FORT DRUM

NEW YORK

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

US Army Garrison Fort Drum
Directorate of Public Works
Environmental Division - Natural Resources Branch
April 2024

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT DRUM, NEW YORK

PREPARED BY

Natural Resources Branch
Environmental Division
Directorate of Public Works

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Cover Photo: Soldiers from 3rd Squadron, 71st Cavalry Regiment, 1st Infantry Brigade Combat Team, 10th Mountain Division, execute situational training exercise lanes July 20, 2023, on Fort Drum, NY. The lanes validated the unit's ability to conduct basic scout skills, such as conducting reconnaissance and gathering information, at the lowest level. (Photo by US Army SPC Kade M. Bowers)

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT DRUM, NEW YORK

APPROVAL
US Army
Garrison Fort Drum

This Integrated Natural Resources Management Plan meets the requirements of Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 USC 670 *et seq.*) as amended.

MYER.MATTHEW.R.1046456935 Digitally signed by MYER.MATTHEW.R.1046456935 Date: 2024.04.30 17:31:31 -04'00'

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT DRUM, NEW YORK

APPROVAL
US Fish & Wildlife Service
New York Field Office

This Integrated Natural Resources Management Plan meets the requirements of Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 USC 670 *et seq.*) as amended.

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT DRUM, NEW YORK

APPROVAL
New York State Department of Environmental Conservation Region 6

This Integrated Natural Resources Management Plan meets the requirements of Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 USC 670 *et seq.*) as amended.

Randall C. Young

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT DRUM, NEW YORK

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FORT DRUM, NEW YORK

EXECUTIVE SUMMARY & CRITICAL ELEMENTS

Fort Drum is a 108,733 acre US Army installation in northern New York and home to the 10th Mountain Division (Light Infantry). This Integrated Natural Resources Management Plan (INRMP) is the current plan to manage natural resources on Fort Drum to support and sustain military training, ensure "no net loss" in the capacity of training lands, and conserve natural resources.

This INRMP was created by natural resources professionals and others on Fort Drum in the spirit outlined in the *Army Strategy for the Environment: Sustain the Mission – Secure the Future* (US Army 2004) whereby it is acknowledged that simply complying with environmental regulations will not be enough to ensure mission sustainability, but instead "*We must strive to become systems thinkers if we are to benefit from the interrelationships of the triple bottom line of sustainability: mission, environment, and community*." The *Army Strategy for the Environment: Sustain the Mission – Secure the Future* specifically states that meeting mission requirements will "*require both safeguarding the natural systems upon which our quality of life depends, and more effective partnering at the global, federal, state, and local levels*." Finally, DoD Directive 3200.15 *Sustaining Access to the Live Training and Test Domain* (Incorporating Change 1, 02 Jul 2020) states that DoD policy is to sustain the resiliency and capacity of areas used for training "through the integration of mission requirements with sound resource management as well as natural and cultural resource principles."

The contents of this INRMP apply to all activities and individuals working, residing or otherwise doing business on Fort Drum. The Secretary of Defense is responsible for ensuring that all necessary actions are taken to integrate natural resources into agency day-to-day decision-making and long-term planning processes across all military missions, activities, and functions. In accordance with *Executive Order 13148 Greening the Government Through Leadership in Environmental Management* (2002), Department of Defense (DoD) will develop and implement an Environmental Management System (EMS) to ensure that strategies are established to support environmental leadership programs, policies, and procedures, and establish and implement environmental compliance audit programs and policies. The INRMP is a component of the EMS.

This INRMP meets the requirements of Public Law 105-85, the Sikes Act Improvement Act of 1997 (16 USC 670, *et seq.*) as amended. The focus of this INRMP is the compliance with natural resources-related regulations and stewardship of public lands and resources. In general, this INRMP does not include environmental programs that are considered compliance-related (e.g., air quality, hazardous waste, water pollution, and solid waste) or cultural resources. (See specific compliance-related plans and/or the Fort Drum Integrated Cultural Resources Management (ICRMP; Fort Drum 2020b) for more information.)

This INRMP was completed with the cooperation of the New York State Department of Environmental Conservation (NYSDEC) Region 6 in Watertown, New York and the U.S. Fish and Wildlife Service (USFWS) New York Field Office (NYFO) in Cortland, New York. This INRMP replaces the 2021 INRMP (Fort Drum 2021). The *Tri-Partite Cooperative Agreement between NYSDEC Region 6, USFWS NYFO, and Fort Drum* in Appendix C2 of the *Commander's Guide* Supplement, contains specific items of agreement between NYSDEC, USFWS, and Fort Drum as it relates to natural resources management and enforcement.

This INRMP is organized as follows:

- The *Commander's Guide* is supplemental to the INRMP and can be a stand-alone document to be provided to new Commanders and other new Senior Leaders. This streamlined overview outlines the natural resources doctrine, addresses the most important natural resources challenges and concerns on Fort Drum, summarizes encroachment issues on and around the installation, and reviews the tools and processes in place to facilitate communication and coordination with internal stakeholders.
- Chapter 1 is an overview of the INRMP including its authority, background, and scope. Chapter 1 identifies the primary internal and external stakeholders responsible for implementing this INRMP and outlines the goals and objectives natural resources professionals use to implement this INRMP.
- Chapter 2 focuses on information about the installation: history, military mission, current infrastructure, and natural resources.
- Chapter 3 focuses on community stakeholders and partnerships that contribute to mission sustainability.
- Chapter 4 outlines natural resources management on Fort Drum in each functional area of the Natural Resources Branch: (1) aquatic resources, (2) land resources, (3) fish and wildlife resources, (4) human-wildlife conflicts, and (5) recreation and outreach. Each section includes applicable regulations and guidance documents; current status; management principles and methods; and management strategies that are currently taking place or planned to be implemented.
- Chapter 5 sets forth some of the mechanisms involved to implement the activities outlined in this INRMP including funding, staffing, and tools to evaluate the effectiveness of the implementation.

The most critical elements of this INRMP as identified by internal and external stakeholders can be found in the following sections and pages:

CRITICAL ELEMENTS	Section	Pages
Tri-Partite Agreement	Appendix C2	C20-C21
Public Access	3.3	32-33
Global Climate Change & Resiliency	3.6	36-40
Threatened and Endangered Bat Management	4.3.2.1 4.3.4.1 Appendix 6	112-115 134-135 258-276
Bald Eagle Management	4.3.4.2.7	137
Migratory Bird Management	4.3.2.2 4.3.4.2 Appendix 7	115-123 135-137 277-288

CRITICAL ELEMENTS (continued)	Section	Pages
Pollinator Management	4.3.2.6 4.3.4.5	129-131 139
MBTA In-Season Vegetation Management	Appendix 8	289-293

Effects of implementation of this INRMP are documented in a Record of Environmental Consideration (REC) prepared by Fort Drum Environmental Division citing the Programmatic Environmental Assessment (PEA) for Natural Resources Management Planning Compliance at Army Materiel Command (AMC) Installations prepared in 2019. The REC and PEA fulfills documentation requirements in regards to the National Environmental Policy Act (NEPA). This INRMP can be referenced with regard to the description of affected environment to reduce verbiage in other NEPA documents.

All requirements set forth in this INRMP requiring the expenditure of funds are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 USC Section 1341). No obligation undertaken by Fort Drum under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose.

This INRMP is a working document that will be reviewed annually and updated as appropriate. Please send comments or suggested changes to: Fort Drum Environmental Division, 4205 Po Valley Rd., Fort Drum, NY 13602 or Raymond.E.Rainbolt.civ@army.mil.

Commander's Guide to Natural Resources Management on Fort Drum

CG 1. Overview

The "Commander's Guide" is a supplement to the Integrated Natural Resources Management Plan (INRMP) and functions as a stand-alone document to offer any leader a synopsis of the most critical aspects of natural resources and their management on Fort Drum in terms of mission sustainability. The content of the Commander's Guide includes:

- Management doctrine the DPW-Natural Resources Branch follows to implement the INRMP with examples of what has or could be accomplished;
- Most important challenges and concerns of natural resources management on Fort Drum;
- Encroachment issues in and around Fort Drum; and
- Processes and tools in place to facilitate communication and coordination with external and internal stakeholders.

Congress passed the Sikes Act of 1960 and the Sikes Act Improvement Act of 1997 which are the primary drivers for natural resources management on all military installations. Among other provisions, these laws:

- Promote and require effective communication and coordination with the US Fish & Wildlife Service and state fish and wildlife agencies;
- Require the preparation and implementation of INRMPs;
- Provide public access for recreation;
- Authorize DoD to enforce all federal environmental laws; and
- Mandate an adequate number of professionally trained natural resources personnel be employed, including law enforcement personnel, on military installations.

The INRMP is a long-term planning document designed to guide the management of natural resources which is driven by compliance and stewardship requirements. As a federal entity, the US Army is required to comply with all federal laws (e.g., Endangered Species Act, Clean Water Act) and some state laws. Stewardship—the responsibility to manage and conserve natural resources and public lands for the future—is already part of the military environmental and training ethic and the Army's "*triple bottom line of sustainability: mission, environment, and community*." Fort Drum implemented its first INRMP in 2001; the last INRMP was in 2021.

The overall goal of the INRMP and natural resources managers is to enhance/sustain the capability of military installation lands to support the military mission while conserving installation resources for multiple uses, including recreation and biological integrity in perpetuity. The Natural Resources Branch within the Environmental Division of the Directorate of Public Works carries out the responsibilities for the integrated management of natural resources on the installation.

CG 2. Natural Resources Management Doctrine

With approximately 100,000 acres of undeveloped lands in addition to over 8,000 acres of training facilities, housing, an airfield and other infrastructure, Fort Drum is practically a city-state with many of the same issues and challenges. Likewise, Fort Drum's Natural Resources Branch functions similarly to a state natural resources agency for the installation with trained natural resources professionals to support and sustain the military mission. The Natural Resources Branch consists of the following five functional areas:

- Aquatic Resources Management (Clean Water Act, wetlands, watersheds, open water, invasive species);
- Land Resources Management (commercial forestry, vegetation management, invasive species, geology/soil);
- Fish & Wildlife Resources Management (fish, wildlife, endangered species, Bald Eagles, migratory birds, species-at-risk);
- Human-Wildlife Conflict Management (including wildlife-aircraft strike hazards, nuisance wildlife); and
- Natural Resources Recreation and Outreach (including hunting, fish, special events).

To implement the INRMP, the following overall doctrine will be followed and examples are provided showing some of the capabilities of the Natural Resources Branch.

1. Support Mission Readiness. Natural resource managers are mission enablers and ensure management decisions support the training and deployment of US armed forces. The first step in mission support is effective communication and cooperation between DPW-Environmental Division and DPTMS-Training Division. Examples:

- Manage nuisance beaver problem areas to minimize or eliminate flooding issues of roads and range facilities to avoid firing range impacts and maintain maximum Soldier throughput.
- Create maneuver space, landing zones, firing points, or other range requirements in forested environments by utilizing commercial forestry practices at no cost to the government.
- Delineate upland areas on ranges and exempt those areas from the time-consuming wetland regulatory process to avoid delays and maximize options and flexibility for trainers to move and/or establish new targets.
- Review training, land maintenance and construction activities and offer alternatives if necessary to support objectives while reducing conflicts or violations with MBTA, ESA, CWA or other regulations.
- Coordinate with Wheeler-Sack Army Airfield personnel and modify habitat in and around the airfield to maintain safe flight patterns and minimize the chances of a catastrophic aircraft-wildlife strike.
- Advise ITAM regarding locations of invasive species impacting mission maneuverability and/or safety in the Training Area (e.g., Wild Parsnip).

2. Manage Proactively. Natural resource managers must be forward-thinking and anticipate future challenges and opportunities. Constantly reacting to problems causes delays and does not allow for holistic or sustainable decisions—which does not support the mission. Early identification of potential issues and addressing those issues appropriately will ensure no net loss in the capability of installation lands to support existing and projected military training and operations. Examples:

- Conduct forest inventories on more than 60,000 acres of forested landscape to provide up-to-date information for any new training scenario required.
- Establish and/or maintain Fort Drum's Wetland Mitigation Bank, Regional General Permit, Off-Post Compensatory Mitigation, and proposed Stream Mitigation Bank to minimize the cost, time, and area that must be mitigated when wetlands or other waterbodies are impacted by construction and/or training missions.
- Eradicate newly established invasive species to avoid immediate impacts to human health/safety (e.g., Giant Hogweed) or avoid long-term ecological or economic impacts when the species becomes widespread and impossible to eliminate.
- Survey and monitor for potential threatened and endangered species to provide the "best available science" to regulators if the species becomes listed in order to determine and avoid/mitigate for any potential mission impacts.
- Monitor water quality at sites where rivers and streams enter and exit Fort Drum to determine a baseline against which water quality impacts can be evaluated and/or mitigated following a POL or sewage spill or other incident.

3. Manage Sustainably. Natural resource managers serve as stewards of public lands to ensure the military can utilize those lands for any training scenario when the need arises. Short-term decisions cannot have long-term consequences or jeopardize future training needs. Good stewardship not only benefits military trainers, but also other stakeholders and natural resources. Examples:

- Manage forests to allow for regeneration and the presence of multiple ages to ensure continued forested cover (e.g., bivouac areas and maneuver corridors).
- Aggressively manage for deer in the Cantonment Area to ensure deer densities are low enough to allow forest regeneration and reduce the impact of ticks and Lyme disease.
- Protect portions of frequently used bivouac areas in the oak savannas to minimize trampling and ensure future generations of oak trees will grow in the same areas.
- Rotate herbicide active ingredient usage to decrease possibility of resistance in undesirable species.
- Reduce costs where possible by utilizing commercial forestry operations to remove trees at no cost; pursue hay leases for long-term maintenance of grassland areas; leverage partnerships to obtain services such as biocontrol agents through the US Department of Agriculture; and cooperate with other stakeholders to borrow equipment instead of purchasing or renting.

4. Manage Holistically. Natural resource managers see the "big picture" to ensure military training lands are sustainable. Good stewardship of military lands will focus on the needs of military trainers and other stakeholders to ensure activities in one area do not negatively impact another and be aware of cumulative effects of all activities over time. Management decisions will be made at the appropriate spatial scale--an ecoregion, a watershed, a soil type, or habitat type. Management will mimic natural processes whenever possible. Examples:

- Manage for climax forest in riparian areas to support healthy streams and fisheries by reducing stream temperatures via shading, providing a source of large woody debris for fish habitat, and stabilizing stream banks.
- A training mission by the Combat Engineers was integrated to improve access for boater and anglers at Indian Lake and provide an area large enough for a field helipad.
- Incorporate Low Impact Development (LID) principles (such as subsurface treatment and permeable pavement) into storm water management which reduces acreage lost to more conventional facilities (retention/detention ponds) and frees up more land for training. LID facilities are also typically less expensive and easier to maintain in the long term.
- Create open understory in oak savanna forest types in Training Areas 4 and 5 to benefit not only Red-headed Woodpeckers, but also create preferred areas for bivouac operations and land navigation in relative close proximity to the Cantonment Area.
- Establish tree seedlings through natural basal sprouting (e.g., aspen) or natural re-seeding (e.g., oak) to grow native species and limit costs instead of planting monocultures of Scotch or Red Pine as was done in the 1950-60's by land managers.

