perform pest management activities in support of natural resources management, e.g. invasive species, forest pests, etc. This section is applicable to this installation.

*Program Overview/Current Management Practices*

Pest management on the installation consists of reducing the deleterious impacts of insect pests, noxious weeds, diseases and nuisance animals. These pests are controlled and managed under the Integrated Pest Management Plan which is updated annually and has reduced the use of pesticides on the installation by 70%. This plan directs JB MDL personnel and private contractors to survey for pest problems and respond accordingly. Individuals referenced above are certified pesticide applicators and receive periodic training to update their skills. The response to a pest outbreak may be cultural, mechanical, or it may be a pesticide application. This plan lists the pests found on the installation, where they are found and methods of treatment. It also includes pests such as ticks, mosquitoes, mice and termites which are found in TAC Areas or buildings. The entire installation is covered by this plan. Control of nuisance wildlife at JB MDL must be conducted in accordance with all applicable state and federal regulations and should be coordinated through Natural Resources personnel. In addition to the IPM techniques described in this plan, Natural Resource personnel plan on installing bat boxes in various locations on JB MDL to assist with mosquito control. Bats consume large quantities of insect pests for no cost, but many bat species are declining due to loss of roost sites and white-nose syndrome. This initiative will help bats by providing new roosts while at the same time, JB MDL will benefit from pest reduction provided by bats.

**Wildlife Pest Problems and Techniques Used for Wildlife Control**

Geese, whitetail deer and turkey vultures are a special concern on the base. The BASH contractor surveys and controls the geese and other wildlife hazards to prevent aviation accidents in accordance with the installation BASH Plan. Control activities are coordinated with NR personnel.

Beavers can become nuisance species when their dam construction activities block culverts and cause facility and road flooding. The preferred action in such instances is for NR personnel to install a beaver exclusion device in the affected culvert. If beavers persist in the area and continue to cause damage, more intrusive measures may be required. A site-specific permit from NJDFW is needed in order to trap and release or trap and destroy beavers. Since beaver damming has environmentally beneficial aspects such as increased biodiversity and sediment reduction for streams, control actions are only taken when necessary.

**Policies, Programs, and Methods Used to Control Feral Animals**

Pets that have been abandoned or left behind by owners can become serious pests on military installations. Feral pets may carry diseases such as rabies, distemper and feline leukemia (cats) and pose a serious health threat to humans and other family pets. It is therefore important to ensure that pets on the installation are properly vaccinated, tagged and registered when brought on-base.

In addition, feral animals and loose pets, particularly cats, are known to be very damaging to neotropical migratory bird populations and other native wildlife. To reduce impacts to native wildlife, JB MDL residents should be encouraged to keep pets indoors to the greatest extent possible or under strict control when outdoors. Pet owners should also be encouraged to spay and neuter their pets to reduce the occurrence of unwanted pets.

Feeding of feral cats and dogs is strictly prohibited. It is an unacceptable practice as this may cause feral and other predator populations such as raccoons to increase as well. Prompt garbage removal, keeping dumpsters and refuse receptacles covered with tight fitting lids, and increasing public awareness on the problems associated with feral cats are first step solutions to controlling their populations. JB MDL must ensure the humane capture and removal of feral cats and dogs and every effort should be made to find homes for adoptable animals. The Armed Forces Pest Management Board Technical Information Memorandum No. 37 (1996) indicates that feral cat control plans and policies are to be described in the Installation's Pest Management Plan.

More intrusive methods, such as removal and disposal are likely to meet with public resistance and will only be undertaken if serious public health or disease problems develop. The local animal control warden assists in capture and placement or disposal of feral cats and dogs.

**Disease, Insects and General Maintenance Issue Associated with Turf Areas and Ornamental Planting Areas**

It is JB MDL policy to employ an IPM program that minimizes pesticide use. IPM uses a wide variety of biological, cultural and mechanical pest management strategies to reduce the use of chemicals. The Armed Forces Pest Management Board has useful information on DoD pest management policy and issues on their website http://www.afpmb.org/

In accordance with the installation IPM Program, annual surveys of ornamental plantings are conducted by the ground’s maintenance contractor and JB MDL pest control personnel. The importance of using native species, appropriate planting methods, proper site selection, adequate irrigation during plant establishment and employing trained personnel cannot be over emphasized for ensuring success in ornamental plantings. Non-chemical methods of pest control are employed whenever practicable for the maintenance of ornamental plants. Pruning, hand picking, use of water or soap sprays and pheromone traps are the preferred methods. To be effective, these controls should be scheduled to interrupt the pest's life cycle. For example, pruning of infected material and hand picking or destroying egg sacks should occur before young disperse, generally in the early spring.

This method of pest management involves four primary control strategies: mechanical and physical

control (physical removal or exclusion of pests), cultural control (altering the environment to make it less suitable or attractive to the pest), biological control (use of other organisms that control the pest) and chemical control (use of pesticides and herbicides). AFI 32-1053, Pest Management Program, is a policy to conduct effective pest management programs, and establishes responsibilities and procedures for pest management at USAF installations.

Additional gypsy moth surveys are conducted by NR staff on ornamental plantings as well as in forested areas (potential aerial surveys will be coordinated with US Forest Service). When gypsy moth defoliation or egg mass counts indicate the need, control efforts are initiated if possible. Non-chemical strategies such as the use of pheromone traps, wrapping susceptible trees with burlap, destroying trapped caterpillars and destroying egg masses are methods used on individual trees or in small areas that become infested. If large areas are threatened, spraying may become necessary. Any chemical spraying would be performed by and in conjunction with NJ Department of Agriculture programs and monitoring. Bacillus thuringiensis (BT) is the only pre-approved pesticide for gypsy moth control at JB MDL. BT will only affect caterpillars that feed on it by consuming foliage. It is not toxic to other insects, mammals, birds or fish. It only remains on the leaves for about ten days after application.

The golf course performs its own disease and pest management activities since the grounds they manage are intensely used. Maintenance personnel survey for pests on the course and when pest levels become critical, appropriate cultural treatment or pesticide is applied. Course management maintains a licensed DoD pesticide applicator and membership in the Golf Course Superintendents Association of America and NJ. Personnel also attend periodic pesticide training classes administered by pesticide industry representatives.

**Invasive Plants**

Most non-indigenous plants introduced to new areas by humans do not cause environmental problems. Occasionally, they may spread into wild habitats, reproduce, and become dominant, displacing native species and communities. Many non-native invasive species that have been used in agriculture, erosion control, or as ornamentals, or which were accidentally introduced, have become problematic weed species that are now considered a leading threat to natural ecosystems and biodiversity. The animals that depend upon the food and cover provided by native species will suffer. Invasive plants can displace or hybridize with native plants and may even change important natural processes. An invasive species is defined as a species that is: “(1) non-native (or alien) to the ecosystem under consideration, and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health” (Federal Register 1999).

Over 1,000 non-indigenous plants exist in NJ. Many cause harm by crowding out native plants, contributing to species extinction and disrupting ecosystem functions. Invasive plant infestations have also been documented to prevent or interfere with military training.

EO 13112, Invasive Species from 1999 requires federal facilities, to the extent practicable and permitted by law to:

- Prevent the introduction of invasive species.
- Detect and control such species.
- Monitor invasive species populations.
- Provide for restoration of native habitats that have been invaded.
- Conduct research on invasive species to prevent introduction and for sound control.
- Promote public education on invasive species.

EO 13112 directed the establishment of the Federal Interagency Committee for the Management of Noxious and Exotic Weeds, of which DoD is a member. The committee was tasked with the development of a national strategy to reduce the influx of invasive plants into the United States, control or eradicate those that are already a problem and to restore already degraded lands.

Information on the National Invasive Species Management Plan and control of invasive species can be obtained from the following website http://www.invasivespecies.gov.

Primary management objectives recommended in the national strategy are to eradicate small infestations and contain expansive infestations. Early eradication of a small infestation will save significant time and money and will be more successful than attempts to eradicate the infestation after it becomes substantial. Expansive infestation should be contained by preventing the edges from advancing with long-term control efforts, such as biological control, focused on the core of the infestation. This is a recommended course of action when invasive species appear to be permanently established. However, the most effective action may be to prevent their spread or lessen their impacts through control measures. Preventing the introduction of invasive species from infested to non-infested areas should be a priority. Early control of new infestations will also reduce the likelihood of establishment and expansion. For certain invasive species, adequate control methods are not available, or populations are too widespread for eradication to be feasible.

To separate the most invasive from the more benign species, the NJDEP commissioned the report "An Overview of Non-indigenous Plant Species in New Jersey" (Snyder and Kaufman 2004). This report lists, describes and discusses controls for the 30 most invasive non-indigenous species. The deliberate planting or use of invasive nonindigenous species at JB MDL is prohibited by presidential Executive Order 13112. Unfortunately, there is not one definitive list of invasive non-indigenous species that occur at JB MDL. To address this shortcoming the CEIE is documenting and mapping the occurrences of invasive exotic species that currently exist at JB MDL. This baseline data will give managers a more complete picture of invasive, non-indigenous plant issues at JB MDL. The information obtained will be used to determine locations where treatments are needed. This determination will be based on the threat that exists to natural resources that are present and to the training mission. A list of known problematic invasive, non-indigenous plant species on JB MDL is provided in Appendix H.

The NJ Strategic Management Plan for Invasive Species and the Overview of Non- indigenous Plant Species in NJ can be obtained from the following website: http://www.nj.gov/dep/njisc/.

Several of the problematic non-indigenous invasive plants of concern found at JB MDL are described below:

Japanese Barberry (*Berberis thunbergii*) is a dense deciduous spiny shrub native to Japan. Most commonly it is two or three feet high but can grow to six feet in height. Barberry forms dense stands in a variety of habitats including closed canopy forests and open woodlands, wetlands, meadows and disturbed areas. Due to the thorny nature of its stems and the thickets that it forms, infestation can hinder training exercises, especially those that require dismounted maneuvers. Japanese barberry is known to occur in some of the Tactical Areas on the west side of the installation. Although prohibited, in the past it was still commonly planted as a landscape plant at JB MDL around housing. Since it is a prolific seed-producer with a high germination rate, prevention of seed production should be a management priority.

Since barberry can re-sprout from root fragments remaining in soil, thorough removal of root portions is important. Manual control works well but may need to be combined with chemical in large or persistent infestations.

Common barberry (*Berberis vulgaris*) is another invasive plant that is less common than Japanese barberry.

Similar in general appearance to Japanese barberry, Common barberry has toothed leaves and spines that are double or triple branched. Mechanical removal of the plant is recommended because it is effective and minimally intrusive. In early spring, it is one of the first plants to leaf out and can be distinguished easily from other shrubby vegetation. The use of a hoe weed wrench or mattock is suggested to uproot the entire bush and associated roots. The uprooted shrubs can be piled as cover for small animals. Plants growing in areas that cannot be dug out can be treated with herbicide.