5. Manage in a Regional Context. Natural resource managers know that natural resources do not stop at the installation boundary. Priority is given to habitats and natural communities that are rare or of regional conservation concern. Examples:

- Manage for early successional forests which are declining throughout NYS and the northeastern US, but are abundant on Fort Drum and doing so can be done at no cost through commercial timber harvesting.
- Manage for northern sandplain grasslands (Fort Drum has among the highest quality sandplain grasslands in NYS) which also creates habitat for Upland Sandpiper and Grasshopper Sparrow, and provides large open areas for certain military training exercises. These areas are under threat due to succession. Patches of overgrown sandplain grassland in TAs 7D and 7G were cleared of woody vegetation allowing native grasses to thrive.
- Manage for nightjars (e.g., Whip-poor-will and Common Nighthawk) which are rare or declining throughout the northeastern US and learn more about them to manage for their populations elsewhere.
- Partner with the USDA Forest Service to establish a study area to address whether silvicultural thinning treatments can effectively decrease invasive *Sirex* wood wasp populations within Scotch/Red Pine stands to help limit the spread of the insect across northern New York and preserve healthy forests.
- Partner with the Northeast Regional Center for Excellence in Vector-Borne Diseases at Cornell University, Army Public Health Center at Aberdeen Proving Ground, or other entities to develop a means to manage ticks and tick-borne diseases in the region.

- Conduct annual Maple Days event every spring which highlights maple trees and syrup production—a unique attribute in the northeastern US and the only Army installation to do so. The event targets the Fort Drum community to educate on all aspects of natural resources management through demonstrations, displays, and an interactive nature trail. The event also encourages attendees to visit other maple producers in the region.

6. Develop Partnerships. Natural resource managers know the more combat power concentrated at the right time and place, the greater the odds of success. Fort Drum and the Army cannot solve all problems by ourselves. Proactive management also requires management of resources outside of the installation's boundaries before it becomes Fort Drum's "problem." Examples:

- Partner with the St. Lawrence Eastern Lake Ontario Partnership for Regional Invasive Species Management (SLELO-PRISM) to share information re: invasive species in the region.
- Partner with NYSDEC and Cornell Lab of Ornithology on research projects that may result in strategies for maintaining Golden-winged Warbler populations without the need for a federal listing. Cooperation has included using Golden-winged Working Group recommendations for habitat management, allowing access to Fort Drum as a study area, and sharing data collected by Fort Drum Natural Resources staff.
- Partner with USFWS, USACE, NYSDEC and other entities to research White-nose Syndrome and better survey and manage for bats.
- Partner with USDA APHIS Wildlife Services to support our nuisance trapping to manage beaver in nuisance situations throughout the year.
- Partner with individuals, organizations and government agencies to organize and host Outdoor Adventure Day, an annual free family-friendly event that includes live demonstrations and/or hands-on activities related to outdoor recreation and natural resources.

7. Maintain Proactive Outreach. Natural resource managers realize that public support is a force multiplier. An active outreach program is critical to maintain effective relationships with other professionals, neighbors, and the public for the benefit of natural resources and military mission. Examples:

- Conduct annual birding trips led by Fort Drum biologists. These trips have allowed numerous birders to see first-hand the high diversity of birds on the installation and how Fort Drum is managed, helping to create an overall positive opinion of Fort Drum management among New York's birding and conservation communities.
- Publish manuscripts in peer-reviewed journals showing Fort Drum's commitment to following science in monitoring and natural resources management decisions.
- Engage with college students and professional societies (e.g., SUNY-ESF, NYS Ranger School, Society of American Foresters) and host regular natural resources management tours of the installation to highlight management actions and show how they can support natural resources as well as the Army's mission.
- Maintain an active web site and Facebook page as well as regularly contribute to various publications.
- Organize and host free, family-friendly events: Maple Days in March, Youth Fishing Derby in May, and Outdoor Adventure Day in August.

8. Be a Part of the Community. Natural resource managers know their influence reaches beyond the fence line and they are part of not only a larger ecological community, but also a greater social community. Examples:

- Facilitate public access for hunting, fishing, and other recreational opportunities—this has been the standard ever since Fort Drum became the largest Fish & Wildlife Management Act Cooperative Hunting Area in New York State in 1959.
- Educate students at local schools and universities about various natural resources topics including natural resources management on military lands.
- Attend community events and provide information about natural resources management at Fort Drum (e.g., Cornell Cooperative Extension, Jefferson Community College, Development Authority of the North Country, Thousand Islands Land Trust).
- Provide forest products to local businesses and the general public.
- Share expertise in managing invasive plant species with the City of Watertown and the St. Lawrence Eastern Lake Ontario Partnership for Regional Invasive Species Management.
- Organize a committee to discuss the Programmatic Environmental Assessment for large off-post exercises involving the 10th Combat Aviation Brigade and 10th Sustainment Brigade with representatives from NYSDEC, Adirondack Park Agency, NYS Tug Hill Commission, Adirondack Council, and others.

CG 3. Mission Sustainability Challenges

The sustainability challenges and environmental concerns addressed in this section are issues that are currently impacting or will have the potential to impact natural resources in the future and that have a direct or indirect impact to the mission. The natural resources challenges/concerns are organized in the same five functional areas as the Natural Resources Branch and INRMP—Aquatic Resources; Land Resources; Fish & Wildlife Resources; Human-Wildlife Conflicts; and Natural Resources Recreation & Outreach—Institutional Challenges is the last category and are similar for all areas.

CG 3.1 Natural Resources Challenges/Concerns

CG 3.1.1 Aquatic Resources Challenges/Concerns

CG 3.1.1.1 Wetlands & Clean Water Act Regulations

A considerable portion of Fort Drum is relatively flat and poorly drained resulting in approximately 20%—or 20,000+ ac (8,094 ha)—of the installation characterized as "wet" with wetlands, streams, and other waterbodies. Many of these areas are jurisdictional "Waters of the United States" as defined in the Clean Water Act. Clean Water Act regulations are complicated and the process of working with the US Army Corps of Engineers (USACE) New York District is arduous, therefore, the primary responsibility of two staff members in the Natural Resources Branch is to ensure Fort Drum is in compliance with the various state and federal regulations. The primary regulatory drivers pertaining to surface water includes Sections 401 and 404 of the Clean Water Act (33 USC 1341, 1343, and 1344) and Articles 15 and 24 of NYS Environmental Conservation Law (ECL) administered by the New York State Department of Environmental Conservation (NYSDEC). Avoidance of wetlands is usually the preferred course of action, but processes are in place if any of these areas are altered or filled. Although few "wet" areas are technically "off limits," they provide logistical and functional challenges for training, construction, and almost any other action on Fort Drum. Natural features such as sinkholes, landslide-prone areas, and quicksand do not occur on Fort Drum. See INRMP Section 4.1.2.3 for more information.

CG 3.1.1.2 Culvert Management & Flooding

Fort Drum has over 290 miles of improved roads, over 85 miles of trails, and 92 miles of streams resulting in over 1000 culverts where streams and trails intersect. Some culverts need to be replaced, others require maintenance, and all should be inspected regularly—a continual task and cost as well as a regulatory burden to stay in compliance with regulations (see Section 3.1.1.1 above). Exacerbating regular culvert problems, Fort Drum has a healthy Beaver population and always will have—so managing Beaver through various means is another perpetual task that is undertaken. See INRMP Section 4.1.4.6 for more information regarding culverts; and INRMP Section 4.4.4.8 for more information regarding Beaver management.

CG 3.1.1.3 Contaminants

Contaminants such as POLs, pesticides, and heavy metals have been identified as persistent pollutants in various fish and wildlife species, but especially game fish. These chemicals can accumulate through the food chain and can cause a variety of detrimental health effects. The most pervasive contaminant on Fort Drum and across NYS is mercury, which settles on land and waters via deposition and is leached from area soils into waterbodies. Operations on Fort Drum are not the source of mercury. There is a NYS-wide fish consumption advisory due to mercury; in 1982, NYS Department of Health issued a fish consumption advisory for Fort Drum's Indian Lake. Fish surveys on Remington Pond in 2003 found PCBs and derivatives of DDT in fish tissue prompting a self-imposed catch-and-release policy. Contaminant surveys on Fort Drum in 2011-2013 have shown a continuing need for fish consumption advisories across the installation. See INRMP Section 4.1.4.5 for more information.

CG 3.1.2 Land Resources Challenges/Concerns

CG 3.1.2.1 Ecological Succession

Ecological succession is the natural process of change in species structure of an ecological community over time. In the geological history of Fort Drum, the first pioneering community of plants and animals developed from the sandplains of glacial Lake Iroquois and glacial tills from the last Ice Age. Grassland communities eventually formed which later gave way to shrublands and hardwood forests. Eventually beech forests became the climax community. After European settlement, much of present-day Fort Drum was reverted to agriculture. At the time of federal acquisition in the 1940s, most of what is now Fort Drum consisted of extensive hayfields with scattered woodlots and small patches of shrub-scrub. Once in federal ownership, mowing ended in hayfield areas and succession began converting these fields to shrubland and woodland. Succession is a natural process and neither good nor bad, but must be considered and potentially managed to reach the desired landscape. If no management is done, climax forests will once again dominate Fort Drum; if open areas of any kind (e.g., bivouac areas, open maneuver space, landing zones, firing points) are desired, then management must be conducted. All management decisions must consider succession—nothing on Fort Drum will remain open in perpetuity without active management. See INRMP Section 4.2.2 for more information.

CG 3.1.2.2 Loss of Contiguous Open Space/Grassland Habitat

When Fort Drum was first established, numerous large open areas occurred across the landscape, including extensive old hayfields in the western Training Areas and sandplain grasslands in the southern Training Areas. Over time many of these open areas converted to shrubland or forest through ecological succession-- Fort Drum has gone from approximately 25% of forest/shrub land in 1945 to approximately 85% of forest/shrub land in 2006. Development of the Cantonment Area, WSAAF, and ASP have also eliminated many sandplain grassland areas. These open areas were not only favored by many wildlife species, but were also favored locations for tracked vehicle maneuvers and other training activities that required large areas with nearly unlimited visibility. The loss of most of these grasslands restricts exercises that require extensive open space and these areas continue to rapidly decrease in size as ecological succession continues. See INRMP Section 4.2.2.4.1 for more information.

CG 3.1.2.3 Invasive Species

Invasive plant species are known to cause various ecological problems, but certain species can also create challenges to military training including but not limited to creating walls of dense vegetation impeding mounted and dismounted maneuvers, increasing the potential for erosion, and even cause skin irritation and other physical reactions to individuals. Wild Parsnip, Black and Pale Swallow-wort, Oriental Bittersweet, and Japanese Knotweed are plants that currently exist on Fort Drum that have the greatest potential to impact training lands. Other species like Giant Hogweed are known to occur in the region. See INRMP Section 4.2.2.8 for more information.

CG 3.1.2.4 Hazard Trees in Cantonment Area

As the Cantonment Area has developed, many forested areas were removed, yet some larger dominant trees were saved for aesthetic reasons. Due to the movement of heavy equipment and compaction of soils during construction, trenching for water/sewer lines, change of the natural drainage patterns, and creation of impermeable surfaces (e.g., roads/parking lots), many of those remaining isolated trees are losing branches and slowing dying. Dropping of dead limbs and the breakage of dying trees increase the concerns for public safety and property damage (both governmental and personal) throughout the densely populated Cantonment Area. See INRMP Section 4.2.4.1.8 for more information.

CG 3.1.3 Fish & Wildlife Resources Challenges/Concerns

CG 3.1.3.1 Endangered Species

As a federal agency, the Army is required to implement programs to conserve federally listed species on its properties in compliance with the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq). Currently, (as of January 2024), two federally-listed species are known to occur on Fort Drum—the endangered Indiana Bat (*Myotis sodalis*), and the endangered Northern Long-eared Bat (*Myotis septentrionalis*) which was listed as threatened in 2015 and uplisted to endangered in 2023. Ensuring compliance with the Endangered Species Act and conserving these species is mandatory and the responsibility of every directorate, organization, contractor, and individual on Fort Drum that is directly and/or indirectly responsible for any aspect of construction, military training, forest management, vegetation management, prescribed burning, pesticide use, wildlife management/vertebrate pest control, and outdoor recreation. To ensure our actions will not jeopardize these bats or their habitat, Fort Drum reviews all projects related to the above categories that may affect these species. The majority of activities are covered in Fort Drum's Biological Assessment and the US Fish & Wildlife Service's Biological Opinion or concurrence as part of the Section 7 consultation process. Two of the most important conservation measures to protected endangered bat species on Fort Drum include: (1) felling of trees (> 3 in / 10 cm diameter breast height) must take place between October 16 and April 15 to protect roosting bats during non-hibernation seasons and (2) the establishment of a 2,200+ ac (890 ha) Bat Conservation Area (BCA) which protects known bat roosting and foraging areas from permanent development within the Cantonment Area. See INRMP Section 4.3.4.1.1 for more information regarding the ESA; INRMP Section 4.3.2.1.1 for more information regarding bats.

CG 3.1.3.2 Potential Endangered Species

The Monarch Butterfly was petitioned for listing in 2014 (CBC 2014); in December 2020 it was determined that listing the species was warranted, but precluded by work needed for other higher-priority listing actions. Therefore, the Monarch Butterfly became a candidate for listing under the ESA and its status will be reviewed each year until it is officially listed, or is no longer a candidate for listing. There are also several other species known to occur on Fort Drum that have also been petitioned to be listed (including the Little Brown Bat (Kunz and Reichard 2010) and Tricolored Bat (CBC and Defenders 2016); Hoary Bat (USFWS 2023); Golden-winged Warbler (Sewell 2010); Wood Turtle (CBC 2012) and Spotted Turtle (CBC 2012); and American Bumble Bee (CBC 2021)); however, no determinations have yet been made for those species. A proactive management stance for these species is critical to minimize or avoid mission impacts from potential future listings. Congress (and the US Army) does not recognize special status of any species designated by NYS as endangered, threatened, or of special concern. Yet, recognizing state-listed species is an important indicator of species that may be federally-listed in the future and monitoring and proactive management for conservation purposes may be warranted to ensure they are not listed. See INRMP Section 4.3.3.2 for more information.

CG 3.1.3.3 Bald Eagles

Bald Eagles are known to use Fort Drum throughout the year; however, no nests had ever been documented on the installation until 2020 when a nest was found in TA 19 (on Mud Lake). This nest was ultimately successful and the pair raised at least 1 young that fledged from the nest. Preliminary eagle conservation management actions were developed in coordination/consultation with USFWS and NYSDEC and implemented starting in late summer/early fall of 2020. Buffers of different sizes and times were placed around the nest to minimize or eliminate disturbance concerns from fixed and rotary-winged aircraft, military training, forest management operations, and recreation (Appendix 9, Figure 8). Educational and regulatory signage was also installed to help minimize disturbance. If all conservation actions are followed, the USFWS determined that no actual regulatory permit will be needed for potential adverse impacts. Monitoring will take place during the nesting season (01 January- 30 September). If the nest location changes over time, or conservation actions are determined to be inadequate for mitigating disturbance, then additional actions may be required. Bald Eagles continue to nest in the area.

CG 3.1.3.4 Migratory Birds

Fort Drum (and all of DoD) has a legal and regulatory responsibility to manage and protect migratory birds per the Migratory Bird Treaty Act. Doing so in a way that does not constrain the military mission presents a significant challenge since birds occur in all natural and human-created landscapes, so that virtually any land management activity will affect migratory birds—some negatively and others positively. Evaluating proposed activities of the likely impacts to bird populations and preventing or mitigating any significant negative impacts is just one aspect of migratory bird management. The most important conservation measure to minimize the taking/killing of migratory birds is a land clearing window which allows vegetation clearing only between 01 August – 15 April to minimize the destruction of eggs, nestlings, and nesting adult birds--this clearing window is for undeveloped areas such as grassland areas in the Training Area as well as land

clearing for construction, but does NOT pertain to mowing lawns and landscape maintenance in the Cantonment Area. Certain exemptions exist depending on the situation and actions will be evaluated on a case-by-case basis. See INRMP Section 4.3.4.2 and Appendix 7 for more information. See Appendix 8 for actions proposed to occur during the migratory bird nesting window (16 April – 31 July).

CG 3.1.4 Human-Wildlife Conflict Challenges/Concerns

CG 3.1.4.1 Human-Wildlife Conflicts

Wildlife is abundant on Fort Drum. Living and working amongst so much wildlife can be very disconcerting for some residents, and many types of conflicts may arise. Wildlife are opportunistic feeders and will go where food is easiest to obtain, so many conflicts are relatively simple to alleviate by removing the food source (e.g., dog food, garbage, etc.) For Soldiers in the Training Area, improper handling and storage of food items and food waste leads to nearly all cases of wildlife conflicts (e.g., Black Bears and Raccoons). Beavers cause conflicts when roads and/or ranges are flooded—beaver issues are handled primarily through a contract with US Department of Agriculture-APHIS-Wildlife Services. Venomous snakes do not occur on Fort Drum. See INRMP Section 4.4.2 for more information.

CG 3.1.4.2 Wildlife-Aircraft Strike Hazards

Wheeler-Sack Army Airfield averages 2.0 wildlife-aircraft strikes a year ranging from 0-8 strikes from 2001-2023. Compared to other airports and airfields, this is a relatively low number although any strike is one too many. The worst incident on Fort Drum occurred in 2008 when three Canada Geese came through the windscreen of a UH-60 helicopter during night maneuvers; the pilot was able to land the aircraft safely, but he was taken to the hospital and treated for injuries from broken glass. Although it is impossible to avoid all strikes between aircraft and wildlife, the potential exists for a catastrophic air strike and proactive measures are taken to minimize the possibility as much as possible both inside the WSAAF perimeter and the area around WSAAF including annual management of Canada Geese in the Cantonment Area which began in 2010. See INRMP Sections 4.4.4.1 and 4.4.4.7 for more information.

CG 3.1.4.3 Deer in Cantonment Area

The fenced portion of the Cantonment Area south of Rte. 26 is 8,255 acres which once had a White-tailed Deer density calculated in 2017 to be approximately 40 deer/square mile although the population was not uniform and in some areas the density was as high as 100 deer/square mile. Deer are very adaptable and have a relatively high reproductive rate producing two fawns a year which are then able to reproduce the following year. As large herbivores, deer greatly impact vegetation—nearly all tree seedlings and many ornamental shrubs/trees in housing areas have been over-browsed by deer and deer-vehicle collisions were increasing. A lack of tree regeneration affects the future health of the forest which is particularly important since the majority of the Bat Conservation Area for the two federally-listed bat species (see section *CG 3.1.3.1 Endangered Species* above) are found in the Cantonment Area. Deer are also part of the life cycle and transportation system of ticks which carry Lyme disease. The deer population should be less than 20 deer/square mile in order to maintain habitat suitable for forest regeneration; and approximately 8-10 deer/square mile to impact ticks and

Lyme disease. Archery/crossbow hunting has been allowed in designated areas of the Cantonment Area since the 1990s, but hunting has not been able to take enough deer to manage the deer population. Deer culling utilizing NYSDEC Deer Damage Permits and contracting with USDA-APHIS-Wildlife Services to shoot deer with rifles in the Cantonment Area has occurred since September 2018. Between September 2018-December 2023, a total of 829 deer have been removed—182 with hunting and 647 with culling. See INRMP Section 4.4.4.2 for more information.

CG 3.1.4.4 Ticks/Lyme Disease

An expanding deer population throughout the northeastern US has led to an expanding Black-legged Tick population into northern New York followed by Lyme disease. This has been a relatively recent phenomenon since ca. 2010. According to NYS Department of Health, New York State now has the highest number of confirmed Lyme disease cases in the US. Surveys on Fort Drum in 2015-2016 have shown that 46% of adult ticks in the Cantonment Area carries the Lyme disease bacteria. A variety of other tick-borne diseases have also been recently discovered; all of which present a serious public health concern for Soldiers, Family Members, employees, and recreationists. Fort Drum has been working with West Virginia University conducting various tick and small mammal surveys from 2014-2020 and other partnerships are being pursued for tick management in the future. See INRMP Section 4.4.4.8 for more information.

CG 3.1.4.5 Rabies

Rabies is a fatal viral infection that can be found in any mammal, but is most common in Raccoons, bats, and Striped Skunks. A Fort Drum Soldier died of rabies in 2011 after returning from Afghanistan where it was presumed he contracted it from a dog bite. Rabies is one of the most common wildlife diseases known to occur in the Fort Drum area. Currently, as a part of the National Rabies Management Program, vaccination baits are dropped during the late summer or early fall throughout the area for mammals to consume. On Fort Drum, baits are dropped in the Training Area from airplanes contracted by USDA-APHIS-Wildlife Services in coordination with WSAAF. MEDCOM-Preventive Medicine assists the effort by hand-placing baits in the Cantonment Area. Jefferson County Department of Health is the lead agency regarding rabies in the area. See INRMP Section 4.4.4.4 for more information.

CG 3.1.5 Recreation/Outreach Challenges/Concerns

CG 3.1.5.1 Public Access

When Fort Drum (formerly Pine Camp) was expanded by 75,000 acres in 1940, it caused five villages to be eliminated and displaced 525 families. Memories of those actions still persist, particularly among the longtime residents who lost family farms and favored hunting lands. Public access for outdoor recreation is a very important community asset and has been in place since 1959. Although Fort Drum can do many things without creating community angst, closing the training area to recreation after the 9/11 terrorist attacks was very unpopular and public access was re-instated a year later. All recreationists in the Training Area are required to have a Fort Drum Recreational Pass easily obtained from the FortDrum.iSportsman.net web site free-of-charge. See INRMP Section 3.3 for more information.

CG 3.1.5.2 Hunting/Fishing Regulations

Hunting, fishing, and trapping on Fort Drum are conducted in accordance with Environmental Conservation Laws (ECL) of New York and applicable federal laws. All seasons, bag or daily limits, shooting times, minimum lengths, etc. are based on NYS ECL. Anyone hunting, fishing, and or trapping anywhere on Fort Drum must have a valid applicable NYS license. Fort Drum can be more restrictive in their regulations, but not less restrictive than state regulations. Fort Drum has additional regulations—*Fort Drum Regulation 420-3 Hunting, Fishing, & Other Outdoor Recreation* (FD Reg 420-3)—which are reviewed annually. Access passes are issued through an on-line process administered by DPW; access for recreation is managed by DPTMS. NYS environmental conservation officers have concurrent jurisdiction with Fort Drum conservation law enforcement officers. See INRMP Section 4.5 for more information.

CG 3.1.6 Institutional Challenges/Concerns

CG 3.1.6.1 Changing Missions & Short Term vs Long Term Planning

The military mission is ever-changing and requires US forces to become proficient in operations against insurgents and terrorist groups, maintaining a high level of competency in conventional conflicts with nation-state adversaries, and being prepared to conduct any other mission under a range of circumstances. All of these missions and training scenarios are important, but there is a need for sustainable and holistic planning so a short-term scenario does not jeopardize a long-term asset. The garrison workforce needs to understand the goals in order to provide the best possible outcome for the mission at hand as well as the mission tomorrow.

CG 3.1.6.2 Transformation, Reorganization & Sequestration

All aspects of the US Army have undergone continual institutional transformations since 2002. Army Transformation (creating BCTs), the Base Realignment and Closure (BRAC) process (last completed in 2005), Army re-stationing, establishment of the Installation Management Agency (in 2002) which later became the Installation Management Command (IMCOM; in 2006), and a myriad of other changes to internal structure, budgeting procedures, and the role of Army Environmental Command, have all impacted Fort Drum. The US Budget Sequestration in 2013 led to further organizational changes and reduced staffing levels for both the military and garrison including the Natural Resources Branch where 50% of the employees were identified as overhires by FY19. The establishment of the Army Futures Command (in 2018) and implementation of the Army 2030 modernization plan will continue to create new challenges and opportunities.

CG 3.1.6.3 Understanding & Complying with Regulatory Processes

Compliance with environmental laws and regulations is a requirement of every directorate, organization, and individual responsible for actions conducted on Fort Drum (i.e. personnel involved in any aspect of construction, military training, forest management, vegetation management, pesticide use, prescribed burning, outdoor recreation, etc.). Addressing environmental laws and regulations at the outset of a proposed project will reduce potential delays in project approvals. Noncompliance with laws may result in delays to projects and/or punitive fines. The true challenge lies in

relaying these requirements to civilian and military personnel and Fort Drum residents, so everyone understands their responsibilities.

CG 3.2 Encroachment & Training Constraints

Encroachment, defined as activities outside the fenceline that may impact the military mission of Fort Drum, is relatively minimal in the realm of natural resources.

The Fort Drum region of northern New York has generally been remote and rural with a relatively sparse, slow-growing population. Historically, with relatively few neighbors to Fort Drum, safety concerns were minimal and conflicts over noise and other disturbances were rare. With the expansion of Fort Drum in the 1980s and again beginning in 2005, the entire region experienced rapid increases in population which corresponded with a growing encroachment threat to the installation as adjacent property owners and local and regional developers expressed interest in developing privately-owned farms and other previously undeveloped areas located between Fort Drum and the surrounding communities. Most of this development has occurred on the southern end of the installation near the Cantonment Area and WSAAF. The slowdown in expansion in the 2010s lessened the desire to develop and Fort Drum training areas are still only minimally impacted by external urban encroachment. However, future expansion/development will ultimately lead to increased conflicts between the installation and its neighbors.

Associated with development, the increasing loss of habitat for federal- and state-listed threatened and endangered species near the installation has the potential to become a critical encroachment issue in the future. Development both on- and off-post has reduced the availability of woodlots, hedgerows, and farm fields between Fort Drum and a nearby hibernaculum for the federal and state-endangered Indiana Bat. Likewise, both development and ecological succession has caused a decrease in grassland habitats for many state-listed bird species. The loss of habitat provides less roosting and foraging habitat for the Indiana Bat and Northern Long-eared Bat, and less nesting habitat for grassland birds, which may force several species to further utilize the installation. Like military installations nationwide, the potential exists that Fort Drum will serve as an island refugium for listed species as development increases off-post.

See INRMP Section 3.4 for more information regarding Encroachment Management; INRMP Section 4.3.1 Endangered Species Act, INRMP Section 4.3.1.1.1 Grassland Management for Wildlife, INRMP Section 4.2.4.3.2 Grassland Birds; and INRMP Section 4.3.4.2.7 Bald & Golden Eagle Management for more information.

CG 4. Communication & Coordination

To support the training requirements and readiness of Soldiers, one of the most important functions of natural resources professionals is effective engagement, communication, and coordination with external and internal stakeholders.

CG 4.1 Communication & Coordination with External Stakeholders

External stakeholders are those entities concerned with the direct development of the INRMP and natural resources management on Fort Drum. External stakeholders include the US Fish & Wildlife Service (USFWS) and New York State Department of Environmental Conservation (NYSDEC).

US Fish & Wildlife Service

The mission of the USFWS is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The USFWS provides technical assistance pursuant to the Endangered Species Act, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, Clean Water Act (i.e. wetlands), and the Fish and Wildlife Coordination Act.

At Fort Drum, the USFWS is involved with all aspects concerning federal threatened and endangered species, Bald and Golden Eagle Protection Act considerations, Migratory Bird Treaty Act, a member of the Interagency Review Team for wetland banking, and an interested party in the ACUB Program. Fort Drum primarily interacts with the USFWS New York Field Office (NYFO) in Cortland, New York for Endangered Species Act/Section 7 consultation requirements, and the USFWS North Atlantic-Appalachian Region Division of Migratory Birds from the Regional office in Hadley, Massachusetts for Bald and Golden Eagle Protection Act considerations and permits related to migratory birds.

New York State Department of Environmental Conservation

NYSDEC is responsible for management of all fish and wildlife in NYS, including those on Fort Drum. NYSDEC is also responsible for wetland, stormwater, air, water, mining, and solid waste issues. As a federal entity, Fort Drum is not required to follow all state regulations unless stated by Congress.

The primary office Fort Drum interacts with is the NYSDEC Region 6 Office in Watertown, New York. NYSDEC is a member of the Interagency Review Team for wetland banking and is an interested party in the ACUB Program. NYSDEC Environmental Conservation Officers have concurrent jurisdiction on Fort Drum for the enforcement of natural resources regulations.

The USFWS and NYSDEC are signatory cooperators in the development and implementation of the INRMP in accordance with the Sikes Act. The *Tri-Partite Cooperative Agreement between NYSDEC Region 6, USFWS NYFO, and Fort Drum* in Appendix C2 contains specific items of agreement between NYSDEC, USFWS, and Fort Drum as it relates to natural resources management and enforcement.

Fort Drum Natural Resources Branch staff regularly communicate with their USFWS and NYSDEC counterparts. However, there are also two formal opportunities annually to express concerns about natural resources management on the installation. A Natural Resources Conservation Meeting is organized by the Natural Resources Branch and chaired by the Garrison Commander—typically in late spring and late fall. These meetings include natural resources professionals from Fort Drum, USFWS and NYSDEC; law enforcement personnel from Fort Drum and NYSDEC; and other internal stakeholders.

CG 4.2 Communication & Coordination with Internal Stakeholders

4.2.1 Operational Planning & Review

Due to the complex array of environmental regulations, vagaries of the natural environment, and ever-changing mission requirements, effective communication and coordination as well as maximum flexibility and adaptability between natural resources professionals and military trainers is essential. At the same time, long-term planning is needed with the understanding that natural systems sometimes take a relatively long time to develop (e.g., regenerating a forest) and that training requirements today may not be the same as those needed tomorrow. Natural resources are also finite, so trainers and natural resources professionals must ensure the carrying capacity of the land for training is not exceeded. Quality and diverse training opportunities necessitate quality and diverse natural resources.

The primary forum to discuss training needs and requirements is the quarterly Range Facilities Steering Committee (RFSC) Meeting, which is chaired by the Deputy Commanding General - Operations and attended by all major subordinate commands and garrison directorates including a Natural Resources Branch representative.

To ensure a cooperative and coordinated working relationship, communication between DPW-Environmental Division and DPTMS-Ranch Branch occurs through various means:

- DPTMS-Training Division is invited to attend the semi-annual Natural Resources Conservation Meeting.
- DPTMS-Training Division is invited to attend the quarterly Environmental Quality Control Committee.
- DPW-Environmental Division is invited to attend the quarterly Range Facilities Steering Committee (RFSC).
- DPW-Environmental Division and DPTMS-Training Division meet quarterly during regularly scheduled meetings to facilitate coordination of projects, brainstorm ideas, and provide status reports of various issues.
- DPTMS-Training Division and DPW-Engineering Plans & Services Division (and USACE) are invited to attend quarterly meetings organized by Environmental Division to ensure proper coordination is taking place for construction activities and ensure all environmental issues are resolved in a timely manner.