Oriental bittersweet (*Celastrus orbiculatus*) is a deciduous woody twining vine native to Eastern Asia. It infests forest edges, open woodlands, fields and especially disturbed lands. While often found in open sunny sites, its shade tolerance allows it to invade forest areas. It is an aggressive invader that grows over native vegetation, completely covering and killing them by preventing photosynthesis, by girdling and by uprooting trees through excessive weight. It spreads both by bird dispersed seeds and vegetatively. All types of plants, and even entire plant communities, can be over-topped and shaded by the vine's rapid vegetative growth. Nearly pure stands of this vine are not uncommon in affected areas. Upland meadows, thickets and young forests, both natural and managed, appear to be most vulnerable. At JB MDL, Oriental bittersweet is present in some of the Tactical Areas that occur within the outer coastal plain. Manual, mechanical and chemical control methods are all effective in removing and killing Oriental bittersweet. Where hand labor is practical, vines can be pulled out by the roots and removed from the site, preferably before fruiting. If fruits are present, vines should be bagged and disposed of in a landfill or left in the bags and allowed to bake in the sun long enough to kill the seeds. Systemic herbicides like triclopyr and glyphosate are absorbed into plant tissues and carried to the roots, killing the entire plant within about a week. This method is most effective if the stems are first cut by hand or mowed and herbicide is applied immediately to cut stem tissue. Herbicide applications can be made any time of year if temperatures are above 55- or 60-degrees F for several days and rain is not expected for at least 24 hours. Fall and winter applications will avoid or minimize impacts to native plants and animals. Repeated treatments are likely to be needed. A combination of cutting followed by application of concentrated systemic herbicide to rooted, living cut surfaces is likely to be the most effective approach. For large infestations spanning extensive areas of ground, a foliar herbicide may be the best choice rather than manual or mechanical means which could result in soil disturbance.

Autumn olive (*Eleagnus umbellata*) is a deciduous shrub that can grow to 20 feet in height. It is drought tolerant and thrives in a variety of soil and moisture conditions which allow it to invade grasslands, fields, open woodlands and disturbed areas. It can produce up to 200,000 seeds each year and can spread over a variety of habitats as its nitrogen-fixing root nodules allows the plant to grow in even the most unfavorable soils. It spreads by seeds that are dispersed by birds and mammals.

At Dix, autumn olive is invading wooded edges and old fields and is the largest plant in recently planted riparian forest buffers. Individual young plants can be hand-pulled, ensuring that roots are removed. Cutting, in combination with herbicide application, is effective. Hedges can be cut down using a brush type mower, chain saw, or similar tool, and stumps treated with a systemic herbicide like glyphosate or triclopyr will not resprout.

Japanese honeysuckle (*Lonicera japonica*) is a perennial vine that was introduced to the U.S. from Eastern Asia. It is a vigorous grower, smothering most vegetation in its path and girdling shrubs and small trees as it twines upward in search of light. It produces abundant seeds which are dispersed by birds. Japanese honeysuckle is present in many of the Tactical Areas on the west side of the installation.

An effective method for removal of patches of honeysuckle covering the ground is to lift and hold a portion of the vine mass with a rake and have a chain saw operator cut the stems low to the ground.

Mowing large patches of honeysuckle may be useful if repeated regularly but is most effective when combined with herbicide application. Mow twice a year, first in mid-July and again in mid-September. Plants can also be grubbed out using a pulaski or similar digging tool, taking care to remove all roots and runners. Burning removes above ground vegetation but does not kill the underground rhizomes, which will continue to sprout. In moderate cold climates, Japanese honeysuckle leaves continue to photosynthesize long after most other plants have lost their leaves. This allows for application of herbicides when many native species are dormant. However, for effective control with herbicides, healthy green leaves must be present at application time and temperatures must be sufficient for plant activity. Several systemic herbicides (e.g., glyphosate and triclopyr) move through the plant to the roots when applied to the leaves or stems and have been used effectively on Japanese honeysuckle.

Japanese stiltgrass (*Microstegium viminium*) is an annual grass resembling a small delicate bamboo that is two to three feet in height when mature. It spreads vegetatively and by seed. A single plant can produce up to 1,000 seeds that remain viable for at least five years. Japanese stiltgrass is especially well adapted to low light conditions and therefore spreads rapidly through forested areas. Japanese stilt grass has taken over the forest floor of many wet successional forests in the outer coastal plain sections of JB MDL. A variety of control methods are available for stiltgrass, depending on the extent of the infestation, the type of habitat and the availability of labor and other resources. Preventing the introduction of stiltgrass from infested to non-infested areas should be a priority. Early control of new infestations will also reduce the likelihood of establishment and expansion. Stiltgrass is a shallow-rooted annual that can be pulled by hand throughout the growing season, especially when the soil is moist and entire plants with roots can be removed. Pulling is easier and probably more effective in mid-to-late summer when the plants are much taller and more branched. At this stage, entire plants can be easily removed by grabbing the basal portion of a plant and pulling firmly. In short time, a fair amount of stiltgrass can be pulled and piled up to dehydrate on site. Stiltgrass can be mowed in late summer (i.e., August through September) when the plants are flowering but preferably before seed is produced. This can be done using a lawn mower or "Weed Whacker" type machine or a scythe. Because stiltgrass is primarily an annual plant, cutting late in the season before the plants would die back naturally avoids the possibility of regrowth. Plants that are cut early in the summer may respond by regrowing and flowering soon after cutting, much earlier than they would normally flower. This is another reason to consider cutting in late summer to fall rather than during the early summer months. Where appropriate, pre-emergent (applied in March) or emergent herbicides (applied in late summer) have been shown to be effective for large infestations.

Common Reed (*Phragmites australis*) also known as Phragmites, is a tall, perennial wetland grass that grows to 15 feet tall and spreads primarily by rhizomal sprouting, which allows it to form pure, dense stands. It can also spread to new areas by seed or rhizome fragments. It grows in a variety of freshwater and brackish habitats including marshes, bogs, lakeshores, ditches and riverbanks. Common reed quickly displaces other plant species creating a monotypic stand with low value to most wildlife (Clark 1997), limiting diversity in the wetland community and providing little food or nesting areas for wildlife. Dense, single species stands of reeds disrupt important habitat for native animal species, disrupt hydrologic flows and decrease overall biological diversity. Although Phragmites provides little food for animal species it is an excellent habitat for populations of flocking birds to take cover and rest. Due to the natural attraction that flocking birds have for this habitat type, stands of common reed can hold thousands of flocking birds at a time and present a large BASH issue on the airfields.

In instances where diverse, natural wetlands are being invaded or where stands are attracting flocking birds creating a BASH issue, control of common reed is clearly warranted. Observations at JB MDL over the years indicate that this species is expanding. An area of concern is on and adjacent to the McGuire Airfield where Phragmites has spread into the ditches and the adjacent wetlands.

A treatment that has had some success is the combined use of herbicide and prescribed fire (Clark 1997).

With this treatment, a wetland-approved glyphosate herbicide is applied in two successive late summer treatments with a controlled burn during the winter between the two herbicide applications. Spot treatments are generally necessary over the next several years.

Because of the difficulty involved in eradicating common reed, preventing its establishment is a more effective means of control. The natural resources program has made significant progress in reducing phragmite stands on and near the McGuire airfield. This effort will continue with ongoing funding from AFCEC for invasive species control.

In stands that occur in standing water, hand cutting below water level may provide effective control. Cutting the stalks repeatedly in this manner will eventually drown the plants as they need the above ground shoots to absorb oxygen. Upland seed supplies must also be controlled for this method to be effective.

Multiflora rose (*Rosa multiflora*) is a thorny perennial shrub with arching stems native to Japan, Korea, and Eastern China. It tolerates a wide range of soil, moisture, and light conditions and can invade fields, forests, some wetlands and many other habitats. Multiflora rose has been a concern as it has invaded many old training areas that have reverted to a mix of tree species and multiflora rose briar patches. These rose bushes hamper the natural regeneration of native species. Due to the thorny nature of its stems and the thickets that it forms, infestation can hinder training exercises especially those that require dismounted maneuvers. JB MDL NR staff has removed some infestations of multiflora rose on Dix using a bulldozer and/or brush mower where it was the dominant vegetation. They also have prescribed- burned successional forests, whose understory is almost impenetrable due to this plant. The objective of these burns was to improve this forest for training by reducing the multiflora rose thickets. These forests are easier to maneuver in now, but the multiflora rose was not eradicated.

Control of these plants is most likely to be obtained through repeated, frequent cutting and mowing in combination with the application of contact and systemic herbicides. Mechanical and chemical methods are currently the most widely used methods for managing multiflora rose. Frequent, repeated cutting or mowing at the rate of three to six times per growing season, for two to four years, has been shown to be effective in achieving high mortality of multiflora rose. In high quality natural communities, cutting of individual plants is preferred to site mowing to minimize habitat disturbance. Various herbicides have been used successfully in controlling multiflora rose but, because of the long-lived stores of seed in the soil, follow-up treatments are likely to be necessary. Application of systemic herbicides (e.g., glyphosate) to freshly cut stumps or to regrowth may be the most effective methods, especially if conducted late in the growing season.

### *7.12 Bird/Wildlife Aircraft Strike Hazard(BASH)*

#### *Applicability Statement*

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section is applicable to JB MDL.

#### *Program Overview/Current Management Practices*

The 305 AMW actively implements a BASH Plan (Tab 1), thereby reducing the potential for a bird strike to occur at the base. Both avian and mammalian wildlife hazards are present on the airfields at JB MDL, including resident and migratory populations of birds. Significant amounts of white-tailed deer have also historically been removed on both airfields. In the past three years, significant progress has been made on replacing the airfield fence at McGuire as well as ensuring that various facilities around the McGuire airfield do a much better job of closing their gates that access the airfield. Fewer than ten deer per year are now accessing the McGuire airfield and future fence repairs/replacements should reduce this number close to zero.

Replacing the ineffective cattle guards with gates is also underway. These steps should reduce deer incursions at Lakehurst to near zero. Wildlife, water, and vegetation issues on the airfield all involve the natural resources program. Consequently, NR personnel participate in many phases of the BASH program. NR personnel attend the quarterly BASH meetings and provide information and mapping for contract work involving the clearing/dredging of airfield ditches to reduce invasive species and facilitate water movement off the airfield. Invasive species control efforts will continue over the next few years to reduce berry- producing shrubs and Phragmites around the airfields. Berries draw many species of birds, and Phragmites is an attractant for several problem species of flocking birds, especially red-wing blackbirds and European starlings. The NR office also schedules prescribe burns for vegetation control. NR personnel have recently installed fencing across the intakes and outflows of culvert pipes under Broome Road to discourage beavers from blocking the pipes which backs up water onto the airfield and creates a wildlife attractant. The hunting program includes areas near the airfields, especially at the Lakehurst airfield, which reduces the number of deer that may wander out on to the runways. The BASH interagency cooperators are in regular communication with NR personnel to collaborate on efforts to maximize the safety of air operations.