This represents a minimum of 18 formally scheduled meetings not including special meetings or informal communication when necessary.

Natural Resources Branch personnel are also part of the Wildlife Hazard Management Working Group which meets annually at a minimum, but can meet more frequently if

necessary; this meeting is chaired by the Airfield Manager. Regular dialogue occurs with Natural Resources Branch and WSAAF Base Operations personnel throughout the year and Natural Resources Branch personnel are also invited to participate in other meetings, tours, and discussions as needed.

4.2.2 Facilities Planning & Review

Natural resources personnel also directly support the mission by assisting with the construction and maintenance of infrastructure to include range facilities.

Range and training-related projects are generally divided into four categories: (1) Military Construction, Army (MCA) Workplan; (2) Range Modernization Program-Operations and Maintenance, Army (OMA); (3) Bridge Repair Program; and (4) in-house ITAM projects funded through Training Division funds.

The MCA Work Plan and Range Modernization Program support the continual modernization of training facilities and real property assets. The project list for the Range Modernization Program is continually updated and includes approximately 21 repair, improvement, and construction projects.

The Bridge Repair Program ensures complete access throughout the Fort Drum Training Area. The project list for this program is also continuously updated and currently includes work on more than 30 bridges.

ITAM projects are mostly focused on vegetation management, trail maintenance, and other soil and water-related actions.

In the past when there were several construction projects occurring concurrently, regular meetings were organized by Environmental Division to ensure proper coordination was taking place and all environmental issues were being identified and resolved in a timely manner. DPW-Engineering Plans & Services Division, US Army Corps of Engineers, and DPTMS-Training Division were all invited to attend. These meetings took place monthly or quarterly depending on the level of construction activity. Otherwise, regular dialogue between project proponents and Environmental staff regarding construction activities is accomplished through the NEPA process.

4.2.3 National Environmental Policy Act

Another form of communication and coordination is through compliance with the National Environmental Policy Act of 1970 (NEPA). The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions by avoiding, minimizing, and/or mitigating environmental damage.

The Army's NEPA regulation (32 CFR 651, *Environmental Analysis of Army Actions*; a.k.a. Army Regulation 200-2) requires full disclosure, documentation, and mitigation of significant impacts on the human environment for Army and Army-related actions (e.g. military training, new technology, equipment testing, construction projects, land management actions, real property transactions, etc.). The purpose of NEPA is not to stop actions but to analyze impacts of proposed actions for use as a planning and decision-making tool and to give the public a platform for active involvement to ensure (1) federal agencies identify environmental concerns; (2) provide alternatives; (3) avoid and minimize impacts; and (4) mitigate impacts when used early in the planning stages of project development.

There are three main levels of NEPA documentation, each of which has specific levels of analysis and complexity and is dependent on the extent and significance of the impact.

(1) Record of Environmental Consideration (REC). The REC is the simplest and most common level of documentation of an action. This document and its associated categorical exclusions are used when an action individually and cumulatively has already been determined to not have a significant impact on the human environment, but have to be documented that there was a review for potential effects. Depending on the complexity of a proposal, review of a completed REC can take from minutes up to a month.

(2) Environmental Assessment (EA). The EA is a more complex level of documentation intended to facilitate agency planning and decision-making by increasing the understanding of the potential effects of a proposed action and any alternatives to the action on the human environment. An EA requires a 30-day public comment period and, if warranted, followed by the publishing of a Finding of No Significant Impact (FONSI) which describes the EA's conclusions. An EA typically takes 3-9 months to complete depending on the complexity of the proposed action.

(3) Environmental Impact Statement (EIS). The most comprehensive level of NEPA documentation is the EIS. This document is a detailed written statement required by NEPA for major federal actions that could have a significant adverse impact on the human environment and includes an extensive analysis of the proposed action and the alternatives. If a FONSI is not warranted for an EA, then an EIS is required. Public meetings and hearings as well as three published documents for public review are required components of an EIS. An EIS typically takes 1-2 years to complete.

The need for, or level of, documentation necessary is determined by the Fort Drum Environmental Division NEPA staff based on criteria set forth in 32 CFR 651. All proposed actions are reviewed by subject matter experts within Environmental Division (Fish and Wildlife including Endangered Species and Migratory Birds; Forestry; Wetlands; Stormwater; Petroleum, Oils & Lubricants; Water Quality; Air Quality; and Cultural Resources) to provide comments on specific training actions to avoid or minimize impacts. An example of a potential impact that is avoided using the REC process includes relocating a military unit to prevent fueling operations in an area where groundwater aquifers exist. The NEPA process also increases Soldier awareness of environmental concerns and the need to maintain a healthy environment.

APPENDIX C1

Natural Resources Branch Points of Contact

Natural Resources Branch Chief	Jason Wagner	315-772-5971	315-778-5688
AQUATIC RESOURCES			
Wetlands & Clean Water Act	Jason Murray Eugene Nichols	315-772-6328 315-772-8093	315-778-6346
Watersheds	Jacob Ball	315-772-4729	315-405-5352
Lakes & Streams	Jacob Ball	315-772-4729	315-405-5352
Culverts	Jacob Ball	315-772-4729	315-405-5352
Beaver Management/Flooding	Chris Dobony	315-772-4999	315-778-6348
Fish Contaminants	Fred Ossman	315-772-9303	315-955-5173
LAND RESOURCES			
Forestry/Land Management	Travis Ganter Mike Stiefel	315-772-0874 315-774-6767	
Firewood	Travis Ganter Mike Stiefel	315-772-0874 315-774-6767	
Grassland Management	Rodger Voss	315-772-3107	315-408-1725
Invasive Species	Rodger Voss	315-772-3107	315-408-1725
Hazard Trees	Mike Stiefel	315-772-6767	
FISH/WILDLIFE RESOURCES			
Endangered Species / Bats	Chris Dobony	315-772-4999	315-778-6348
Bald Eagles	Chris Dobony	315-772-4999	315-778-6348
Migratory Birds	Jeff Bolsinger	315-772-6187	315-737-4347
Other Fish/Wildlife	Fred Ossman	315-772-9303	315-955-5173
WILDLIFE CONFLICT			
Bird/Wildlife Aircraft Strike Hazards	Raymond Rainbolt	315-772-9636	315-212-6397
Beaver Management /Flooding	Chris Dobony	315-772-4999	315-778-6348
Deer Management	Raymond Rainbolt	315-772-9636	315-212-6397
Bats	Chris Dobony	315-772-4999	315-778-6348
Ticks/Lyme Disease	Raymond Rainbolt	315-772-9636	315-212-6397
Rabies	Raymond Rainbolt	315-772-9636	315-212-6397
General Problems	Raymond Rainbolt	315-772-9636	315-212-6397
RECREATION/OUTREACH			
Access Passes	Fred Ossman	315-772-9303	315-955-5173
FD Reg 420-3 / Deer Management	Raymond Rainbolt	315-772-9636	315-212-6397
Maple Days	Travis Ganter Mike Stiefel	315-772-0874 315-774-6767	
Outdoor Adventure Day	Raymond Rainbolt	315-772-9636	315-212-6397
ENVIRONMENTAL REVIEW			
NEPA	Cait Schadock	315-772-5110	315-771-6026

APPENDIX C2

Items of Cooperation Between the New York State Department of Environmental Conservation, US Fish and Wildlife Service, and Fort Drum Military Installation

PURPOSE: The purpose of this appendix is to list specific items to be provided by the New York State Department of Environmental Conservation (NYSDEC), US Fish and Wildlife Service—New York Field Office (USFWS), and Fort Drum Military Installation (Fort Drum) for cooperative implementation of the Fort Drum Integrated Natural Resources Management Plan 2024 (INRMP). Items not specifically listed will generally be the responsibility of Fort Drum unless the other agencies agree to assist with their implementation.

AUTHORITY: In accordance with the authority contained in Title 10, USC, Section 2671, and Title 16, USC, Section 670 the Department of Defense, the Department of Interior, and the NYS, through their duly designated representatives whose signatures appear in this INRMP, specifically approve the INRMP and the below specific items of cooperation among the three agencies.

MUTUAL AGREEMENT:

(1) Military training is the primary purpose of Fort Drum Military Installation and “no net loss” of training lands and the capability to train thereon is the primary goal of Fort Drum natural resources managers.

(2) This INRMP will become effective upon the date subscribed by the last signature and shall continue in full force until terminated by written notice to the other parties by any of the parties signing this agreement. This agreement may be amended or revised by agreement between the parties hereto. Action to amend or revise may originate with any of the other participating agencies.

(3) Hunting, fishing, trapping, and other recreational activities are allowed on Fort Drum. These activities are controlled by the installation commander in accordance with locally published installation regulations promulgated in compliance with applicable federal and State laws, Army regulations, military requirements, and this INRMP. Hunting, fishing, trapping, and other recreational activities will be allowed in areas where there is no conflict with military training and no unreasonable safety hazard to participants.

(4) Public access for hunting, fishing, trapping and other recreational activities is allowed under a system of controls established by Fort Drum. Except for specific restricted areas due to security or other concerns, the public will be considered on an equal basis with active and retired military personnel, military family members, and Army civilian employees for access and recreation permits. If the need arises for quotas on the number of hunters permitted on a daily or seasonal basis for reasons of safety or recreational carrying capacity, such quotas will not be instituted prior to consultation with the NYSDEC.

(5) All hunting, fishing, and trapping on Fort Drum will be in accordance with federal and state laws and regulations. The NYSDEC shall establish season and bag limits for harvest of game species on Fort Drum. Because Fort Drum is its own Wildlife Management Unit (6H) and the NYSDEC enacts regulations based on Wildlife Management Unit (WMU) boundaries, Fort Drum may periodically request regulatory amendments in support of efficient fish and wildlife management.

(6) Persons hunting, fishing, or trapping on Fort Drum must purchase State licenses, tags, and stamps as required by NYSDEC, unless exempt by NYSDEC regulations. New York State law provides that active military personnel stationed in New York may purchase hunting, trapping, and fishing licenses at resident prices. New York State law provides that active military personnel who are New York State residents and are in the state on leave or furlough for 30 days or less are eligible for free hunting, fishing and trapping licenses.

(7) Persons hunting, fishing, trapping, or engaging in other recreational activities on Fort Drum must obtain a Fort Drum Recreation Permit in accordance with Fort Drum Regulation 420-3. Persons guilty of violating this requirement may be prosecuted under 10 USC 2671(c). Funds derived from the sale of these permits will be used exclusively on Fort Drum in accordance with Army regulations and the Sikes Act. Fees charged for these permits, if any, shall be established by Fort Drum in accordance with Army regulations.

(8) Fort Drum has concurrent enforcement jurisdiction where natural resources laws are enforceable by federal- or state-commissioned personnel. Enforcement will be a joint responsibility of Fort Drum, the NYSDEC, and the USFWS.

(9) Representatives of the NYSDEC and the USFWS will be admitted to the installation at any time subject to requirements of military necessity and security.

(10) Natural resources professionals from Fort Drum, the NYSDEC, and the USFWS will mutually assist one another in the management of natural resources. Such efforts may include personnel, equipment, vehicles (including boats and aircraft), facilities, and/or technical expertise.

(11) Fort Drum agrees to cooperate with USFWS and NYSDEC for management of threatened or endangered species residing on the installation. Such efforts will be in compliance with federal and state laws and applicable Army regulations. There is no waiver of sovereign immunity for threatened and endangered species, so although State laws for state-listed species are not applicable, Fort Drum will attempt to consider these species in actions to the maximum extent practicable.

(12) Fort Drum shall encourage and support research conducted by NYSDEC, USFWS and/or their cooperators by coordinating access to the installation and/or facilitate suitable study sites subject to requirements of military necessity and security. Fort Drum shall receive the data collected from survey efforts and research conducted on Fort Drum.

(13) Fort Drum has the option to directly transfer funds to the NYSDEC and USFWS for implementation of this Integrated Natural Resources Management Plan.

Integrated Natural Resources Management Plan

1. Overview

1.1 Authority & Background

The Sikes Act Improvement Act (SAIA), as amended (16 USC §§ 670a-670o), requires the Secretary of each military department to prepare and implement an integrated natural resources management plan (INRMP) for each military installation in the United States with significant natural resources. Fort Drum Military Installation (Fort Drum) implemented its first INRMP in 2001 (Fort Drum 2001) and the last in 2021 (Fort Drum 2021).

An INRMP is a long-term planning document designed to guide the management of natural resources to support the preparedness of the Armed Forces, while protecting and enhancing installation resources for multiple uses including recreation, sustainability, and biological integrity. The INRMP shall strive to prevent the net loss in the capability of military installation lands to support the military mission.

The management of natural resources is driven by compliance and stewardship requirements. As federal entities, Department of Defense (DoD) and the Department of Army are required to comply with all federal laws and some state laws (relevant laws and regulations are listed in the applicable sections in this INRMP). Stewardship—the responsibility to manage and conserve natural resources for the future—is a major component of the military environmental and training ethic. DoD actively manages military lands for multiple training and testing missions, while implementing policies and programs to reduce impacts to the land and ensuring both environmental and mission sustainability. Environmental regulatory compliance and natural resources stewardship must be of equal importance on military installations.

The SAIA requires the preparation of INRMPs to be completed in cooperation with the Secretary of the Interior, acting through the Director of the United States Fish and Wildlife Service (USFWS), and the head of each appropriate fish and wildlife agency for the state in which the military installation is located. Representatives from the USFWS New York Field Office in Cortland, New York and New York State Department of Environmental Conservation (NYSDEC) Region 6 Office in Watertown, New York participated in the review of this INRMP.

The goal of this INRMP is for mutual agreement with the USFWS and NYSDEC concerning conservation, protection, and management of natural resources on Fort Drum. However, mutual agreement is required only to those elements of the plan that are subject to the otherwise applicable legal authority of the USFWS and NYSDEC to conserve, protect, and manage fish and wildlife resources. No element of the SAIA is intended to either enlarge or diminish the existing responsibility and authority of the USFWS or NYSDEC concerning natural resources management on military lands. If the

USFWS or NYSDEC withheld its agreement with the INRMP based on objections to elements of the INRMP clearly not within the scope of the particular agency's authority, Fort Drum could, notwithstanding the objections, finalize the INRMP and proceed to manage its natural resources in accordance with the terms of the plan.

The SAIA requires this INRMP to be reviewed by the USFWS and NYSDEC on a regular basis, not to exceed 5 years. The requirement to review an INRMP on a regular basis does not mean that the INRMP must be revised annually. The need to revise an INRMP will be the decision of the installation based on the outcome of the review and any changes in policy or operations in the interim.

It is DoD policy that Fort Drum invite the USFWS and NYSDEC to evaluate the effectiveness of the INRMP annually to determine whether it is being implemented to meet the requirements of the Sikes Act and contribute to the conservation and rehabilitation of natural resources on military installations. At Fort Drum, external and internal stakeholders have at least two opportunities annually to express concerns about natural resources management on the installation at the Natural Resources Conservation Meeting chaired by the Garrison Commander.

1.2 Scope

This INRMP pertains to the management of natural resources on the Fort Drum Military Installation in Jefferson and Lewis counties in northern New York. If any lands are acquired by Fort Drum in the future, a revision or addendum to this INRMP may be required.