**Requirements for Fish and Wildlife Habitat Improvement**

Wildlife in or near the airfields are monitored by the BASH program and their presence is discouraged. Training areas such as tactical areas, range areas, bivouac areas, the parachute drop circle and areas of unimproved forest cover are not under BASH guidelines and wildlife habitat improvement can occur in these areas.

**Existing and Potential Hazards to Aircraft Operations Posed by Wildlife**

The NR management program is responsible for wildlife management on the base, and birds and deer are the primary focus of the BASH program. The BASH contractor is responsible for daily management of wildlife around both airfields. Birds are a major concern on both airfields.

Birds may be encountered at altitudes of 30,000 feet and higher. However, most birds fly close to ground level, and over 95% of all reported incidents in which a USAF aircraft has struck a bird have been below 3,000 ft. above ground level (AGL). Approximately half of these bird strikes occur in an airfield environment, and approximately one quarter occur during low-altitude training. Strike rates rise significantly as altitude decreases, which is partly due to the greater number of low-altitude missions, but mostly because birds are commonly active close to the ground.

Migratory waterfowl (ducks, geese, and swans) pose a threat to low-flying aircraft. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. Waterfowl are usually only a hazard during the migratory season, occurring in the spring and fall. Waterfowl typically migrate at night and generally fly between 1,500 and 3,000 feet AGL during the fall migration and 1,000 to 3,000 feet AGL during spring migration.

**Issues of the BASH Program that Relate to Natural Resources Management**

At the base there are several common bird species that are often present and could present occasional problems with air operations. Vultures, Canada goose, red-winged blackbirds, starlings, horned larks and swallows are some of the more common species around the airfields. Buteos (especially red-tail hawks), ducks, meadowlarks, mourning doves and sparrows are also present, and they occasionally cause problems with air operations.

An Environmental Assessment was completed and a Finding of No Significant Impact (FONSI) was signed 6 April 2017, and involves a change in vegetation management on McGuire airfield intended to maximize flight safety and minimize the BASH risk while minimizing impact to state-listed threatened

or endangered species to the extent practicable, as required by AFMAN 32-7003 Section 3.38.2, and the INRMP OBJECTIVE Section 8.1.1.5. In part, this involves phased reseeding of approximately 100 acres per year using a native grass seed mix based on guidance provided by USFWS, Pinelands Preservation Alliance and others. The grassland conversion of the airfield is projected to last for approximately 10 years in order to progressively convert the airfield to a warm season native grassland. In addition, follow up bird surveys are being conducted during breeding season throughout the airfield to assess success or failure of native grass restoration and the effects that may have on grassland bird populations. A copy of the FONSI has been added as Appendix N.

Grasshopper sparrows are common on the grasslands of JB MDL, but they have never been a serious hazard to aircraft operations. This species does not flock in heavy numbers, and the individual birds are quite small. While the grasshopper sparrow is certainly attracted to an airfield with higher grass, grass height can be a major attractant or deterrent to birds. Shorter heights, grass less than seven inches, attract a wide variety of problem species, and this should be avoided on all parts of the airfield except where pilot sightlines to navigational aids preclude allowing taller grass.

Tall grass has been a management practice at the Lakehurst airfield for over 25 years. It was initiated by the base natural resource's manager in consideration of the habitat preferences of birds most likely to be hazardous to air operations. Geese and gulls are known to avoid high grass areas and are not present at Lakehurst airfield in significant numbers. The native warm season grasses that dominate the airfield are not species with heavy seed heads, so seed eaters like blackbirds and starlings are less likely to be drawn to the airfield compared to other tall grass species. The negative aspects associated with high grass containing heavy seed heads on airfields is its ability to provide food and cover for wildlife species that potentially pose a threat to aviation safety. While there may not be significant numbers of geese, gulls, or seed eaters, there are a significant number of raptors. As USDA-Wildlife Services (WS) data on rodent populations are inconclusive, it is unclear if the raptor population is a direct result of elevated rodent numbers due to long grass management. USDA-WS will conduct further rodent population studies, and a possible change in methodology, which may provide more conclusive data than was indicated in their first study which showed an insignificant rodent population despite 600 nights of trapping. However, large mammals such as white-tailed deer pose a significant risk to air operations and have been heavily documented on Lakehurst airfield. While the large deer population is mainly due to the open-ended airfield fence, the upcoming fence closure project of the 300-foot gap at ECHO taxiway will greatly reduce these numbers. The forthcoming EA will examine both grass height and tree clearing issues and will provide the best management options. Unfortunately, Lakehurst airfield has little to no wildlife strike data available.

The McGuire airfield has maintained a 7-14-inch grass height requirement during the years except for grassland bird nesting season (April 15-July 31) for 20 years. Comparison of the two airfield management systems and their relative benefits to species and risks to flight safety has been an ongoing source of disagreement among various base components. In order to get closer to a consensus on which vegetation height is optimal for air operations safety, JB MDL engaged USDA-WS to conduct a Wildlife Hazard Assessment (WHA) on the McGuire airfield (Dec 2013-Jan 2015). The result of the assessment showed that most birds were found in the airfield area on short grass, but also that large mammals (deer) were accessing the airfield via improperly managed fencing and gates. A recommendation of the assessment was to mow the airfield continually at 6" to 10". While the increased reporting of birds and wildlife in short grass may be due to an observational bias (wildlife is more easily seen in shorter grass), the tall grass in close proximity to where wildlife is observed impedes removal of deer and large mammals by providing cover.

The USFWS did agree with a base request to mow this area during breeding season in a letter dated April 11, 2013, with the recommendation that qualified personnel walk in front of all mowers and locate/mark active bird nests in the triangle to prevent their destruction. JB MDL viewed this recommendation as highly impractical in a 395-acre area and could not support this level of effort. However, another USFWS letter dated August 5, 2013 changed the recommendation to a requirement.

During a meeting with NJDEP and USFWS in August 2015, both agencies indicated a willingness to work towards a mutually acceptable method of meeting USAF standards while minimizing impacts to migratory birds. An EA was completed, and the breeding season mowing was changed to 7-14 inches in the FONSI.

One definite need on the McGuire airfield is an increased management effort to replace the high shrub component presently on site. While periodic control burning is helping to restrict broadleaf shrub expansion, selective herbicides should be used to supplement the burning program. Significant progress has been made in the eradication of phragmites on and around the airfield in the past four years. This effort is scheduled to continue for at least two more years.

Allowing the grass height in the Lakehurst airfield to exceed 14 inches is out of compliance with AFI 91- 212, the US Air Force Mishap Prevention Program. JB MDL will develop a proposed action and alternatives for NEPA analysis in collaboration with the 305 AMW Wing Safety office, USDA-WS, NJDFW and USFWS to achieve airfield grass height in compliance with AFI 91-212. JB MDL will review this INRMP annually with NJDFW and USFWS and modify the INRMP IAW the selected alternative from the completed NEPA document. No changes to the current mowing practices will take place until JB MDL, in collaboration with the 305 AMW Wing Safety office, USDA-WS, NJDFW and USFWS selects an alternative from the completed NEPA document.

Taking of migratory birds requires both a Federal (USFWS) and State (NJDFW) permit. Deer culling requires a State permit in most cases, although JB MDL is an exclusive jurisdiction so it may proceed without one if the State requirements are not compatible with the military mission. These permits shall be held and administered by the 787 CES/CEIE with copies provided to the appropriate air operations flights and relevant contractors. Annual reports of depredation activities must be filed with appropriate Federal and State offices before they issue renewed permits for the following year.

Standing and/or open water on or near airfields is a wildlife attractant. Due to federal and state wetlands protection laws, the natural resources program will provide information and mapping for contract work involving the clearing/dredging of airfield ditches to facilitate water movement off the airfield. Program managers must work to minimize habitat which may draw strike-risk bird species. This may involve clearing vegetation and dredging ditches. Due to the lack of elevation changes on the airfields, moving water swiftly off the airfield is not a realistic expectation. The natural resources program should focus on keeping the ditches fully functional and controlling vegetation that attracts potentially problematic bird species.

Broadleaf shrubs and invasive species, especially Phragmites, are another issue that affects airfield safety. Native broadleaf shrubs, especially fruit-producing species such as blueberry (*Vaccinium* spp.), huckleberry (*Gaylussacia* spp.) and blackberry/raspberry (*Rubus* spp.), can be attractive to many species of wildlife. Scrub oak, an acorn producing native shrub which also provides cover for wildlife, is also a major problem in several portions of the Lakehurst airfield.

The natural resources program has started an eradication effort to reduce and remove these species from the airfield clear zones. Many selective herbicides are labeled for control of these target species and they will not kill the native warm season grasses nearby. The goal is to convert these scrub-shrub areas to a monoculture grassland of native warm season grasses. Portions of the Lakehurst airfield and the "triangle" area and the lateral clear zone east of runway 06/24 at the McGuire airfield should be priority areas in this effort to reduce broadleaf shrubs on the airfields.

**How the Natural Resources Management Program Supports BASH Plan Objectives**

NR management can support the BASH program in several critical ways. NR personnel shall ensure compliance with all Federal and State laws and regulations. Staff can advise the airfield operators on various wildlife problems. Deer that get on to the airfield can be depredated by controlled deer drives or bait and shoot culling. NR personnel, utilizing FES and the WSM, can conduct control burns during the winter which help reduce shrub encroachment and preserve native warm season grass stands. Staff can provide guidance on drainage issues regarding the contracted clearing of airfield ditches and can assist with controlling beaver and eradicating Phragmites. Broadleaf shrubs can be reduced through proper application of appropriate herbicides.

### *7.13 Coastal Zone and Marine Resources Management*

#### *Applicability Statement*

This section applies to USAF installations that are located along coasts and/or within coastal management zones. This section is not applicable to JB MDL.

#### *Program Overview/Current Management Practices*

No portion of JB MDL lies within the Coastal Zone Management Area.

### *7.14 Cultural Resources Protection*

#### *Applicability Statement*

This section applies to USAF installations that have cultural resources that may be impacted by natural resource management activities. This section is applicable to JB MDL.

#### *Program Overview/Current Management Practices*

Cultural resources management at JB MDL is provided in accordance with Sections 106 and 110 of the National Historic Preservation Act (NHPA), the Archeological Resources Protection Act, the American Indian Religious Freedom Act, the Native American Graves Protection and Repatriation Act, DoD Directive 4715.03 (Archeological and Historic Resources Management, 1984) and AFI 32-7065 (Cultural Resources Management Program).

Management of cultural resources on JB MDL is the responsibility of the Environmental Office, 787 CES/CEIEA. An Integrated Cultural Resources Management Plan (ICRMP) is current and updated annually. This plan is reviewed every five years and adjusted to reflect changes in operations and land usage. This enables JB MDL to be pro-active rather than reactive.

Management occurs in conjunction with the New Jersey State Historic Preservation Office (SHPO) and the Pinelands Commission. Any natural resources management activities which have the potential to impact cultural resources will be conducted in accordance with the ICRMP.

The objective of the cultural resources program at JB MDL is to assure that the installation is in compliance with all cultural resources laws and regulations. The main thrust of the program is to identify and evaluate sites that have the potential for listing in the National Register of Historic Places. Cultural Resources reviews are conducted for projects that could adversely affect listed, eligible and potentially eligible historic resources and provides recommendations to minimize adverse effects on those resources.

**Cultural and Historic Resources**

A total of 12 National Register (NR) listed and eligible archaeological sites and the Pointville archaeological historic district have been identified on JB MDL. Hanover Furnace (28BU512), the archaeological remains of a post-Revolutionary War period bog iron furnace, was listed on the NR in 1974. The furnace produced iron and metal implements for the War of 1812 and local domestic needs. In addition to the furnace itself, the remains of workers' housing adjacent to the site (28BU514) are eligible for listing in the NR. A series of archaeological surveys completed in the area known historically as Pointville identified four NR eligible historic archaeological sites (28BU413, 28BU473, 28BU542, 28BU913) which were designated the Pointville Archaeological Historic District in 2018. The NR eligible archaeological site known as the Cherry Valley Tavern/ Pointville Hotel site (28BU413) consists of the archaeological remains of a late eighteenth to mid-nineteenth century hotel and tavern. The site was excavated in the 1990s and found to contain commercial and domestic refuse that provides insights into the history of Pointville. The NR eligible archaeological site (28BU542) located at the same intersection as site 28BU413 contains the remains of a nineteenth century store and houses within the community of Pointville. The NR eligible archaeological site (28BU913) known as the Haven-Jobes site consists of foundation ruins, features and domestic and architectural artifacts that represent a mid-nineteenth to early twentieth century residential occupation. The NR eligible archaeological site (28BU473) consists of features and domestic and architectural artifacts that represent a mid-nineteenth to early twentieth century residential occupation. Two historic archaeological sites (28BU458 and 28BU459) were also identified at McGuire and contain intact house foundations and domestic artifacts dating to the mid to late nineteenth century.

One NR eligible historic archaeological site, the Russian Proving Ground/Lakehurst Proving Ground site (28-Oc-178), was identified at Lakehurst. The site contains foundation ruins and features associated with World War I era chemical weapons testing ranges leased by the Eddystone Company on behalf of the Imperial Russian Army and later by the U.S. Army Chemical Warfare Service. Three NR eligible prehistoric archaeological sites (28BU526, 28BU689 and 28OC67) have been identified at Dix and contain artifacts related to food processing and tool manufacturing activities representative of short-term foraging occupations from approximately 12,000 B.C. to A.D. 1600. Extensive Phase I surveys across the entire JB MDL area has produced zones of archaeological sensitivity as well as a total of 126 archaeological sites dating from the Paleo-Indian to the Historic Period that have yet to be evaluated for their NR eligibility.

No Native American human remains, or Traditional Cultural Properties have been identified on JB MDL. JB MDL is in the process of establishing government-to-government relationships with Federally recognized Native American tribes affiliated with the base. In addition to archaeological sites, JB MDL contains nationally significant historic architectural resources.

A total of three eligible historic districts (Scott Plaza, LTA, and McGuire BOMARC-SAGE) are located within JB MDL along with one National Historic Landmark (Hangar #1) and four individually eligible buildings (120, 1907, 3209, and 9726). Hangar #1 located at Lakehurst was designated a National Historic Landmark in 1968. It is near the site of the Hindenburg crash of 1937. It is also a contributing building to the National Register eligible Lighter than Air Historic District, a collection of 120 historic buildings within the Lakehurst area that were built for the development and use of the Navy's rigid and non-rigid airships. Building 120 was built in 1932 as a housing and mess facility for enlisted men and marines stationed at Naval Air Station Lakehurst.

McGuire contains two buildings and one Historic District considered eligible for the National Register. The SAGE building (1907), built during the height of the Cold War in 1956, was found to be eligible under criteria for exceptional significance as the command and control center for the Air Force continental Air Defense. A related complex of 111 missile shelters and buildings known as "BOMARC" (Boeing Michigan Air Research Center), located at Dix is also eligible for listing in the National Register. Three of the missile shelters were dismantled due to radiation contamination, which was remediated in 2005. In 2013, Building 1506, a communications transmitter, was identified as a contributing element of the SAGE system. In 2019, the BOMARC Missile site and the SAGE complex of buildings were designated the BOMARC-SAGE Historic District. Building 3209 is a maintenance hangar built in 1955 that represented one of the largest hangars in the AF at the time of its construction. Located at Dix, the Scott Plaza Historic District (buildings 5412-5416, 5419-23, 5425) is cluster of buildings constructed by the Works Progress Administration in 1938-1939 for pre-World War II mobilization.

Two historic architecture resources are no longer extant. The Railroad Historic District (Buildings 3103-3106, 3111, 3115, 3116, 3123 and 3125) represented a cluster of World War II era temporary buildings built for railroad storage and maintenance at Dix. Building 9726 was built in 1941 as a Series 700 Day Room, type A-5 as part of the World War II mobilization at Dix and served a surrounding complex of temporary barracks constructed at the same time.

Five individual buildings are potentially eligible for listing in the National Register: a World War I railroad facility (3135); nineteenth century farmhouses (Quarters 1 and Quarters 2) purchased as part of the World War I era development of Camp Dix; a World War II era firehouse (5353); and a World War II era building (9004) used as a Range Control house.

Cultural Resources Impact on Training

Although a number of archaeological and historic sites are listed above, the impact of the protection of those resources on the military mission is minor. Generally, buildings and archaeological sites are located in areas where military training exercises occur infrequently. Portions of the installation that are most impacted by training include the range and tank training areas. Many of these areas were formerly sandpits and are likely already disturbed.

A Phase I survey of Tactical Areas was conducted at Dix. Care should be taken to avoid potentially significant archaeological sites.

Cultural Resources Impact on Natural Resources Management

Cultural resource protection does have an impact on natural resource management. Some of the sites listed above are located in areas of the installation where more intensive forest management is practiced. New logging roads or logging decks can destroy existing cultural resources if not properly sited.

Potentially significant archaeological sites are protected, and potential adverse effects to those sites must be mitigated under Section 106 of the NHPA.

Natural Resources Management Implications

Potential negative impacts on cultural resources by natural resource management may be caused by ground disturbances including LRAM, erosion control projects, firebreaks, and timber harvest. To reduce this potential, natural resource projects will avoid disturbing any potential sites, such as those outlined above. To avoid these sites, natural resource personnel will coordinate projects with the Installation Cultural Resources Manager (CRM). The locations of sites and buildings have been added to GIS mapping database. Ideally, the CRM should be able to identify potential archeological sites that may be uncovered during construction. If encountered, all work must stop, and an on-site investigation must be conducted by the CRM to determine if the site is a potential cultural resource.

The CRM will brief Range Control, Outdoor Recreation, and the CLEO on laws protecting archaeological resources and actions to be taken if potential cultural resources are discovered.

### *7.15 Public Outreach*

#### *Applicability Statement*

This section applies to all USAF installations that maintain an INRMP. JB MDL is required to implement this element.

#### *Program Overview/Current Management Practices*

Natural resources awareness education programs are necessary to enable all installation personnel- military, civilian, and contractor- to participate in the stewardship of natural resources. At JB MDL, public affairs and outreach for NRPs are facilitated by the 787 CEIE NR personnel and FSS, which includes the Outdoor Recreation program.

The objectives of natural resource awareness programs at JB MDL are:

- To provide information to military units, civilian employees and other installation users to improve their understanding of the impacts their activities at JB MDL have on the environment and how to reduce those impacts.
- To provide decision makers with information needed to make judgments that affect JB MDL's natural resources.
- To provide programs to the military community and the public community for recreation on approved areas of JB MDL.
- To provide general environmental and conservation education to the military community and the communities surrounding JB MDL.
- To foster good relationships with community members regarding natural resource issues.

JB MDL has several natural resource educational programs throughout the year. JB MDL has a very successful seasonal bluebird nest box monitoring program manned primarily by volunteers. JB MDL also hosts an installation wide Earth Day celebration every April that is enjoyed by over 1,000 guests. JB MDL hosts Summer picnic events where the NR Department personnel staff an educational booth to inform attendees of the various flora and fauna of the base. JB MDL also has hosted an Arbor Day tree planting ceremony and takes the opportunity to teach attendees about urban forestry.

School groups, scouts, birding groups and other organizations are invited periodically to participate in workdays and/or tours of nature trails that natural resources maintain. NR staff visits local schools to teach students about endangered species, forestry, and watershed protection. Natural Resources staff also provides programs for the JB MDL home school group and summer campers.

NR personnel administer a robust volunteer program. Enthusiastic volunteers help to make the natural resources program on JB MDL a success. Volunteers are key to the success of natural resource projects, Earth Day, Arbor Day, National Public Lands Day, checking bluebird nest boxes, water monitoring, and Family Fun Day. Through this program, volunteers learn more about important natural resource features of the pinelands community and gain a sense of achievement and community involvement while helping NR meet its goals.

### *7.16 Geographic Information Systems (GIS)*

*Applicability Statement*

This section applies to all USAF installations that maintain an INRMP, since all geospatial information must be maintained within the USAF GeoBase system. JB MDL is required to implement this element.

*Program Overview/Current Management Practices*

The JB MDL Geographic Information System (JBGIS) is conceived as a robust Spatial Decision Support System. The JBGIS Mission is to create, analyze, manage and distribute authoritative standardized spatial information, products and services for the management and execution of training strategies and missions on installation ranges and training lands. Through information excellence, JBGIS strives to provide the Joint Base Community, Trainers, Sailors, Airmen and Soldiers with the ability to leverage the most accurate and complete datasets through easily accessible and user-friendly products and applications.

JB MDL uses a variety of geospatial information technologies, including geographic information systems (GIS), remote sensing and Global Positioning Systems (GPS) to collect, store, retrieve and analyze natural resource data. The data inputs can emanate from a variety of sources that must then be integrated into the JBGIS. This data can then be leveraged to make spatial decisions and aid in the planning, design, management and use of lands and facilities on the installation.

The various JB MDL geospatial assets are distributed across a variety of platforms, media and Installation Directorates. The primary producers and stewards of data are the Environmental Division GIS (EDGIS) through Natural resources, the Sustainable Range Program (SRP) GIS (through the ITAM offices), and the 787 CEPT (Civil Engineering Program Flight Support Technology). The services these offices provide are primarily consumed by JB MDL planning, management and training components.

In general, additional GIS data layers for JB MDL should be created such as forest management activities, updated land use/land cover, T&E species habitats, stormwater conveyance systems (i.e. catch basins, culverts, pipe outlets, and detention/water quality basin location), actual percent impervious cover by sub-watershed and other information for natural resource management.