The INRMP is written by and for the Natural Resources Branch, Environmental Division, Directorate of Public Works (DPW).

1.3 Responsibilities

This section lists the stakeholders and their roles and responsibilities related to natural resources management on Fort Drum. For the purpose of this document, the term "stakeholders" does not refer to public or non-governmental organizations.

1.3.1 Internal INRMP Stakeholders

Internal stakeholders are those Fort Drum entities involved directly or indirectly with natural resources management on Fort Drum.

1.3.1.1 Installation Commander

The Installation Commander or designate (usually the Garrison Commander) is ultimately responsible for all aspects of installation operations at Fort Drum including the implementation of this INRMP and management of natural resources. Acting through subordinates, the Installation Commander is responsible for:

- Planning land utilization to avoid or minimize adverse effects on environmental quality and provide for the sustainability of the mission and environment;

- Funding and staffing of natural resources management professionals and other resources required to effectively manage natural resources on the installation;
- Ensuring all installation land users are aware of and comply with procedures and requirements necessary to accomplish objectives of this INRMP together with environmental laws, regulations, policies, and other measures;
- Entering into appropriate cooperative plans (16 USC 670a) and agreements with state, federal, and other entities related to natural resources management, and;
- Ensuring the function of an Installation Environmental Quality Control Committee (EQCC) which is chaired by the Garrison Commander and meets quarterly.

1.3.1.2 Directorate of Public Works

The Directorate of Public Works (DPW) will maintain an Environmental Division to accomplish the INRMP. DPW also has other divisions and programs that relate to natural resources management including the Operations & Maintenance Division and Engineering, Plans & Services Division. DPW is responsible for:

- Ensuring coordination of the natural resources program with all installation land users to support the mission and to responsibly manage natural resources;
- Preparing and ensuring implementation of this INRMP;
- Coordinating with local, state, and federal governmental and non-governmental organizations relative to natural resources management on Fort Drum;
- Reviewing all environmental documents, project proposals, and other plans to ensure natural resources are adequately considered and/or management is implemented;
- Identifying issues and making recommendations for the enhancement and management of natural resources;
- Developing and implementing programs to ensure the inventory, delineation, classification, monitoring, and management of all natural resources;
- Ensuring the installation commander is informed regarding natural resources issues which may impact the mission and/or result in a violation of laws, policies, or regulations;
- Providing for the training of natural resources personnel;
- Providing public affairs with information regarding natural resources management activities and issues, both positive and negative, and;
- Serving on the Environmental Quality Control Committee.

The Environmental Division consists of the Compliance Branch, Cultural Resources Section, and Natural Resources Branch. Support personnel also include Geographic Information Systems (GIS), database management, and environmental outreach. Compliance issues (e.g., hazardous waste, air quality, noise, etc.) are addressed in individual plans maintained by the Compliance Branch. Cultural resources issues are addressed in the *Integrated Cultural Resources Management Plan* (ICRMP; Fort Drum 2020b). The Natural Resources Branch is outlined in Section 1.4.

The DPW-Operations & Maintenance Division includes the Roads & Grounds Branch and the Installation Pest Control Program. The Roads & Grounds Branch is responsible for the maintenance and improvement of the grounds, landscaping, and roads throughout Fort Drum including removing obstructions caused by beaver activities. Pest management on Fort Drum is mainly focused on disease vectors, household pests, some vertebrate pests, and some invasive species. The Pest Control Program coordinates all chemical pesticide use on the installation including aerial validation plans for herbicide spraying, and is responsible for the *Fort Drum Installation Pest Management Plan* (2016) that includes approved pesticides and approved methods to control pests.

The DPW-Engineering, Plans & Services Division includes five branches: Master Planning, Real Property Real Estate, Design, Job Order Contracting, and Installation GIS. All five branches interface with the Natural Resources Branch regarding the siting, planning, and construction (or demolition) of facilities and other infrastructure. Master Planning is responsible for two plans that impact natural resources management: the *Fort Drum Installation Planning Standards* (Fort Drum 2017) and the *Real Property Master Plan* (Fort Drum 2012).

1.3.1.3 Directorate of Planning, Training, Mobilization and Security

The Directorate of Planning, Training, Mobilization, and Security (DPTMS), particularly its Range Branch, is the most important partner in natural resources management outside of DPW-Environmental Division. DPTMS is responsible for:

- Operating and maintaining Fort Drum ranges, associated training facilities, field training sites, and range equipment;
- Preparing, maintaining, and enforcing range regulations;
- Providing Integrated Training Area Management (ITAM) Program management and funding;
- Assisting with the support of a GIS database;
- Coordinating with DPW-Environmental Division activities that may affect natural resources, and;
- Coordinating use of the training area to accomplish provisions of this plan including forest management, land rehabilitation, and recreational use.

The Training Division-Range Branch is responsible for indirectly supporting the implementation of this INRMP by coordinating access to the training areas for natural resources personnel and recreationists. Range Branch is responsible for the *Range Complex Master Planning Tool* (an online plan maintained through the Sustainable Range Program) and *Fort Drum Regulation 350-4 Range Regulation (Safety, Training Facilities, Utilization, Description and Schedule*; 20 March 2017) which includes facets of natural resources management. The ITAM Program is an Army-wide program that was originally created in response to the degradation of Army training lands that jeopardized the sustainability of the military mission. ITAM implements various land management actions through Range Branch. ITAM also maintains a GIS capability that provides standard mapping and spatial analysis to support Range Branch.

DPTMS also manages Wheeler-Sack Army Airfield (WSAAF). The Airfield Manager is responsible for implementing the WSAAF Wildlife Hazard Management Plan (Fort Drum 2019) See *Section 4.4.4.1 Birds/Mammals at Wheeler-Sack Army Airfield* for more information in this INRMP.

1.3.1.4 Directorate of Emergency Services

The Directorate of Emergency Services (DES) is responsible for fire, safety, and police activities on Fort Drum and implementation of the *Integrated Wildland Fire Management Plan* (IWFMP; Fort Drum 2023a). The Law Enforcement Division has a full-time Conservation Law Enforcement Officer Section that is responsible for natural resources law enforcement. See *Section 5.3 Law Enforcement* for more information.

1.3.1.5 Directorate of Families, Morale, Welfare, and Recreation

The Directorate of Families, Morale, Welfare, and Recreation (DFMWR) is responsible for a variety of quality of life concerns for Soldiers and their Families. DFMWR is mostly responsible for recreational activities on the installation exclusive of hunting and fishing. The Outdoor Adventure Program also directs and/or promotes recreational activities on and off the installation and maintains shooting ranges. DMFWR-Parks & Recreation manages Remington Park and rents outdoor equipment.

1.3.1.6 Public Affairs Office

The Public Affairs Office (PAO) is responsible for promoting an understanding of Fort Drum's environmental management programs and providing professional public affairs advice and support.

1.3.1.7 Fort Drum Medical Command (MEDCOM)

MEDCOM-Veterinary Services provides medical care for household pets, assists with stray animals found on post, and prepares animal samples that are sent off-post for analysis for diseases of concern such as West Nile virus and avian influenza virus.

MEDCOM-Preventive Medicine is responsible for environmental health concerns including coordination with Jefferson County for rabies prevention programs; surveys and/or control for black flies, mosquitoes, and ticks; and water quality sampling in Remington Pond for swimming.

1.3.1.8 Other Installation Organizations

Implementation of this INRMP requires assistance from other directorates and organizations usually in a support capacity. Such organizations include the Mission and Installation Contracting Command (MICC), Command Safety Office (CSO), Staff Judge Advocate (SJA), Equal Employment Office (EEO), and commanders of major subordinate organizations, tenant units and activities.

1.3.2 External INRMP Stakeholders

External stakeholders are those entities concerned with the direct development of the INRMP and natural resources management on Fort Drum. See Chapter 3 for more information about these agencies and other stakeholders.

1.3.2.1 US Fish & Wildlife Service

The USFWS is one of the signatory cooperators in the development and implementation of this INRMP in accordance with the Sikes Act. The mission of the USFWS is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The USFWS provides technical assistance pursuant to the Endangered Species Act (ESA), Bald and Golden Eagle Protection Act (BEGPA), Migratory Bird Treaty Act (MBTA), Clean Water Act (CWA), and the Fish and Wildlife Coordination Act.

Fort Drum is in USFWS Region 5—the Northeast Region. The USFWS Region 5 Headquarters is in Hadley, Massachusetts and Fort Drum interacts with that office for Bald and Golden Eagle Protection Act considerations and permits related to migratory birds. However, the primary office Fort Drum interacts with is the USFWS New York Field Office in Cortland, New York, which is the signing authority for this INRMP. The USFWS is involved with all aspects of federal threatened and endangered species, Bald and Golden Eagle and Migratory Bird Treaty Act considerations, a member of the Interagency Review Team for wetland banking, and an interested party in the ACUB Program.

Fort Drum is in the jurisdiction of the USFWS-Law Enforcement Office in Albany, New York.

1.3.2.2 New York State Department of Environmental Conservation

NYSDEC is one of the signatory cooperators in the development and implementation of this INRMP in accordance with the Sikes Act. NYSDEC is responsible for management of all fish and wildlife in NYS, including those on Fort Drum. NYSDEC is also responsible for wetland, stormwater, air, water, mining, and hazardous/solid waste issues.

Fort Drum is in NYSDEC Region 6. The primary office Fort Drum interacts with is NYSDEC Regional Office in Watertown, New York. NYSDEC is a member of the Interagency Review Team for wetland banking and is an interested party in the ACUB Program.

NYSDEC Environmental Conservation Officers have concurrent jurisdiction on Fort Drum for the enforcement of natural resources regulations.

1.4 Natural Resources Management on Fort Drum

The Natural Resources Branch consists of the following five functional areas which are further detailed in Chapter 4:

- Aquatic Resources Management (Clean Water Act, wetlands, watersheds, open water);

- Land Resources Management (commercial forestry, vegetation management, invasive species, geology/soils);
- Fish & Wildlife Resources Management (endangered species, species-at-risk, migratory birds, mammals, reptiles, amphibians, fish, invertebrates);
- Human-Wildlife Conflict Management (including nuisance wildlife, noxious plants, wildlife-aircraft strike hazards);
- Natural Resources Recreation and Outreach (hunting, fishing, special events).

The Natural Resources Branch carries out Public Works responsibilities for the integrated management of natural resources on Fort Drum addressed in this INRMP. See *Section 4.0 Natural Resources Management* for management strategies natural resources professionals use for implementation of this INRMP.

1.4.1 Natural Resources Management Background

The following is a chronology of natural resources management on Fort Drum.

- 1909: Pine Camp (later Fort Drum) was established.
- 1940: Approximately 75,000 ac was purchased to expand present-day Fort Drum which also included the first major period of construction with the completion of over 800 buildings.
- 1947: US Forest Service conducted a study of US Army installation resources across the nation and made recommendations to place the forests under sound management plans.
- 1955: Natural resources management on Fort Drum began with the development of a forest management plan in 1955.
- 1957: First "conservation" practice initiated when NYSDEC helped reclaim and furnish trout to stock Remington Pond.
- 1958: US Army issued AR 420-74 which required installations to open all or part of the installation to the public for hunting and fishing, if feasible.
- 1959: The first cooperative plan/agreement between Fort Drum, NYSDEC, and USFWS was signed. Fort Drum became a New York State Fish & Wildlife Management Act Cooperative Hunting Area—the largest cooperator in New York State to this day.
- 1960: The Sikes Act was passed by Congress which promoted effective planning, development, maintenance, and coordination of wildlife, fish, and game conservation on military lands. It also required military installation to provide for public access subject to safety requirements, military security, and ensuring military preparedness.
- 1972: Federal Water Pollution Control Amendments (Clean Water Act; CWA) was passed by Congress.
- 1973: Endangered Species Act (ESA) was passed by Congress.
- 1985: 10th Mountain Division (LI) was stationed at Fort Drum and the largest peacetime construction effort began.
- 1990: Integrated Training Area Management Program began as a DPW function.
- 1991: First Fish & Wildlife Biologist hired on Fort Drum. (Before this time, one Army employee was responsible for all natural resources on Fort Drum.)
- 1991: Geographic Information Systems (GIS) begins.

- 1991: A recreational permit fee program was initiated--$10 for big game hunting, $10 for small game hunting, $10 for fishing, $10 for trapping, $25 for a combination of hunting and fishing, and $35 for all activities.
- 1992: Natural Resources Branch developed.
- 1994: A dedicated Wetlands Biologist was hired on Fort Drum to deal with the requirements of the Clean Water Act (i.e., wetland regulations).
- 1995: ITAM was moved from DPW to DPTMS.
- 1998: Fort Drum became its own Wildlife Management Unit 6H in the NYSDEC hunting/trapping regulations.
- 1999: Army Headquarters Office of the Director Environmental Program (ODEP) issued guidance mandating forest management to consider not only forest production, but also include military training, fish and wildlife habitat, forest health, water quality, and aesthetics. Supporting all of these interests through sustainable forest management practices continues to this day.
- 2001: Following the Sikes Act Improvement Act of 1997 (16 USC 670 et seq.), the first Integrated Natural Resources Management Plan was completed.
- 2001: In response to the 9/11 terrorist attacks, public access was restricted from Fort Drum for the first time.
- 2002: Natural Resources Branch took over operations from DFMWR to issue recreation passes and public access was re-instated to Fort Drum after 9/11.
- 2002: After the US Court of Appeals confirmed federal agencies are subject to the Migratory Bird Treaty Act in 2000, the Department of Navy was successfully sued for killing migratory birds during training exercises. This action caused migratory birds to be emphasized in all DoD actions.
- 2003: Fort Drum instituted a “land clearing window” when vegetation clearing can take place between 01 August – 15 April to minimize the take of migratory birds during the majority of the nesting season between 16 April – 31 July.
- 2005: Natural Resource Branch foresters assisted the Fort Drum Fire Department to develop the first *Integrated Wildland Fire Management Plan*.
- 2005: Fort Drum experienced its third major expansion with the transformation of the US Army, the Residential Communities Initiative (RCI) privatizing Army housing, and the eventual expenditure of more than $2 billion worth of construction projects.
- 2006: First federally-listed species—the endangered Indiana Bat—was confirmed on Fort Drum.
- 2007: A dedicated Migratory Bird Biologist was hired on Fort Drum to coordinate compliance with the Migratory Bird Treaty Act, Memorandum of Understanding to Promote the Conservation of Migratory Birds, Executive Order 13186, and the Final Rule re: Take of Migratory Birds by the Armed Forces.
- 2008: The Bat Conservation Area was established through Section 7 consultation with the USFWS.
- 2008: An Army Compatible Use Buffer (ACUB) Program was implemented on Fort Drum with Ducks Unlimited as the cooperative agreement partner.
- 2009: First installation-wide three-year Biological Assessment for the Indiana Bat was completed.
- 2009: The effect of White-Nose Syndrome, a fungal disease inflicting cave-dwelling bats, was confirmed on Fort Drum.
- 2010: The recreational permit fee program was discontinued—all recreation passes were issued free of charge.