These data layers will help natural resource professionals manage the land on the installation and determine trends, such as changes in riparian areas, sources of pollution and actual stormwater runoff. Digital aerial photo coverage should also be updated on a three to five-year interval. Aerial photo coverage is often available from the NJDEP free of charge.

The challenge facing the use of GIS on the installation is access to data, software and training for the natural resource managers and military trainers. GIS files must be converted to the approved geo-database format.

## 8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and supporting objectives to manage and protect natural resources while supporting the military mission. Goals express a vision for a desired condition for the installation's natural resources and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and

are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF missions, this section may list specific goals and objectives aimed at eliminating, reducing or mitigating the effects of encroachment on military missions. These natural resources management goals for the future have been formulated by the preparers of the INRMP from an assessment of the natural resources, current condition of those resources, mission requirements and management issues previously identified. Below are the integrated goals for the entire natural resources program.

The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

*Installation Supplement – Management Goals and Objectives*

**Fish and Wildlife Management Goals and Objectives**

## GOAL 8.1.1: MANAGE FISH AND WILDLIFE – MANAGE FISH AND WILDLIFE, BASED ON AN ECOSYSTEM-MANAGEMENT APPROACH

- OBJECTIVE 8.1.1.1: Monitor Snake Population – Check on populations annually to ensure snake populations are stable and continue to thrive.
  - PROJECT 8.1.1.1.1: Complete Phase II Pine Snake Survey at former Dix Range areas by Late Summer 2020. The Phase II Survey for pine snakes was a continuation of the Phase I Survey previously conducted on base. This survey will provide essential information on the species. This information will be helpful when considering potential development or mitigation strategies in the area.
  - PROJECT 8.1.1.1.2: Place survey boards at appropriate locations to search for timber rattlesnake.
- OBJECTIVE 8.1.1.2: Monitor Bird Population.
  - PROJECT 8.1.1.2.1: Conduct grassland bird surveys on an annual or biennial basis at JB MDL.
- OBJECTIVE 8.1.1.3: Monitor Bat Population – Surveys will monitor bat species for presence/absence and track presence/absence trends over time.
  - PROJECT 8.1.1.3.1: Continue bat surveys – Annually perform bat surveys on base. The information collected will be provided to the State to fill in data gaps of the bat population.
- OBJECTIVE 8.1.1.4: Manage Deer Population – Seasonally manage deer population on-base to avoid disease and overuse of habitat.
  - PROJECT 8.1.1.4.1: Annual hunting and fishing program under a unified JB MDL instruction – Issue deer hunting permits in compliance with the base instruction for deer and maintain a database of permits sold along with deer harvested on the installation seasonally, beginning in August 2015.
- OBJECTIVE 8.1.1.5: Manage Existing Grasslands – Manage existing grasslands on base to maximize the safety of air operations while enhancing and protecting biodiversity and providing habitat for grassland species annually.
  - PROJECT 8.1.1.5.1: Over-seed 5% of Grasslands – Beginning at the completion of this INRMP, over-seed 5% (approximately 80 acres/year) of the base grasslands that are in poor condition (unimproved areas and/or natural areas) with warm season grass varieties annually, to reach a goal of 800 acres by 2023.
  - PROJECT 8.1.1.5.2: Conduct annual mowing of grassland fields on JB MDL-Lakehurst (approximately 122 acres) and JB MDL-Dix (approximately 34 acres) starting in Winter 2022. This mowing, in conjunction with rotating prescribed burns, will help maintain early successional, native warm season grasslands and discourage pioneering trees from encroaching

on this habitat. Healthy stands of native warm season grasses will also help preclude the encroachment of various invasive species.

**GOAL 8.1.2: IMPROVE SPECIES DIVERSITY**

- OBJECTIVE 8.1.2.1: Improve and maintain species diversity in natural areas on JB MDL as appropriate.
  - PROJECT 8.1.2.1.1: Implement Noxious and Invasive Control – Continue to implement noxious and invasive weed control to include herbicide or mechanical removal of invasive species throughout all JB MDL annually through 2025. Mow only when mechanical, chemical or burning treatments cannot achieve effective control or a specifically targeted weed species responds better to control by mowing. Treat at least 50 acres each year on JB MDL.
  - PROJECT 8.1.2.1.2: Remove Litter and Debris – Annually assess and remove all litter and debris from Laurel Pond, ongoing since 2015.
  - PROJECT 8.1.2.1.3: Install and repair interpretive signs on Misty Hollow, Bass Lake, and Laurel Pond nature trails by Fall 2020 – Maintain the trails and interpretive signs with landscaping to be weed-free and in good condition throughout, to be completed by2020.
- OBJECTIVE 8.1.2.2: Manage Wildlife Nesting Structures – Continue to manage inventory of bluebird nesting structures, wood duck boxes and bat houses.
  - PROJECT 8.1.2.2.1: Continue successful nest box programs and stop those that fail to draw target species – Install additional nest boxes or structures for target species which are successfully using the boxes (bluebirds, wood ducks, etc.) in appropriate locations throughout the base starting in Spring, 2020.
  - PROJECT 8.1.2.2.2: Clean Structures – Clean out and maintain/replace the existing bluebird, wood duck, and bat nest structures being used on base. Use volunteer groups ifpracticable.

**GOAL 8.1.3: COMPLY WITH ALL GAME AND FISH LAWS**

- OBJECTIVE 8.1.3.1: Continue to remain in compliance with federal, state, and local laws and regulations governing fish and wildlife.
  - PROJECT 8.1.3.1.1: Continue annual consultations with State biologists on deer seasons and bag limits.
  - OBJECTIVE 8.1.3.2: Ensure Hunter Compliance – Ensure 100% hunter compliance with State regulations annually and keep base instruction updated biannually, beginning in August2020.
  - PROJECT 8.1.3.2.1: Implement Enforcement of State Regulations – Implement enforcement of State regulations and AFI 32-4004 by utilizing the CLEOyear-round.

**GOAL 8.1.4: MAINTAIN PARTNERSHIPS – MAINTAIN PARTNERSHIPS WITH AGENCIES AND GROUPS INVOLVED IN FISH AND WILDLIFE MANAGEMENT**

- OBJECTIVE 8.1.4.1: Maintain Agency Communications – Maintain communication with USFWS, NJDFW, New Jersey Forest Service, and Boy or Girl Scouts ofAmerica annually.
  - PROJECT 8.1.4.1.1: Continue to communicate with other Agencies and Interested Non- profits – Continue to communicate with USFWS, NJDFW and NJ Forest Fire Service on all common concerns. Annually communicate with the Boy or Girl Scouts of America and/or the local 4H clubs regarding the cleanout of bird and bat houses and litter and debris removal on base, beginning Spring 2020.
  - PROJECT 8.1.4.1.2: Continuing Research – Continue cooperative efforts with interested non-governmental organizations/non-profits to conduct wildlife research projects on JB MDL which will advance knowledge of resident wildlife to improve DoD management of these species.

**Outdoor Recreation Management Goals**

## GOAL 8.2.1: PROVIDE QUALITY OUTDOOR RECREATION EXPERIENCES

- OBJECTIVE 8.2.1.1: Provide quality outdoor recreation experiences while maintaining ecosystem integrity.
  - PROJECT 8.2.1.1.1: Provide and Plant Native Vegetation along Trails and Ponds – Provide and plant select native vegetation along the trails and ponds to enhance these areas
  - PROJECT 8.2.1.1.2: Replace three old, dilapidated fishing docks located at Island Pond at Lakehurst with new aluminum floating fishing docks. Replace one old, dilapidated fishing dock at Clubhouse Lake, also at Lakehurst, with a new aluminum floating fishing dock. These four docks currently present an unreasonable safety liability to the Air Force. Install one aluminum floating fishing dock at Lake of the Woods at Dix.

**T&E Species Management Goals and Objectives**

## GOAL 8.3.1: MANAGE SENSITIVE SPECIES – MANAGE AND PROTECT SENSITIVE SPECIES AND ASSOCIATED HABITATS WHILE PROTECTING OPERATIONAL FUNCTIONALITY OF THE INSTALLATION'S MISSIONS

- OBJECTIVE 8.3.1.1: Manage base grasslands for NJ listed T&E species – Manage, develop plans and monitor existing populations of bird and plant species of concern and survey for species lacking in data on base.
  - PROJECT 8.3.1.1.1: Continue the phased reseeding of the McGuire airfield inner triangle. This involves reseeding approximately 100 acres per year using a native warm season grass (NWSG) mix for approximately 10 years to progressively convert this area to an NWS grassland.
  - PROJECT 8.3.1.1.2: Continue to conduct follow-up bird surveys of the McGuire airfield inner triangle for approximately 10 years during breeding season to assess success or failure of native grass restoration and the effects that it may have on bird populations.
  - PROJECT 8.3.1.1.3: Review List of Species Known to Occur at JB MDL – Annually review, update and evaluate the list of threatened and endangered species which potentially occur on JB MDL, beginning Spring, 2020.
  - PROJECT 8.3.1.1.4: Bog Turtle Survey – NR personnel will conduct an annual Bog Turtle survey starting in 2019 from April 15th to June 15th around the wetlands in the southeast corner of Lakehurst where a bog turtle was last captured in 1993. A "beaver deceiver" device has been installed in this wetland in the hopes that a stable water level may benefit this potential bog turtle habitat. This survey should include:
    1. Information and consultation from the USFWS, the NJDEP, and other local experts.
    2. Incorporate biological survey data into GIS and INRMP as collected.
  - PROJECT 8.3.1.1.5: PIT tag program with northern pine snake base wide –Continue inserting pit tags into pine snakes after their initial capture for immediate release back into the wild. Record data for these and other previously captured snakes. This effort includes data on snake gender, size, condition and location. Data will be entered into the Excelspread sheet database.

- OBJECTIVE 8.3.1.2: Monitor Bird Species of Concern – Conduct a 12-month survey of forest bird species on JB MDL with special emphasis on species of concern by September 2023.
  - PROJECT 8.3.1.2.1: Bald Eagle Survey – Annually, approximately between March 1 and May 15 (prior to leaf-out), survey on base and around base perimeter for bald eagle nests and coordinate with NJDEP if any nests are discovered.
  - PROJECT 8.3.1.2.2: Conduct a marshland bird survey to identify 12 species of concern and whether suitable breeding habitat exists on the base beginning in Spring, 2022.

- OBJECTIVE 8.3.1.3: Monitor Plant Species of Concern – On a biennial basis, monitor three State plant species of concern using GIS to map any new locations, document population expansion, and

evaluate plant vigor/health beginning in June2021.

- PROJECT 8.3.1.3.1: Lakehurst Plant Survey – Conduct a plant survey beginning in June 2021 during blooming periods for federal and state endangered, threatened and plant species of concern. The field survey should spatially measure the plant area with GIS/Global Positioning System (GPS), count individual plants if possible, take photographs and evaluate plant vigor/health. The survey should be documented via field notes, GIS and filed appropriately.

- OBJECTIVE 8.3.1.4: Protect Sensitive Habitat – Continue protection of sensitive habitats beginning at the completion of this INRMP.
  - PROJECT 8.3.1.4.1: Discuss Sensitive Species with Planning Personnel – Discuss potential sensitive species constraints with base planning personnel as early as possible to avoid, minimize and mitigate potential adverse impacts as a result of future development planning. Incorporate any species constraints into the base general plan, beginning at the completion of this INRMP.
- OBJECTIVE 8.3.1.5: Continue annual Bat Presence/Absence Monitoring mist netting for bat species.
  - PROJECT 8.3.1.5.1: Continue Mist Netting surveys with USFWS. Continue mist netting for northern long-eared bat in locations with "hits" from the acoustic surveys. Map known hits of listed endangered species as well as monitor all possible new candidates detected (especially little brown bat and tri-colored bat) through the monitoring, and partner with USFWS to increase mist netting efforts to confirm species locations from acoustic surveys. Place transmitters on captured northern long-eared, little brown or tri-colored bats to determine location of maternity colonies.

**Water Resource Goals and Objectives**

## GOAL 8.4.1: COMPLY WITH THE JB MDL STORMWATER POLLUTION PREVENTION PLAN (SWPPP) – REMAIN IN COMPLIANCE WITH THE JB MDL SWPPP

- OBJECTIVE 8.4.1.1: Maintain State and Federal Water Quality Standards – Maintain state and federal water quality parameters to prevent environmental degradation and habitat loss via implementation of BMP's, beginning at completion of this INRMP.
  - PROJECT 8.4.1.1.1: Annual Meeting with Water Quality Manager – Conduct annual meetings with the JB MDL Water Quality Manager to discuss BMPs, level of water quality parameters, and associated natural resource protection issues, beginning in October 2020.

**Wetland Management Goals and Objectives**

## GOAL 8.5.1: COMPLY WITH EO 11990 – REMAIN IN COMPLIANCE WITH EO 11990, CLEAN WATER ACT, USACE, AND STATE OF NEW JERSEY WETLAND REGULATIONS

- OBJECTIVE 8.5.1.1: Comply with Wetland Laws – Comply with state, federal Wetland Regulations and Air Force and DoD Regulations, Policies and Directives annually, and track compliance and correspondence in an excel spreadsheet or database, beginning at the completion of this INRMP.
  - PROJECT 8.5.1.1.1: Maintain Communications – Maintain communication with USACE and request JB MDL is included on the USACE mailing list for special public notices, regulatory guidance letters, and information papers directing policies affecting wetlands, beginning at the completion of this INRMP.

## GOAL 8.5.2: PROTECT WETLANDS

- OBJECTIVE 8.5.1.2: Protect wetlands from operational activities at JB MDL and maintain healthy,

functional wetlands.

- PROJECT 8.5.1.2.1: Inventory of Flora and Fauna – Conduct an inventory of floral and faunal species found in the wetlands, beginning in May 2022.

**Grounds Maintenance and Land Management Goals and Objectives**

## GOAL 8.6.1: IMPROVE EFFECTIVENESS OF GROUNDS MAINTENANCE TO THE OVERALL ECOSYSTEM

- OBJECTIVE 8.6.1.1: Vegetation Assessment.
  - PROJECT 8.6.1.1.1: Perform Flora/Fauna Survey Phase II (Colorado State) at Dix.
  - PROJECT 8.6.1.1.2: Reseed Exposed Soil – Continue to reseed exposed soils after ground disturbing activities using the appropriate native grass mixture for each area.
  - PROJECT 8.6.1.1.3: Develop Reseeding Schedule – Develop a base reseeding and improvement schedule including the use of native plant species by June2021.
  - PROJECT 8.6.1.1.4: Review New Projects and Contracts – Natural Resources staff reviews new construction projects and landscape designs, Grounds Maintenance contract and Green Plan revisions to integrate and ensure consistency with INRMP goals and objectives of land management biennially.

## GOAL 8.6.2: CONTROL NOXIOUS AND INVASIVE PLANTS – CONTROL NOXIOUS AND INVASIVE PLANT SPECIES IN THE INSTALLATION ENVIRONMENT

- OBJECTIVE 8.6.2.1: Use Best Management Practices (BMPs) to Reduce Noxious and Invasive Plants – Use BMPs to reduce Noxious and Invasive Plants transport and dispersal, and ensure these practices are included in Grounds Maintenance contracts.
  - PROJECT 8.6.2.1.1: Monitor Lespedeza and Phragmites and control where practical. Apply controls on at least 5 acres/year.
- OBJECTIVE 8.6.2.2: Baseline Survey – Continue surveys, developing control plans and monitoring for noxious and invasive weed presence and proliferation.
  - PROJECT 8.6.2.2.1: Update Noxious Weed Inventory and Plan. Survey and Update Noxious Weed Inventory and Plan by December 2020 – Update weed inventory and control plan and monitor locations of known populations of noxious weeds and measure increase or decrease in levels of infestation, beginning after the completion of the Noxious Weed Survey Update.
- OBJECTIVE 8.6.2.3: Implement Weed Control Plan –Implement the weed control plan on base annually.
  - PROJECT 8.6.2.3.1: Provide information and mapping for contract work involving the clearing/dredging of airfield ditches to reduce invasive species and facilitate water movement off the airfield.

**Forest Management Goals and Objectives**

## GOAL 8.7.1: MANAGE URBAN FOREST – CONTINUE DEVELOPMENT AND MANAGEMENT OF TREES ON BASE, IN ACCORDANCE WITH THE URBAN STREET TREE SURVEY

- OBJECTIVE 8.7.1.1: Protect Against Biological Threats – Protect against biological threats, such as Dutch elm disease and emerald ash borer, and safety threats, such as broken limbs and potential deadfall trees, by practicing effective tree selection, removal and management annually.
  - PROJECT 8.7.1.1.1: Conduct Annual Tree Pest Inspection – Conduct annual spring base- wide windshield tours of the base to identify trees infected with Dutch elm disease, emerald ash borer, Spotted Lanternfly or other tree diseases, using GPS technology to document trees and update the tree database in need of treatment or removal, beginning at the completion of this INRMP.
  - PROJECT 8.7.1.1.2: Conduct Annual Tree Hazard Survey – Conduct an annual spring

windshield survey to identify trees which are safety hazards, dead, or need monitoring because they are in poor condition.

- PROJECT 8.7.1.1.3: Remove Infected Trees – Annually identify trees for removal during the windshield survey known to be infected with Dutch elm disease, emerald ash borer, Spotted Lanternfly or other rapidly spreading insects/diseases immediately from the installation, and dispose of by burying in a landfill or chipping to adequately sanitize the tree and protect the remaining urban forest.

- OBJECTIVE 8.7.1.2: Update Tree Inventory – Update Urban Street Tree Survey and improve Street Tree pruning, care and planting.
  - PROJECT 8.7.1.2.1: Update GIS Inventory – Update the GIS tree inventory to include missed surveyed areas, including all tree planting projects and removals.
  - PROJECT 8.7.1.2.2: Re-inventory forest plantations for updated GIS data/thinning requirements/and clear cuts.
  - PROJECT 8.7.1.2.3: Conduct forest inventory update.

- OBJECTIVE 8.7.1.3: Continued implementation of Firewood Program – Allow public into base to clear dead trees from areas.
  - PROJECT 8.7.1.3.1: Manage a JB MDL firewood program and when possible, sell all timber from lots scheduled to be cleared for approved projects.
  - PROJECT 8.7.1.3.2: Do NEPA documentation and conduct timber sales for forest thinning in overstocked stands.

**GOAL 8.7.2: USE MECHANICAL THINNING IN OVERSTOCKED FOREST STANDS IN POOR CONDITION TO INCREASE FOREST AND TREE HEALTH, HABITAT VALUE AND TO DECREASE WILDFIRE THREATS**

- OBJECTIVE 8.7.2.1: Mechanically reduce tree density to 60 sq. ft./acre in forested areas close to Lakehurst northwest boundary to provide wildfire threat reduction and improved tree health. The reduction of tree stands densities makes them more resistant to the spread of disease and harmful insects.
- PROJECT 8.7.2.1.1: Spring 2022. Reduce tree density to 60 sq. ft./ac. in Area A (139 ac.).
- PROJECT 8.7.2.1.2: Spring 2023. Reduce tree density to 60 sq. ft./ac. in Area B (22 ac.).
- PROJECT 8.7.2.1.3: Spring 2024. Reduce tree density to 60 sq. ft./ac. in Area C (62ac.).
- PROJECT 8.7.2.1.4: Spring 2025. Reduce tree density to 60 sq. ft./ac. in Area D (78 ac.).
- PROJECT 8.7.2.1.5: Spring 2026. Reduce tree density to 60 sq. ft./ac. in Area F (19ac.).
- PROJECT 8.7.2.1.6: Remediate catastrophic death/damage to forest stand if necessary.

**Wildland Fire Management Goals and Objectives**

**GOAL 8.8.1: USE PRESCRIBED FIRE TO MANAGE GRASSLANDS, AIRFIELDS, AND WOODLANDS.**

- OBJECTIVE 8.8.1.1: Conduct prescribed burning of grasslands, airfields, and woodlands to maintain biodiversity – Different selected areas will be burned on a rotational schedule annually.
  - PROJECT 8.8.1.1.1: Update and implement JB MDL Wildland Fire Plan and Annually Conduct Wildland fire response – Bring all resources into compliance with AFMAN 32- 7003 by 2020, including personnel and equipment. Currently, JB MDL is equipped with a 25- year-old John Deere 350 dozer with a fire plow, a model which has been discontinued, and a rollback transport vehicle which is 16 years old. An accompanying Type 6 wildland fire engine is almost 15 years old. All three vehicles are well in excess of their service lives, and frequently break down. It is strongly recommended that this outdated but essential equipment be replaced.

    As was previously mentioned in this plan, the NJ Pinelands region is the 2nd most fire prone ecosystem in the United States. JB MDL is situated within the Pinelands region, and the

installation is exposed to approximately 150-200 wildfires a year. Most of these wildfires are started by live firing on the ranges, which is a mission-critical operation. JB MDL also maintains an aggressive prescribed burning program to minimize the threat of uncontrolled wildland fires that have the potential to destroy federal training facilities and private property in the wildland urban interface. On average, approximately 4,000 acres undergo prescribed burning every year. If a major wildfire should ever escape the base, the Air Force could be faced with an overwhelming liability issue. Considering recent 2018 wildfires in the western US, and in California in particular, this is not a scenario that can be allowed to advance. A 2007 fire which escaped from the Warren Grove Bombing Range located approximately 12 miles south of JB MDL caused millions of dollars in damages to private structures.