- 2011: The second INRMP was completed.
- 2015: The threatened Northern Long-eared Bat was the second federally-listed species on Fort Drum.
- 2017: The Natural Resources Branch was given the responsibility for Fort Drum's Army Compatible Use Buffer Program.
- 2018: The third INRMP was completed.
- 2018: Intensive urban White-tailed Deer management began with culling in the Cantonment Area.
- 2019: USDA-APHIS-Wildlife Services personnel were stationed at Fort Drum as a full time duty station.
- 2020: The first Bald Eagle nest was documented on Fort Drum.
- 2020: Four DPW-Operations & Maintenance equipment operators were dedicated to the Natural Resources Branch.
- 2021: The first Intergovernmental Support Agreement (IGSA) was signed with the State University of New York-College of Environmental Science and Forestry (SUNY-ESF) to provide natural resources support.
- 2021: The fourth INRMP was completed.
- 2023: The Northern Long-eared Bat was uplisted from threatened to endangered.
- 2024: The fifth INRMP was completed.

1.4.2 Natural Resources Goals & Objectives

This INRMP and its implementation helps ensure: (1) the sustainability of quality training lands to accomplish the military mission; (2) compliance with environmental laws and regulations; (3) good stewardship of public lands; and (4) enhancement of quality of life on and around Fort Drum. Fort Drum's natural resources professionals are committed to supporting these goals.

Goal 1. Provide quality sustainable natural resources as a critical training asset upon which to accomplish the military mission of Fort Drum.

> ***Objective 1.*** Ensure no net loss in the capacity of installation lands to support existing and projected military training and operations on a sustainable basis.
>
> ***Objective 2.*** Sustain training lands through management, monitoring, research, and rehabilitation as appropriate.

Goal 2. Comply with laws and regulations that pertain to the sustainable management of Fort Drum's natural resources.

> ***Objective 1.*** Comply with NEPA to make informed decisions.
>
> ***Objective 2.*** Manage natural resources within the spirit and letter of environmental laws such as the Sikes Act, Endangered Species Act, Bald and Golden Eagle Protection Act, Clean Water Act, and Migratory Bird Treaty Act.
>
> ***Objective 3.*** Implement this INRMP within the framework of Army policies and regulations.

Objective 4. Support professional development of natural resources professionals.

Goal 3. Professionally and proactively manage natural resources on Fort Drum to ensure sound sustainable stewardship of public lands entrusted to the care of the Army.

Objective 1. Use adaptive ecosystem management strategies to conserve and enhance native fauna and flora, and manage or eliminate invasive species.

Objective 2. Conserve and manage threatened and endangered species and critical habitat in accordance with the Endangered Species Act, NEPA, DoD and Army regulations and policy, and any other applicable laws or guidance.

Objective 3. Conserve sensitive species and habitats including those species and habitats considered significant in the State Wildlife Action Plan to ensure species do not become threatened or endangered.

Objective 4. Monitor and manage soils, water, vegetation, and wildlife on Fort Drum with a consideration for all biological communities and human values associated with these resources with a focus on ensuring current and future military training will not be encumbered.

Objective 5. Provide human-valued renewable natural resources products when such products can be produced in a sustainable manner without significant negative impacts on the military mission or other natural resources.

Objective 6. Support enforcement of natural resources-related laws.

Objective 7. Ensure the management of natural resources is coordinated with internal and external entities with similar interests.

Goal 4. Maintain Fort Drum as an exemplary resource in the region and continue to improve the quality of life at Fort Drum and of the surrounding communities through natural resources-based recreational opportunities.

Objective 1. Provide quality outdoor recreational opportunities such as hunting, fishing, trapping, camping, etc. within biological and recreational carrying capacities of the resources.

Objective 2. Provide educational outreach activities for Soldiers, their Families, and surrounding communities.

Objective 3. Maintain Fort Drum as an important regional asset for natural resources in NYS.

2. Installation information

2.1 General Description

Fort Drum officially encompasses 108,733 contiguous acres (434 km^2) in northwestern New York State (NYS; approximate center: 44° 7' N 75° 35' W). The installation is approximately 10 mi (16 km) wide and 20 mi (32 km) long. The initial acquisition of land for Fort Drum occurred in 1909. The most significant acreage—75,000 ac (300 km^2) — was purchased in 1940.

Fort Drum is approximately 30 mi (48 km) from Canada, 6 mi (10 km) east of Interstate 81, and 10 mi (16 km) northeast of the City of Watertown. Approximately 83% of Fort Drum is in the northeastern corner of Jefferson Co. and the remainder is in the northwestern corner of Lewis Co. St. Lawrence Co. borders Fort Drum to the north. Towns within or adjacent to Fort Drum include Wilna, Antwerp, Philadelphia, LeRay, Champion, and Rutland in Jefferson Co.; Diana in Lewis Co.; and Fowler and Rossie in St. Lawrence Co.

2.2 Regional Land Use

The area surrounding Fort Drum is generally rural with small concentrations of residential, commercial, and industrial areas mainly within the villages. The City of Watertown (population 24,685 in 2020), located 10 mi (16 km) southwest of the Cantonment Area is the largest US city within a 50 mi (80 km) radius of Fort Drum.

The region's economy has traditionally been natural resources-based, with many economic opportunities afforded by its water, agricultural, and forest resources. Dairy farming, food processing, and papermaking are major industries with a long tradition in the area.

Historical land use in this region resembles the entirety of NYS—undeveloped forest converted to agricultural fields and woodlots followed by a reversion to forested land through natural succession. For example, land in Jefferson Co. was characterized as 57% farmland in 1910 but only 20% in 1992; conversely, forested land in Jefferson Co. increased from 40% in 1910 to 75% in 1992 (Stanton and Bills 1996). Land use in Lewis Co. and St. Lawrence Co. are similar with 20% and 22% farmland and 75% and 73% forested land, respectively (Stanton and Bills 1996).

Although there are few federal lands near Fort Drum, state lands are numerous including state forests, forest preserves, wildlife management areas, and state parks. The majority of protected land is large forested tracts (primarily state forests, wilderness areas, wild forests, and primitive areas) located in Adirondack Park which is only 5 mi (8 km) from Training Area 19 in the northeastern part of Fort Drum. State forest lands border some areas of Fort Drum. The nearest state wildlife area is Perch River Wildlife Management Area (7800 ac / 3157 ha) approximately 5 mi (8 km) to the northwest of the Cantonment Area of Fort Drum.

The natural beauty of the region along with world renowned sport fishing, boating, and winter recreation opportunities has made tourism a substantial part of the regional economy. This includes the Thousand Islands region along the St. Lawrence River approximately 20 mi (32 km) to the north of Fort Drum, Lake Ontario approximately 16 mi (26 km) to the west, and Adirondack Park to the east. The Black River running past Fort Drum and through Watertown is nationally known for kayaking. Fort Drum attracts hunters from throughout the eastern US

2.3 Historic Land Use

Approximately 13,000 to 21,000 years ago, Canada and the northern half of the United States were covered by the Laurentide ice sheet. As the ice sheet began to recede and melt, an ice dam was created on the St. Lawrence River in the Thousand Islands region (approximately 20 mi (32 km) northwest of present-day Fort Drum). The ice dam and the melting glacial waters formed Lake Iroquois which was three times the size of present-day Lake Ontario and covered part of present-day Fort Drum.

When the ice dam melted approximately 13,000 years ago, glacial Lake Iroquois lowered to the present level of Lake Ontario. The climate shifted and became cold immediately after the dam melted and persisted for approximately 1,200 years. During this period, temperate boreal forests were replaced by coniferous forests as the climates became more temperate and seasonal much like today (Larson and Schaetzl 2001; Berti 1975).

Native Americans occupied the land of present-day Fort Drum at least 10,000 years ago (McHargue 1998). They migrated with the seasons in pursuit of available food sources and remained hunters and gatherers until approximately 3500 BCE. Diet information is based primarily on inferences drawn from recovery of faunal and floral remains from archeological sites on Fort Drum and the surrounding area. Early Native Americans adapted their diet based on seasonal availability and mainly consisted of plants (e.g., seeds, roots, tubers, nuts, and berries) and supplemented by both land animals and aquatic resources (e.g., fish, birds' eggs, eels and wildfowl; McHargue 1998).

From 3500 BCE to 600 CE, agriculture became increasingly important. Archeological evidence and historic accounts reveal the Native Americans had increased control over the landscape using agricultural cultivation of maize (Indian corn), varieties of squash, and beans. Slash and burn methods of agriculture were increasingly used to clear forested land to make room for crops and fertilize soils. Harvesting local timber also played a large role in their lives. Prolonged food and seed storage and more effective hunting techniques created larger and more populated village sites. At least two village sites were located on present-day Fort Drum (McHargue 1998; Fort Drum 2020b).

The beginning of Euro-American settlement in the area began in 1791 when Alexander McComb, an ambitious land baron, acquired 1,920,000 ac (776,996 ha) of land which included all of present-day Jefferson and Lewis counties as well as large portions of Franklin and St. Lawrence counties. This land, commonly referred to as the McComb purchase, was divided into six lots, known as the Great Lots or Great Tracts. A subsequent land survey in 1795 provided some of the first written records of the Fort Drum area including vegetation field notes and survey information (Hough 1976). Forested areas prior to European settlement would have been very dense with a variety

of age classes (i.e. tree diameters) composed mainly of late successional forest species such as American Beech (*Fagus grandifolia*). Typical of late successional forests, there would have been very little subcanopy vegetation except in areas where trees had been blown over by wind or where other disturbances had occurred. This information is the best known record for determining what the "virgin forests" of Fort Drum were prior to Euro-American settlement.

An early surveyor wrote about the natural resources of the region in a letter in 1800 which includes: "*The country…abounds in oak...In other sections we see a mixture of elms, button wood, sugar maple, butternut, hickory, beech, water, and basswood. We also find hemlock, white pine, and different kinds of spruce, wild cherry, and red, and white cedar….The sugar maple is so common in some sections as to form a third of the trees….We find in many places limestone, clay, and ore of iron, very ductile, but we are still too young to think of building a furnace or large forges*." In describing the wildlife, the writer continues: "*Our rivers abound in fish, and our brooks in trout. I have seen two men take 72 in a day. Of all the colonies of beavers, which inhabited this country and raised so many dams, only a few scattering families remain…Wolves, more cunning and warlike than the former, live at our expense and as yet escape our deadly lead…Among the birds we have the pheasant, drumming partridge, wild pigeon, different kinds of ducks, geese and wild turkey, &c*." (Hough 1976: 52-53).

Another early land owner in the area was James LeRay de Chaumont. LeRay owned approximately 350,000 ac (1,416 km^2) located in Lewis, Jefferson, St. Lawrence and Franklin counties. By 1807 LeRay had commissioned a new home built in the area that would overlook Brown's Mill—later St. James Lake and now known as Remington Pond located in the present day Cantonment Area of Fort Drum (Fort Drum 2020b). Early Euro-American settlement began to change the land almost instantaneously. There were an estimated 1,500 Americans living in Jefferson County in 1805 (not including slaves, indentured servants, or households headed by women); in the 1850 US Federal Census there were 68,153 people in all of Jefferson Co.

In the area that would become Fort Drum, the local population was centered in five small rural villages and outlying farmsteads. These early villages all relied on the exploitation of the available natural resources. The villages of Sterlingville, Lewisburg, and Alpina were all centered on the iron ore industry; the villages of Woods Mills and LeRaysville were founded on the timber industry. In northern New York, the iron ore industry ended at the turn of the century, but the timber industry remains important today (McHargue 1998; Petersen 2002).

By 1908, the landscape had radically changed as a result of Euro-American occupation for 100 years. Large tracts of forests were harvested for timber and for charcoal production for the iron ore industry. Later, forests were cleared for agriculture and livestock, to build homes, provide fuel for heat through the long winters, and were utilized for thousands of other household items. Some of the remaining woodlands—now some of the most valuable areas of standing timber on Fort Drum today—were sugar maple stands that were used to collect sap and make maple syrup (Fort Drum 2020b). Widespread reforestation activities began to occur in the early 1900s by civic organizations and in the 1930s by the Civilian Conservation Corps.

The changing landscape also impacted wildlife, both indirectly due to habitat changes and directly though hunting, fishing, and trapping. Many local citizens supplemented

their food supply through hunting and fishing, as well as their incomes through trapping fur-bearing animals and receiving bounties from killing predatory wildlife such as bears, cougars, and wolves. Hunting, fishing and trapping were means of survival for the early settlers and are now very popular recreational activities.

In 1906, the US War Department began a search for places to locate military installations. In 1907, elements of the NYS National Guard conducted the first documented large-scale maneuvers on lands that would eventually become Fort Drum. With the success of this exercise and the suitability of the training area, 2,000 regulars and 8,000 militia personnel were sent to the area in 1908 for a larger, week-long training exercise where the “pine plains” were found to be an ideal place for military training. In 1909, $55,000 was allocated to purchase 10,000 ac (4047 ha) of land and Pine Camp was established.

Pine Camp was in the national spotlight in 1935 when the largest peacetime maneuvers to date were held on Pine Plains and surrounding farm lands. Approximately 36,500 Soldiers took part in a 36-hour exercise across 100 mi (161 km) of land the Army had leased for the exercise. The maneuvers were judged to be successful and the War Department made additional land purchases from 1935-39. When purchasing was completed, the installation comprised 19,000 ac (7,689 ha). In 1940, large scale maneuvers featured the introduction of mechanized “tanks” alongside the horse-mounted cavalry and horse-drawn artillery.

With the outbreak of World War II in Europe and the Pacific, the US began to expand its armed forces including its training facilities. In 1940, Pine Camp was selected for a major expansion and an additional 75,000 ac (30,351 ha) of land was purchased in 1941. With that purchase, five entire villages and surrounding farms were eliminated affecting 525 local families. In a period of 10 months at a cost of $20 million, 800 buildings were constructed. An additional 5,600 ac (2,266 ha) of land, mostly in Lewis Co., was purchased in 1942 and 8,600 ac (3,480 ha) was purchased in 1948 which completed the present-day boundary of Fort Drum. The Fort Drum of 1945 looked very different than the Fort Drum of today. Approximately the western two-thirds of the installation were agricultural fields, pastures, and woodlots; the northeast corner of the installation was mostly forested.

During World War II, three divisions trained at Pine Camp including General George S. Patton's 4th Armored Division, the 45th Infantry Division, and the 5th Armored Division. Following World War II, Pine Camp resumed its mission as a seasonal training ground for the National Guard and occasional regular Army units. In 1951, Pine Camp became Camp Drum, named after Lt. Gen. Hugh A. Drum, commander of the First Army during World War II. During and after the Korean Conflict, a number of units were stationed and trained at Camp Drum to take advantage of the terrain and climate.

Camp Drum was designated Fort Drum in 1974 when a permanent garrison was assigned. In 1980, the 76th Engineer Battalion (Combat Heavy) was reassigned to Fort Drum from Fort Meade, Maryland to enhance the post as a training area. In September 1984, the Department of the Army announced Fort Drum would be the home of the 10th Light Infantry Division. The first division troops arrived at Fort Drum in December 1984 and the unit was officially activated in February 1985 and the name was changed to the 10th Mountain Division (Light Infantry or LI). The 10th Mountain Division (LI) reached full strength in 1989.

Between 1985 and 1992, $1.3 billion was invested into Fort Drum making it the largest peacetime military construction expansion in the continental United States since WW II. Construction activities included a new cantonment area, improved airfield, 130 new buildings, 35 miles of roads, and 4,272 family housing units.