- PROJECT 8.8.1.1.2: Annually map fires with GPS – Use GPS to map burned areas and calculate acreage

**Integrated Pest Management Goals and Objectives**

**GOAL 8.9.1: MINIMIZE PEST SPECIES**

- OBJECTIVE 8.9.1.1: Control Pest Species on Base by Implementing BMPs.
  - PROJECT 8.9.1.1.1: Monitor forest pests (i.e. Southern Pine Beetle, Emerald Ash Borer, Gypsy Moth and Spotted Lanternfly) – Annually monitor trees for pests with pheromone traps from USDA Forest Service.
  - PROJECT 8.9.1.1.2: Control Feral Dog and Cat Populations – Develop policy and community awareness for controlling feral dog and cat populations.
  - PROJECT 8.9.1.1.3: Monitor Beaver Pests – Control problems with beavers by obtaining appropriate permits for in season and site-specific trapping. Maintain the beaver deceiver units we currently have and purchase additional units for placement in other trouble areas. Where applicable, place chain link fencing over culverts to deter beavers from damming up these structures.
- OBJECTIVE 8.9.1.2: Mosquito Control Efforts.
  - PROJECT 8.9.1.2.1: Focus mosquito control efforts to reduce the threat of West Nile virus to migratory birds and appropriately implement the use of mosquito aerial pesticide application by September 2021.
- OBJECTIVE 8.9.1.3 Spotted Lanternfly Control Efforts
  - PROJECT 8.9.1.3.1: The Spotted Lanternfly is an invasive planthopper native to China, India and Vietnam. It was first discovered in Pennsylvania in Berks County and has spread to other counties in the southeast portion of that State and adjacent counties in NJ. This insect has the potential to greatly impact agricultural crops such as grape, hops, and hardwoods. The USDA has been invited onto the base to help NR personnel identify its presence, and in early Fall 2019 USDA personnel did identify this invasive species to be present on base. Work with the USDA starting in Spring 2020 to identify the host plants of the spotted lanternfly (Tree of Heaven) and eradicate both.

**BASH Management Goals and Objectives**

**GOAL 8.10.1: MINIMIZE WILDLIFE STRIKE HAZARD – MINIMIZE AIRCRAFT EXPOSURE TO POTENTIAL WILDLIFE STRIKE HAZARDS THROUGH WILDLIFE MANAGEMENT**

- OBJECTIVE 8.10.1.1: Maintain Airfield Deer Fence.
  - PROJECT 8.10.1.1.1: Survey the Fence for Gaps, Tunnels, or Holes – Survey the airfield fence line for any holes, gaps and tunnels biannually and identify potential wildlife crossings. Report any needed repairs to the respective airfield managers.
- OBJECTIVE 8.10.1.2: Prevent Flocking birds from Nesting near Airfield – Notify and assist BASH contractor when potentially hazardous bird congregations are discovered. Prevent flocking birds from nesting near airfields to avoid BASH.

- PROJECT 8.10.1.2.1: Install and Maintain Proper Bird Nesting Preventatives – Consult with pest management personnel to install proper bird nesting/perching preventatives.
- PROJECT 8.10.1.2.2: Conduct ongoing assessments on whether water retention features are contributing to BASH Hazards on McGuire and Lakehurst airfields.
- PROJECT 8.10.1.2.3: Maintain appropriate state and federal Permits – Maintain appropriate state and federal permits to ensure proper harassment and depredation of birds located within the flight line.
- PROJECT 8.10.1.2.4: Continue research on Test Runway for bird occupation using east half mowed to 7-14-inch grass height and west half un-mowed through 2023.
- PROJECT 8.10.1.2.5: Conduct an EA that will address both the 7-14" grass mowing analysis and tree-clearing at the Lakehurst airfields as well as a required EA for the INRMP revision.

**Cultural Resource Management Goals and Objectives**

## GOAL 8.11.1: PROTECT HANOVER FURNACE AREA – PROTECT THE HANOVER FURNACE AREA TO PREVENT LOSS OF IMPORTANT CULTURAL RESOURCES

- OBJECTIVE 8.11.1.1: Stabilize Hanover Furnace Area – Stabilize the Hanover Furnace to protect against erosion and subsequent loss of historical archeological deposits and potential cultural resources in this area.
  - PROJECT 8.11.1.1.1: Enhance the natural terrain to buffer and protect the area – Plant natives surrounding the area to build a buffer and seclude area from foot traffic.

**Public Outreach Goals and Objectives**

## GOAL 8.12.1: NATURAL RESOURCE EDUCATION AND AWARENESS – PROMOTE NATURAL RESOURCE EDUCATION AND AWARENESS

- OBJECTIVE 8.12.1.1: Use Laurel Pond as an Outdoor Interpretive Center – Continue to develop activities and educational materials using Laurel Pond as an outdoor interpretive center for outreach events, such as National Public Lands Day, Earth Day, and other environmental education venues.
  - PROJECT 8.12.1.1.1: Develop a Litter Clean-Up Day for the installation. Develop a litter clean-up activity for Range 14 or Lake of the Woods on National Public Lands Day annually, starting in 2020.
- OBJECTIVE 8.12.1.3: Update Natural Resource Brochures.
  - PROJECT 8.12.1.3.1: Update publicly distributed natural resources brochures and checklists biennially, using DoD publications, beginning in November 2020.

**GIS Management Goals and Objectives**

## GOAL 8.13.1: ENHANCE, UPDATE, AND MAINTAIN GIS DATA

- OBJECTIVE 8.13.1.1: Incorporate natural resource data into GeoBase – Ensure all current information relative to natural resources is incorporated into the GeoBase.
  - PROJECT 8.13.1.1.1: Collect existing data – Collect existing natural resources data and standardize with GeoBase.
    - PROJECT 8.13.1.1.2: Maintain GIS database containing habitat of concern for T&E species and continually update faunal database as species are located – Locate vernal pools via a potential pool map layer from NJDEP, classify and certify vernal pools using NJ Land Use Regulation standards. Ensure locations and certification data is incorporated into GIS.
- OBJECTIVE 8.13.1.2: Annual GIS data review – Annually review natural resource GIS information to ensure current coverage.
  - PROJECT 8.13.1.2.1: Review Natural Resource GIS Data – Review natural resources GIS spatial data and update to include such layers as prescribed burns and species list annually.

- PROJECT 8.13.1.2.2: Sync GIS Data with GeoBase – Sync the natural resources GIS database with the GeoBase database annually.

## GOAL 8.13.2: USE GIS INFORMATION TO DEVELOP GOALS AND OBJECTIVES

- OBJECTIVE 8.13.2.1: Use GIS information as a tool for developing future natural resource management goals and objectives.
  - PROJECT 8.13.2.1.1: Review GIS data for gaps – Conduct a review of all-natural resource GIS files, compile a list of coverage into a spreadsheet, and determine gaps in information annually.

# 9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISIONPROCESS

## *9.1 Natural Resources Management Staffing and Implementation*

Natural resources and land use management issues are not the only factors contributing to the development and implementation of the INRMP. Base management and other seemingly unrelated issues affect the implementation of this Plan. It is extremely important to the implementation of this INRMP that base personnel take "ownership" of the Plan (i.e., individual or organizational primary responsibility to implement the INRMP), to provide the necessary resources (i.e., personnel and equipment) and to allocate the appropriate funding to enact the Plan. It is of the utmost importance the NR Management and Environmental Element Installation staff aids in the continued development and commit to the implementation of this INRMP. The estimated man-hours to oversee the implementation of the INRMP are shown in Table 21: Estimated Total Oversight Person-Hours of Implementing INRMP.

**Table 21. Estimated Total Oversight Person-Hours of Implementing INRMP**

| INRMP Funding Category | Oversight Estimated Man Hours |
|---|---|
| Ecosystem Management | 1,000 |
| Fish and Wildlife Management | 800 |
| Geographical Information System | 3,000 |
| Grounds Maintenance | 800 |
| Habitat Management | 800 |
| Outdoor Recreation and Public Access | 400 |
| Surrounding Lands | 200 |
| Threatened and Endangered Species | 1,200 |
| Wetlands | 1,000 |
| Wildland Fire | 900 |
| TOTAL | 10,100 |

This INRMP is a "living" document based on several short-, medium-, and long-term planning goals. Short-range goals include activities planned to occur in 0 to 5 years, while medium-range goals include activities in a 6- to 10-year period. Long-range goals are usually scheduled beyond 10 years. Most of the goals and objectives discussed in this INRMP are based on short-term natural resources management goals contributing to the success of the long-term management goals. Because an INRMP is a "living" document, goals may be revised over time to reflect evolving environmental conditions. In addition, medium- and long-range planning goals could eventually become short-range activities that also require implementation.

INRMPs are prepared in cooperation with the USFWS and appropriate State fish and wildlife agencies having jurisdiction in the State in which the installation is located. The USFWS and the State of NJ should be involved early in the scoping, design and preparation of the INRMP. After the draft INRMP has received initial USAF approval, it goes out to the USFWS and NJDFW for their review and comments. The INRMP will reflect the mutual agreement of the USFWS and the State concerning the conservation, protection and management of fish and wildlife and other natural resources. In addition, the INRMP is made available to the public for a review and comment period. After receiving all comments and the incorporation of relevant edits, the final INRMP is signed by the Wing Commander, Field Supervisor of the USFWS, and the Director of the NJDFW.

The office of primary responsibility for maintaining this INRMP is the Environmental Element. To ensure this INRMP properly addresses all aspects of the natural and cultural resources present on the installation

and proposes actions in accordance with USAF goals and objectives, this Plan and all its components are subject to approval by the Wing Commander. Major Command (MAJCOM) reviews drafts. Similarly, all changes to be incorporated into this Plan must be approved by the Wing Commander.

### *9.2 Monitoring INRMP Implementation*

Monitoring implementation of the INRMP, both in the field and office, is conducted by internal reviews through the Environmental Safety and Occupational Health Compliance Assessment and Management Program, and through the Annual Report to Congress USAF Measures of Merit data call. Monitoring criteria for each INRMP goal is included in Chapter: Management Goals and Objectives. These criteria are metrics in which goal and objective attainment is evaluated. This evaluation is the framework for the accomplishment metrics reported annually.

### *9.3 Annual INRMP Review and Update Requirements*

The INRMP is continually being reviewed by base personnel as program objectives are budgeted for and implemented. The initial draft of the INRMP is reviewed by cooperating agencies, including USFWS. Implementation project planning seeks input from all sources of expertise and experience including State and Federal agencies to design the most effective and successful project possible. The NRM will annually send the INRMP Implementation Plan to Wing Command for review and signatures.

The overall INRMP is effective until it is superseded or revoked and requires signatures at least every five years; however, as a living document, the designated Natural Resources Manager within the Environmental Element will review this plan annually. Additionally, the INRMP relies upon the GeoBase, which contains resource and planning maps prepared specifically for JB MDL and this INRMP. This data should likewise be kept up to date to further enhance the plan's effectiveness.

Major revisions may be required by the Air Force whenever extensive planning, development projects, or a significant new resource is identified on the base, such as the discovery of a protected species or major mission changes are proposed. Interim requests for a plan revision may be submitted at any time to the Natural Resources Manager within the Environmental Element. The Natural Resources Manager has primary responsibility for natural resources management and coordinates the development of this plan. The Natural Resources Manager will also review the proposed revisions to the INRMP and, when necessary, recommend significant changes to the Wing Commander. All significant changes to the plan over the 2020-2025 periods are to be circulated for review and comment to all users of the INRMP. Individual projects described in Chapter 8 Management Goals and Objectives will be revised annually during preparation of the JB MDL environmental budget. Annual updates of this INRMP will be coordinated with all appropriate base organizations.

## 10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source and priority for implementation. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows:

- High: The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the Air Force is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a "Benefit of the Species" determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.

- Medium: Project supports a specific INRMP goal and objective and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. However, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within programmed year due to other priorities.
- Low: Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or supports long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

Appendix K: INRMP Implementation Table summarizes the management actions identified in Chapter: 8.0 Management Goals and Objectives and proposes priorities for their implementation. The INRMP Implementation Table will be easy to update as an excel spreadsheet and will be available for annual reviews.

The tasks proposed for this INRMP are extremely aggressive and might not be accomplished within the established timelines due to several factors (e.g., budget and manpower constraints, mission tasks). However, their importance to the proper management of the base's natural resources cannot be understated. Therefore, the management actions presented in the INRMP Implementation Table will be modified as part of the annual review of this INRMP by the Natural Resources Manager to ensure these tasks are continually emphasized and accomplished when practicable.

This INRMP reflects the commitment set forth by JB MDL to conserve, protect and enhance the natural resources present on the base. An ecosystem approach was used to develop the management measures for each resource area. Implementation of the management measures will maintain, conserve and enhance the ecological integrity of the base and the biological communities found throughout various base habitats. In addition, the natural resources management measures described in this INRMP will protect the JB MDL ecosystems and their components from unacceptable damage or degradation and identify and restore previously degraded habitats.

| Annual Work Plan | Section | Action | OPR | Funding Source | Priority Level |
|---|---|---|---|---|---|
| Conduct Grassland Bird Surveys | 8.1.1.2.1 | Conduct grassland birds surveys on an annual or biennial basis | | | Medium |
| Noxious and Invasive Weed Control | 8.1.2.1.1 | Continue to implement noxious and invasive weed control to include herbicide or mechanical removal of invasive species | | | High |
| Phased reseeding of the McGuire Airfield | 8.3.1.1.1 | This project is required under a FONSI. Continue reseeding of the McGuire Airfield inner triangle at approximately 100 acres per year for ten years using a native warm season grass mix. | | | High |

| Annual Work Plan | Section | Action | OPR | Funding Source | Priority Level |
|---|---|---|---|---|---|
| Follow up surveys of the McGuire Airfield | 8.3.1.1.2 | This project is required under a FONSI. Continue to conduct follow op bird surveys of the McGuire Airfield during breeding season to assess success or failure of native grass restoration. | | | High |
| Monitor bird species of concern | 8.3.1.2 | Conduct a 12 month survey of forest bird species on JB MDL with special emphasis on species of concern, threatened and endangered species | | | High |
| Marshland bird survey | 8.3.1.2.2 | Conduct a marshland bird survey to identify 12 species of concern and whether suitable breeding habitat exists on the base. | | | High |

| Annual Work Plan | Section | Action | OPR | Funding Source | Priority Level |
|---|---|---|---|---|---|
| Lakehurst plant survey | 8.3.1.3.1 | Conduct a plant survey during blooming periods for federal and state endangered, threatened and species of concern | | | High |
| Continue bat surveys | 8.3.1.5.1 | Continue mist netting for northern long- eared bat (NLEB) in locations with “hits” from the acoustic surveys. Place transmitters on captured NLEB, little brown or tri-colored bats to locate maternity colonies. | | | High |
| Reduce tree density on Lakehurst | 8.7.2.1 | Mechanically reduce tree density to 60 sq. ft./ac. on northwest boundary of Lakehurst base to provide wildfire threat reduction. | | | High |

| Annual Work Plan | Section | Action | OPR | Funding Source | Priority Level |
|---|---|---|---|---|---|
| Test Runway grass height testing | 8.10.1.2.4 | Continue research on Test Runway for bird occupation using east half mowed to 7-14 inch grass height and west half unmowed through 2023. | | | Medium |
| Conduct EA for Lakehurst Airfield and INRMP revision | 8.10.1.2.5 | Conduct EA that will address both the 7-14" grass mowing analysis and tree clearing at the Lakehurst airfields; as well as a required EA for the INRMP revision | | | High |

## 11.0 REFERENCES

### *11.1 Standard References* *(Applicable to all USAF installations)*

AFMAN 32-7003, Environmental Conservation

**Sikes Act**
eDASH Natural Resources Program Page
Natural Resources Playbook Internal USAF reference available at https://cs1.eis.af.mil/sites/ceportal/CEPlaybooks/NRM2 / Pages/

### *11.2 Installation References*


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## 12.0 ACRONYMS

### *12.1 Standard Acronyms* *(Applicable to all USAFinstallations)*

- eDASH Acronym Library
- Natural Resources Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

### *12.2 Installation Acronyms*

- **ABI** – Association for Biodiversity Information
- **ABW –** Air Base Wing
- **AFCEC -** Air Force Civil Engineer Command
- **AFI -** Air Force Instruction
- **AFMAN –** Air Force Manual
- **AFP –** Artillery Firing Point
- **AFPD –** Air Force Policy Directive
- **AFRC -** Air Force Reserve Command
- **AICUZ –** Air Installation Compatible Use Zone
- **AMC –** Air Mobility Command
- **AMW –** Air Mobility Wing
- **API –** Aircraft Platform Interface
- **AST –** Aboveground Storage Tank
- **ATW –** Air Transport Wing
- **BASH –** Bird Airstrike Safety Hazard
- **BMP –** Best Management Practices
- **BRAC –** Base Realignment and Closure
- **CFR –** Code of Federal Regulations
- **CLEO –** Conservation Law Enforcement Officer
- **CMP –** Pinelands Comprehensive Management Plan
- **CWA –** Clean Water Act
- **DBH –** diameter at breast height
- **DMZ –** Deer Management Zone
- **DoD –** Department of Defense
- **DoDI –** Department of Defense Instruction
- **DPCC/DCR** - Discharge Prevention, Containment and Countermeasures and Discharge Cleanup and Removal
- **EIAP** - Environmental Impact Analysis Process
- **EMP –** Environmental Management Plan
- **EMS –** Environmental Management System
- **EO –** Executive Order
- **ERP –** Environmental Restoration Program
- **ESA –** Endangered Species Act
- **FOB –** Forward Operating Base
- **FSS –** Forces Support Squadron
- **GEMP –** Golf Course Environmental Management Plan
- **HA –** Herpetological Associates
- **INRMP –** Integrated Natural Resource Management Plan

- **IPM -** Integrated Pest Management
- **IGI&S** - Installation Geospatial Information and Services
- **IRP** – Installation Restoration Program
- **IST –** Installation Support Team
- **ITAM** - Integrated Training Area Management
- **JB MDL –** Joint Base McGuire-Dix-Lakehurst
- **JFHQ –** Joint Force Headquarters
- **LRAM -** Range and Training Land Assessment
- **LURP –** New Jersey Land Use Regulation Program
- **MFP –** Mortar Firing Point
- **MOUT –** Military Operations in Urban Terrain
- **NAES –** Naval Air Engineering Station
- **NAWCAD** - Naval Air Warfare Center Aircraft Division
- **NJ –** New Jersey
- **NJAC –** New Jersey Administrative Code
- **NJARNG –** New Jersey Army National Guard
- **NJDEP –** New Jersey Department of Environmental Protection
- **NJDFW –** New Jersey (DEP) Division of Fish and Wildlife
- **NJPDES –** New Jersey Pollutant Discharge Elimination System
- **NJSA –** New Jersey Statutes Annotated
- **NOAA –** National Oceanic and Atmospheric Administration
- **NRCS -** Natural Resources Conservation Service
- **NRHP –** National Register of Historic Places
- **NRM –** Natural Resource Manager
- **PIF –** DOD Partners in Flight Program
- **PRM –** Potomac-Raritan-Magothy (Aquifer)
- **RTLA -** Range and Training Land Assessment
- **RTSM** - NJARNG Regional Training Support Maintenance
- **SAIA –** Sikes Act Improvement Act
- **SHPO –** State Historic Preservation Office
- **SMEs –** Subject Matter Experts
- **SPCC** - Spill Prevention, Containment and Countermeasure
- **SRA** - Sustainable Range Awareness
- **SRP** - Sustainable Range Program
- **SWPPP –** Stormwater Pollution Prevention Plans
- **TAC –** Tactical Training Area
- **TRI -** Training Requirements Integration
- **UECs –** Unit Environmental Coordinators
- **USACE -** U.S. Army Corps of Engineers
- **USDA-WS** – United States Department of Agriculture-Wildlife Services
- **USFWS –** United States Fish and Wildlife Service
- **UST –** Underground Storage Tank
- **WMA –** Wildlife Management Area

## 13.0 DEFINITIONS

***13.1 Standard Definitions*** *(Applicable to all USAFinstallations)*

- Natural Resources Playbook – Definitions Section

## 14.0 APPENDICES

***Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP***

***Appendix B. JB MDL Threatened and Endangered Species Fauna and Flora Register***

***Appendix C. Management and Conservation of Reptiles and Amphibians***

***Appendix D. Wetlands Table***

***Appendix E. JB MDL Flora/Fauna List***

***Appendix F. JB MDL Hunting and Fishing Regulations***

***Appendix G. Migratory Birds Treaty Act***

***Appendix H. JB MDL Invasive Species List***

***Appendix I. Animal Diseases***

***Appendix J. INRMP Implementation Table***

***Appendix K. USFWS Swamp Pink Guidance***

***Appendix L. USFWS Northern Long-eared Bat Conservation Measures***

***Appendix M. Final FONSI for McGuire Airfield***

***Appendix N. JB MDL Flora and Fauna Survey History***

***Appendix O. Best Management Practices for Spotted Turtle***

***Appendix P. USFWS Best Management Practices for Bog Turtles***

***Appendix Q. Wildland Fire Management Plan (WFMP)***

## 15.0 ASSOCIATED PLANS

***Tab 1 – Bird/Wildlife Aircraft Strike Hazard BASH)***

***Plan Tab 2 – Golf Environmental Management***

***(GEM) Plan***

***Tab 3 – Integrated Cultural Resources Management***

***Plan (ICRMP)***

***Tab 4 – Integrated Pest Management Plan (IPMP)***