Beginning in 2005, Fort Drum experienced its third major expansion with the transformation of the US Army and the Residential Communities Initiative (RCI) privatizing Army housing. Army transformation resulted in the 1st and 2nd Brigades being transformed into Brigade Combat Teams (BCTs) and the addition of two more Brigade Combat Teams—the 3rd BCT at Fort Drum and the 4th BCT stationed at Fort Polk, Louisiana. Transformation resulted in a population increase of more than 6,000 Soldiers and 4,500 Family members. Fort Drum Mountain Community Homes is Fort Drum's RCI partner and a master-planned community of 3,782 residential homes, 192 UPH apartments, 5 community centers, playgrounds, walking trails, splash parks, and bark parks on Fort Drum. To accommodate both the transformation and additional Soldiers and Family members, the Army completed more than $2 billion worth of construction projects by the year 2014 to support 20,000 Soldiers.

2.4 Operations & Infrastructure

Fort Drum is operationally divided into a Cantonment Area, an airfield, an ammunition supply point, and a Training Area with ranges, maneuver areas, and impact areas (Appendix 9, Figure 1).

2.4.1 Mission & Population

The Fort Drum garrison is under the Installation Management Command (IMCOM) Readiness Directorate that provides traditional oversight of installation operations functions, contingency operations, and crisis management.

The 10th Mountain Division (LI) is the primary active component at Fort Drum. The major command for the 10th Mountain Division is the US Army Forces Command (FORSCOM). The mission of the 10th Mountain Division (LI) is: *"Team Mountain – an integrated, multi-component, joint team of Soldiers, airmen, civilians, Families, and regional partners – prepares globally responsive combat-ready forces; on order, rapidly deploys adaptive expeditionary units and executes unified land operations in support of the joint force to win in a complex world."*

The 10th Mountain Division (LI) consists of three Light Infantry Brigade Combat Teams (BCTs) (two are stationed at Fort Drum and the third is stationed at Fort Johnson, LA), an Aviation Brigade, Division Artillery, a Sustainment Brigade, and other support elements and tenant units.

Fort Drum is a Department of the Army designated Northeast Regional Collective Training Center that provides full spectrum training and base operations support to 11 states and parts of Canada. Fort Drum is a Power Projection Platform capable of rapidly deploying the 10th Mountain Division (LI) and mobilized forces anywhere in the world. Emphasis is directed toward low to medium intensity conflict with one Brigade Combat Team (BCT) able to depart the installation within 24 hours. In 2001, the 10th Mountain

Division (LI) provided the first conventional combat forces to deploy to Afghanistan in response to the September 11 attacks. The 10th Mountain Division (LI) remains one of the most deployed divisions in the US Army.

In CY21, 204,297 personnel/days were spent training on Fort Drum by 10th Mountain Division Soldiers and tenant units. At the same time, training missions were conducted repeatedly at a minimum of 8 other CONUS sites and 10th Mountain Division (LI) Soldiers were deployed to a minimum of 10 countries.

Fort Drum is also the largest training facility in the region for the US Army Reserve, Army National Guard, Air National Guard, US Air Force Reserve, and US Marine Corps Reserve to fulfill their individual and annual training needs and mobilization. Fort Drum supports active duty Army Soldiers and Marines for winter training, as well as, periodic training by Canadian forces. In FY 21, approximately 14,950 reserve component service members, non-Fort Drum active duty personnel, and other entities trained at Fort Drum; that number was closer to 45,000 during full engagement in Operations Iraqi Freedom and Enduring Freedom.

At the end of FY21, the Fort Drum population included 15,657 active duty military personnel from divisional units, functional support units, and tenant units (excluding National Guard and Reserve units); approximately 15,832 family members (with about half living in the Cantonment Area); and approximately 3,755 civilians. (including federal employees and contractors).

2.4.2 Infrastructure

2.4.2.1 Cantonment Area & Wheeler-Sack Army Airfield

The Cantonment Area is in the southwestern part of the installation and includes residential housing and support facilities (e.g., headquarters, barracks, vehicle maintenance facilities, recreational facilities, etc.). The Cantonment Area is functionally two separate areas—one south of NYS Rte. 26 and a newly constructed one north of NYS Rte. 26 near WSAAF (Appendix 9, Figure 1).

The Cantonment Area consists of 8,951 ac (3622 ha); 8,255 ac (3,341 ha) is surrounded by an 18 mi (29 km) perimeter fence constructed in 1988. This cantonment area is bordered by NYS Rte. 26 to the north, NYS Rte. 342 to the south, US Hwy 11 to the west, and NYS Rte. 3 to the east. Approximately 3,678 ac (1,488 ha) of the Cantonment Area is developed (including landscaped yards). Of the remaining 4,577 ac (1,852 ha) of undeveloped land, 40% are local training areas assigned to individual units used to reinforce basic soldier skills. The new northern cantonment area has been undergoing construction since 2004 and consists of approximately 906 ac (367 ha). The northern cantonment area is bordered by WSAAF to the west, the Black River to the south, and Training Areas 5 and 6 to the east and north.

WSAAF is 2,243 ac (908 ha) and is bordered by NYS Rte. 26 to the south, the northern cantonment area to the east, and Training Areas 4, 5, and 6 to the east, north, and west. The entire perimeter of WSAAF is fenced. Aircraft operations at Fort Drum and WSAAF include rotary-wing, unmanned aerial vehicles (UAV), and fixed-wing aircraft.

WSAAF has expanded its area and its mission since 1997 in response to the 1995 Defense Base Realignment and Closure Commission (BRAC) recommendation that the Griffiss Air Force Base deployment mission be transferred to WSAAF. WSAAF now has three fixed-wing runways: Runway 3/21 was extended to 10,000 ft (3 km)—the longest in the northeastern US—to accommodate any aircraft in support of deployment missions. Another 820 ft (250 m) launch and recovery runway was constructed in Training Area 5A in 2005 for use by Unmanned Aerial Vehicles (UAV).

Surrounding WSAAF are areas associated with various land use restrictions. Approach-Departure Zones are narrow fan-shaped regions of airspace into which aircraft fly upon arrival to or departure from a runway. Clear Zones are the areas immediately beyond the end of runways which has a high potential for accidents where development and certain other activities are prohibited. Aircraft clear zones total 814 ac (329 ha) for Runways 15-33 and 08-26 which extend into Training Areas 3 and 4 to the west and Training Area 6 to the east; and for Runway 03/21 which extends into Training Areas 4 and 5. Accident Potential Zones are located in areas beyond the Clear Zones which are classified as having significant or measurable potential for accidents. Certain activities, facilities, and tall structures are restricted in these areas.

2.4.2.2 Ammunition Supply Point

The ammunition supply point (ASP) is a 375 ac (152 ha) facility located in Training Area 5E. The ASP is surrounded by a perimeter fence and has a variety of storage facilities. A 1,860-ft (567 m) Quantity Safety Distance arc is designated for the ASP which increases the ASP footprint an additional 1,385 ac (560 ha) in Training Areas 5, 6, 7, and 8 with associated land use restrictions.

2.4.2.3 Training Lands & Main Impact Area

Most military training on Fort Drum occurs north of NYS Rte. 26. The Training Area supports all manner of training from light infantry to air assaults with helicopters, from artillery to armor, from fixed wing aircraft and unmanned aerial vehicles to anti-aircraft missiles. This Training Area is approximately 98,299 ac / 39,780 ha (90% of the entire installation) and can be roughly divided into three components: maneuver area, range area and training facilities, and impact area.

Maneuver areas consist of approximately 68,756 ac (27,825 ha) and are divided into 18 training areas which are further divided into 70 sub-training areas ((Appendix 9, Figure 1). Sizes of sub-training areas are between 133 ac / 54 ha (Training Area 6B) to, 4,213 ac / 1705 ha (Training Area 19A). Of the 18 Maneuver Training Areas, four are classified for Heavy Maneuvers (Training Areas 10, 12, 13, and 17) and the remaining 14 are classified for Light Maneuvers. Throughout the maneuver area, there are approximately 94 bivouac areas, 69 landing zones, and 196 surveyed indirect firing points including one hardened artillery firing point in Training Area 8A primarily used for firing field artillery, mortars, and other forms of indirect live-fire training.

Maneuver training exercises are conducted at all unit levels to ensure a combat-ready fighting force from individual troop qualifications to large-scale training exercises at the Brigade level. Brigade level exercises (e.g., Mountain Peak) occur usually twice a year involving up to 5,800 personnel throughout the entire Training Area.

Fort Drum training facilities are capable of supporting the doctrinal training requirements of today's Army. There are 26 ranges for small arms (e.g., pistol, rifle, machine gun, grenade launcher); 9 singular purpose live fire ranges (e.g., shoot houses, engineer qualification area and demolition ranges, hand grenade range, breach facility); 15 reconfigurable live fire maneuver ranges (e.g., FUSA Blvd. Convoy Live Fire Course, Range 24 Infantry Platoon Battle Course, Range 37 Anti-Armor Live Fire Range); 8 observation posts/mortar ranges; and 7 urban training facilities (including a 9.5 ac (3.8 ha) Military Operations Urban Terrain (MOUT) assault course and a Combined Arms Collective Training Facility (CACTF), both in Training Area 13A.). There are also a number of other training facilities throughout the training area including a Bayonet Assault Course; a Confidence Course; a Nuclear/Biological/Chemical facility; an Expert Field Medical Badge Training and Qualification site; a Forward Operating Base in Training Area 5A; and a Floating Bridge site over the Black River in Training Area 6A and 6B.

Aviation units also actively train on Fort Drum at all echelons from individual through battalion/squadron. The training tasks accomplished in the training areas include all tactical maneuvers, performed in accordance with each aircraft's aircrew training manual and the unit's standard operating procedures. These maneuvers include nap-of-the-earth (flying very close to the ground while following the contours of land features), equipment and personnel drops, and low-level flight. Fixed-wing aircraft of the US Air Force (USAF) and Air National Guard (ANG) also conduct training missions in Fort Drum airspace and use Range 48 (Air-to-Ground Gunnery) for weapon gunnery/delivery practice. There are 14 aviation training areas; a 4,000 ft (1,219 m) long flight landing strip (Belvedere Tactical Landing Strip) in Training Area 13A; a Forward Air Refueling/Re-arming Point (FARRP) site in Training Area 18A; and two drop zones (Chute DZ and Panther DZ) in Training Areas 12C and 13A.

The aircraft that predominantly operate on WSAAF and in the Fort Drum airspace are rotary-winged UH-60 Black Hawk, AH-64 Apache, and CH-47 Chinook; during certain training events fixed-winged A-10 Warthog and F-16 Falcon will fly primarily in and around WSAAF and Range 48; and during deployments and other training events fixed wing C-17 Globemaster, C-5A Galaxy, C-130 Hercules, and other commercial aircraft will operate. Unmanned aerial vehicles will also operate throughout the Training Area.

The combined total of all the ranges are approximately 6,844 ac (2,770 ha), but most ranges also have surface danger zones, or range safety fans, associated with their operation. The size of each surface danger zone varies by the type of ammunition fired and number of firing lanes and target layout. In general, the range surface danger zones at Fort Drum overlap and are oriented toward the Main Impact Area, thereby reducing the overall acreage needed for the range system.

The Main Impact Area, a designated area in which dud-producing ordnance impacts and/or detonates, is 20,222 ac (8,184 ha). The Main Impact Area receives firing from a variety of ordnance and is contaminated with dud and unexploded ammunition making it generally off-limits to all personnel without the approval of the Range Control Officer. Training Area 20 (2,477 ac / 1002 ha) was historically used as an impact area, but it has been surface-cleared of unexploded ordnance (UXO), so training activities are allowed except those that involve digging or otherwise disturbing the soil.

2.4.2.4 Agricultural Lands

Fort Drum has no lands currently used for large-scale agricultural purposes for croplands and/or pasture. From 2007-2017, 0.86 acres was leased under a single agreement for 10 apiaries throughout the Training Area, but there are no plans to lease areas for apiaries in the future. In the future, hay leases may be an option to support grassland management.

2.5 Natural Environment

The natural environment is described in the following section as it relates to natural resources management on Fort Drum. For more detailed information, see the references cited in this section.

2.5.1 Climate

Fort Drum has a primarily humid, continental climate with relatively long, cold winters and short, warm and often humid summers.

Temperatures fall below 0°F (-17.8 °C) approximately 20 days during December – February; below-freezing temperatures occur approximately 104 days from December – March. With slightly higher elevations and a greater distance from Lake Ontario, the northeastern part of the installation has winter temperatures 2 - 4 °F lower than those recorded at WSAAF. Wind chills cause winter temperatures to feel much colder. The mean annual wind velocity on Fort Drum ranges from 6 -11 knots.

The mean annual precipitation on Fort Drum is about 41 in (104 cm), and precipitation is well distributed throughout the year. The record-high annual precipitation was 55.4 in (140.7 cm) in 1972, and the record-low annual precipitation was 26.96 in (68.5 cm) in 1908 (USACE 1977). Snowfall is fairly heavy, with an annual average of 109 in (276.9 cm) at Fort Drum. However, snowfall is quite variable, not only from year to year but also from place to place as a result of slope, elevation, and other factors. Snow cover can be several feet deep from December through March.

2.5.2 Geology & Soils

There are 193 different soil types mapped on Fort Drum. The largest soil series by acreage across the installation is “Plainfield Sand, 0-8% slopes” with 8,587 ac (3,475 ha); the soil series with the largest number of isolated occurrences is “Deerfield Loamy Fine Sand, 0-8% slopes” with 174 locations. Both of these soil types are prevalent in the Eastern Ontario Plains Ecoregion. The predominant soil series in the Main Impact Area and Training Areas 18, 19 and 20 is the “Insula-Millsite-Quetico-Rock Outcrop Complex, 3-15% slopes, very bouldery” comprising 8,227 ac (3,329 ha). The “Lyman-Abram complex, very bouldery, very rocky of various slopes” is prevalent across Fort Drum where rocky outcrops are prevalent. Both of these soil types are typical in the Western Adirondack Transition Ecoregion. Soil series that are a silt loam composition—Hudson silt loam, Rhinebeck silt loam, Collamer silt loam, and Niagara silt loam—are dominant in the St Lawrence Valley Ecoregion.

2.5.3 Ecoregions

Numerous classification schemes define ecozones or physiogeographic regions which place Fort Drum in one or more classifications. For this INRMP, Fort Drum natural resources professionals have developed their own ecoregion determinations and designations based on soils, topography, geology, hydrology, and vegetation.

- Soil data was provided by the National Resources Conservation Service (NRCS) in 2001 for portions of Jefferson and Lewis Counties within Fort Drum. This data was incorporated into a GIS layer by Fort Drum. Analysis of soil series by polygon was used to determine soil shifts in composition.
- Topographic information and Digital Elevation Models (DEMs) were used in GIS applications. DEMs were constructed using Arc Grid ®. These two tools were used to decipher significant elevation changes and identify outcroppings of bedrock from aerial photography.
- Hydrogeology of the Fort Drum area of Jefferson, Lewis, and St. Lawrence counties (Reynolds 1986) defined surficial geology and bedrock geology that was incorporated into GIS layers by Fort Drum. This GIS application was used in conjunction with the soil survey conducted in 2001 by NRCS to facilitate the identification of ecoregion boundary lines.
- The Watershed Management Plan currently being developed by the Aquatics Management Team (in progress) integrates Fort Drum's hydrological GIS data and waterbody inventories on the watershed level. This preliminary watershed analysis was used to help verify geological features based on the presence and concentration of lakes and open water within the watersheds of Fort Drum.
- Vegetation was analyzed using data from installation-wide surveys in 2003 and forest inventory data completed in 2006 by Fort Drum foresters. These data were built into a GIS layer by Fort Drum. Because certain plant species show a preference for certain soil types and hydrology, this information was important to verify abiotic conditions.

In general, most of Fort Drum has been influenced by glacial processes. Elevations on Fort Drum range from 410 to 911 ft (125 – 278 m). In general, soils on Fort Drum are not very fertile and organic soils are rare. Fort Drum can be characterized by five distinct ecoregions: Eastern Ontario Plains, St. Lawrence Valley, Western Adirondack Transition, Indian River Transition, and Black River Valley (Appendix 9, Figure 2).

2.5.3.1 Eastern Ontario Plains Ecoregion

The Eastern Ontario Plains ecoregion is approximately 30,000 ac (12,140 ha) situated in roughly the southern third of the installation. This ecoregion is represented by Training Area 7 and parts of Training Areas 4, 5, 6, 8, 9, and 14; WSAAF; ASP; and the southern part of the Cantonment Area and the new cantonment area constructed near WSAAF.

The Eastern Ontario Plains has an average elevation of 682 ft (208 m) with a range of 492 - 862 ft (150 - 263 m); the average slope is 3.5%. The Eastern Ontario

Plains ecoregion is characterized by hillocks formed from recessional moraines and drumlins, and small plains dominated by sandy soils including some areas with sand over 100 ft (30 m) deep. The sandy soils form a large surficial aquifer.

The vegetative communities are generally sandplain grasslands and oak savannah. The sandplain grasslands are characterized by low growing sedges and grasses less than 12 in (30 cm) tall with widely scattered trees. Native grasses and forbs found in the grasslands consist of Common Hairgrass (*Deschampsia flexulosa*), Blue Ridge Sedge (*Carex lucorum*), Parachute Sedge (*C. rugosperma*), and Stiff-leaf Aster (*Aster linariifolius*). White Oak (*Quercus alba*) and Northern Red Oak (*Q. rubra*) dominate the savannah areas. Associated with the oaks are White Pine (*Pinus strobus*), Lowbush Blueberry (*Vaccinium angustifolia*), Bush Honeysuckle (*Diervilla lonicera*), and Whorled Loosestrife (*Lysimachia quadrifolia*). Herbaceous vegetation in the savannas are similar to that found in the grasslands. Invasive plants such as Spotted Knapweed (*Centaurea maculosa*) have established colonies in the sandplains where disturbances have occurred from bivouac activities and along roadsides.

Unique species as well as rare plant communities occur in this ecoregion. The NYS Natural Heritage Program has designated the sandplains as a significant community and the oak savannah as a rare community. The state threatened Schweinitz's Sedge (*Carex schweintzii*) and Houghton's Sedge (*C. houghtonia*) can be found in the barren sandy areas. Frostweed (*Helianthemum canadense*) and Pinweed (*Lechea intermedia*), uncommon in northern New York, can be observed in the sandy areas that have some grass and sedge cover.

This is the area that was first known as "Pine Plains" that attracted the War Department to conduct military training in the region. Historically this area has been utilized for military training more than any other part of the installation. This ecoregion is also the most likely to be impacted by erosion both through excessive military training and wind erosion. At the same time, disturbances such as military training can inhibit ecological succession which is also a threat to these vegetative communities.

2.5.3.2 St. Lawrence Valley Ecoregion

The St. Lawrence Valley ecoregion is approximately 32,000 ac (12,950 ha) and located along the western edge of the installation. This ecoregion is represented by Training Areas 3, 12, 13, and 15; parts of Training Areas 4 and 16; the southern end of the Main Impact Area; and the northern part of the Cantonment Area.

The St. Lawrence Valley ecoregion has an average elevation of 580 ft (177 m) with a range of 410 - 747 ft (125 - 228 m).; the average slope is 2.9%. The St. Lawrence Valley is distinguishable based on its relatively unique silt composition and poor drainage. The silty-clayey soils were developed from glacio-lacustrine sediments.

The ecoregion is defined by shifts from bedrock to the north and sand to the east that dictated where the boundaries were mapped. Vegetative communities found in this ecoregion include grasslands on clay-loam soils, shrub thickets, and successional and mature northern hardwood forests. Grassland communities are dominated by grasses and forbs such as Timothy (*Phleum pratense*), Orchard Grass (*Dactylis glomerata*), Kentucky Bluegrass (*Poa pratensis*), goldenrods (*Solidago* spp.), and Vetch (*Vicia cracca*). Common species found in grassland areas reverting to shrub thickets include

dogwoods (*Cornus* spp.), cherry (*Prunus* spp.), and Meadowsweet (*Spiraea alba*). The areas that are wooded due to ecological succession support Red Maple (*Acer rubrum*), Striped Maple (*A. pennsylvanicum*), Yellow Birch (*Betula allegheniensis*), Gray Birch (*B. populifolia*), American Beech (*Fagus grandifolia*), Northern White Cedar (*Thuja occidentalis*), and Eastern Hemlock (*Tsuga canadensis*).

Due to its relatively flat topography and fertile soils, this area was historically used for agriculture. The existing grasslands are actually abandoned hayfields which represent the largest adjoining patch of open space. These open areas also provide ideal maneuver space for heavy training (i.e., tracked vehicles), both DZs, and the Field Landing Strip. Because of the history of human disturbance, this area has the most invasive and introduced plant species found on the installation.

2.5.3.3 Western Adirondack Transition Ecoregion

The Western Adirondack Transition ecoregion is approximately 43,500 ac (17,603 ha) located in the northeast quarter of the installation. This ecoregion is represented by Training Areas 18, 19, and 20; parts of Training Areas 14, 16 and 17; and the northern part of the Main Impact Area.

The Western Adirondack Transition ecoregion has an average elevation of 678 ft (207 m) with a range of 485 - 911 ft (125 - 278 m); the average slope is 7.0%. This ecoregion is unique to Fort Drum due to its higher elevations, mixed and conifer forests, and extensive outcroppings of bedrock and steep drop-offs. The bedrock is a conglomeration of dominant minerals including biotite, garnet, gneiss, quartz, and granite. Due to the shallow bedrock and physical formations caused from the last glacial retreat, many open water kettle lakes were formed in this region. In fact, all of the named natural lakes and ponds found on Fort Drum are in this ecoregion. The soil is relatively thin and loamy with a general transition from a sandier loam in the east to a clayey loam in the west.

Many areas in the Western Adirondack Transition support flora that are dependent on rich mineotrophic soils. Predominant tree species found in these areas include Eastern White Pine, Eastern Hemlock, Quaking Aspen (*Populus tremuloides*), Big-tooth Aspen (*P. grandifolia*), Red Maple, Sugar Maple, American Beech, Black Cherry (*Prunus serotina*), and Gray Birch.

2.5.3.4 Indian River Transition Ecoregion

The Indian River Transition ecoregion is approximately 2,100 ac (850 ha) located in the northwest corner of the installation. This ecoregion is represented by most of Training Area 17.

The Indian River Transition ecoregion has an average elevation of 526 ft (160 m) with a range of 481 - 585 ft (195 - 237 m); the average slope is 4.7%. This is a small yet distinct ecoregion different from the Western Adirondack Transition ecoregion because of its soil composition. The dominant soil is composed of clay or a clay-based complex. These soils have their origin from glaciolacustrine or glaciomarine deposits. The ecoregion boundaries are at the beginnings of the bedrock outcroppings that are prominent in the Western Adirondack Transition to the east and the silt-dominated soils of the St. Lawrence Valley ecoregion to the south.

Although the geology is different, the vegetative communities of this ecoregion resemble those of the Western Adirondack Transition ecoregion.

2.5.3.5 Black River Valley Ecoregion

The Black River Valley ecoregion is approximately 840 ac (340 ha) located on the southern edge of the installation—the only portion of the installation on the southern side of the Black River and is solely represented by Training Area 6A.

The Black River Valley ecoregion has an average elevation of 637 ft (194 m) with a range of 597 – 681 ft (182 - 208 m); the average slope is 3.5%. This ecoregion is unique due to the types of soils and the geo-processes responsible for their existence relative to the surrounding Eastern Ontario Plains ecoregion. The soils are classified as Galen and Arkport soils which are fine to very fine sandy soils. These soils are formed from the deltaic deposits of the Black River rather than the coarser sands formed from ancient Lake Iroquois.

Although the geology is different, the vegetative communities of this ecoregion resemble those of the Eastern Ontario Plains ecoregion.

2.5.4 Aquatic Resources

Almost all of Fort Drum (98%) is in the Oswegatchie River basin. Most surface drainage features on Fort Drum flow into the Indian River which eventually joins the Oswegatchie and St. Lawrence rivers north of Fort Drum; several streams in the Western Adirondack Transition ecoregion flow directly into the Oswegatchie. The remaining portion of Fort Drum (2%) is in the Black River basin.

There are seven primary lakes and ponds totaling about 450 ac (182 ha) of surface area on Fort Drum. The largest waterbody on Fort Drum is Indian Lake (180 ac / 73 ha) which is adjoined to Narrow Lake (41 ac / 17 ha) through a narrow channel. There are two rivers and approximately eight primary streams on Fort Drum totaling about 91.9 mi / 147.9 km. Wetlands are prevalent throughout the installation and comprise approximately 20% of the land area on Fort Drum. See Appendix 9, Figure 4 for a map detailing the watersheds and water resources on the installation.

For more information about aquatic habitats on Fort Drum, see *Section 4.1.2 Status of Aquatic Resources*.

2.5.5 Flora & Vegetative Communities

Overall, Fort Drum supports a diverse and varied flora due to the convergence of the varied ecoregions. In general, the Eastern Lake Ontario, Western Adirondack Transition, and Black River Valley ecoregions with sand and limestone influenced soils often contain more specialized and/or rare plants and plant communities; while the St. Lawrence Valley and Indian Lakes Transition ecoregions with more common loamy or clay soils support more common plants.

A total of 1,020 plant species have been recorded on Fort Drum. Appendix 3 lists all the floral species documented on Fort Drum. In general, floristic surveys have been limited

and additional species continue to be documented. Refer to *Section 4.2.2* for information on vegetative surveys and *Section 4.2.2.5 and 4.2.2.6* for information about state listed or other specially classified species and communities.

On Fort Drum, there are 93 landcover/vegetation type classifications. In general, the major vegetation types and associated acreages on Fort Drum are listed in Table 2.1. See Appendix 9, Figure 3 for a landcover map of the Installation.

Landcover was determined on Fort Drum first by analyzing aerial photographs and creating polygons of similar land cover types. In 2003, an installation-wide ground-truthing effort occurred where the landcover (e.g., upland forest, wet shrubland, etc.) and main species in the dominant stratum were recorded for each polygon. The classification scheme of land cover followed the Vegetation Classification Standard (FGDC 1997).

Table 2.1 Approximate dominant vegetative cover acreage on Fort Drum based on 2006 digitizing efforts and last updated March 2011). Remaining acreage of Fort Drum includes surface waters, exposed bed rock and sand, landscaped yards, development, etc.

Types	Acres	Hectares
Forest Upland	58,299	23,593
Forest Wetland	3,887	1,578
Shrub Upland	9,559	3,885
Shrub Wetland	3,823	1,538
Forb Community Upland	987	404
Forb Community Wetland	122	40
Graminoid Community Upland	12,549	5,059
Graminoid Community Wetland	2,898	1,173
Fort Drum (Total)	92,124	37,270

For more information about vegetative communities on Fort Drum, see the relevant portions of see *Section 4.1.2.Status of Aquatic Resources* and *Section 4.2.2 Status of Land Resources*.

2.5.6 Fauna

Due to the diversity of flora and habitats, Fort Drum supports a wide variety of wildlife. Various surveys have confirmed the occurrence of 49 mammals, 252 birds, 42 fish, 15 reptiles, and 22 amphibian species on the installation. Invertebrates have not been adequately surveyed on Fort Drum to determine the number of species, although formal surveys for Odonates, sand wasps and moths, and informal and opportunistic inventories for other insects have documented more than 1000 species. The sandy areas with sparse or low vegetation in the Eastern Lake Ontario ecoregion and the grassland areas in the St. Lawrence Valley ecoregion contain the greatest number of NYS species of special concern, mainly birds. Refer to *Section 4.3.2* for information about listed or otherwise specially classified species. A list of specially classified species know to occur on Fort Drum can be found in Appendix 5. See *Section 4.3.4 Fish & Wildlife Management* for more information on fish and wildlife surveys and management. A list of all vertebrate species and invertebrate families documented on Fort Drum are listed in Appendix 4.

3. Community & Mission Sustainability

"Community" in this chapter of the INRMP is used in a broad sense to include entities outside the Fort Drum Army Garrison with whom Natural Resources staff interacts with or could interact with in the future in relation to management of natural resources and supporting the mission. This section also addresses issues "outside" of Fort Drum that still impacts Fort Drum.

3.1 Community Stakeholders & Partners

3.1.1 Tribal Governments

According to DoD Instruction 4710.02, consultations must be conducted with tribal governments when there are tribal rights to natural resources or when natural resources management affects tribal treaty rights. Fort Drum currently consults with the Oneida Indian Nation, the Onondaga Nation, and the St. Regis Mohawk Tribe. The Cultural Resources Section (DPW – Environmental Division) is responsible for consultation with tribal and nation governments. Access to sacred and ancestral sites in addition to natural resources identified as important by and for indigenous people is an institutional priority on Fort Drum (Fort Drum 2020b). To date, no natural resources issues have been consulted upon although there has been past discussions regarding tribal deer hunts in the Cantonment Area. Further information and guidance concerning Native America consultation on Fort Drum is available in the Installation's Integrated Cultural Resources Management Plan (ICRMP; Fort Drum 2020b).

3.1.2 Federal Government Agencies

3.1.2.1 US Department of Interior - Fish & Wildlife Service

The US Fish & Wildlife Service (USFWS) Region 5 Headquarters is in Hadley, Massachusetts. Fort Drum coordinates and consults with this office on Bald and Golden Eagle Protection Act considerations and migratory bird permits for depredation and salvage.

The primary office Fort Drum interacts with is the USFWS New York Field Office in Cortland, New York which was designated the official Sikes Act liaison for Fort Drum in 2006 and is the signing authority for this INRMP. The USFWS is involved with all Section 7 consultations concerning federally threatened and endangered species, a member of the Interagency Review Team for wetland banking, and an interested party in the ACUB Program. Fort Drum Natural Resources staff are in regular contact with their USFWS counterparts related to endangered species, Bald Eagles, and occasionally with the wetland mitigation bank and migratory birds. The USFWS is invited twice a year to attend a Natural Resources Conservation Meeting chaired by the Garrison Commander. These meetings include natural resources professionals from Fort Drum, USFWS and NYSDEC; law enforcement personnel from Fort Drum and NYSDEC; and other internal stakeholders. Topics at these meetings usually include the same items addressed in this INRMP: habitat management, endangered species, migratory birds, human-wildlife conflicts, recreation, and any other timely issues.

Prior to 2006, the Sikes Act liaison was the Lower Great Lakes Fish & Wildlife Conservation Office which is now located in Basom, New York. This office was contracted to conduct several fisheries projects on Fort Drum from 1995-2004 and again starting in 2022.

3.1.1.2 US Department of Defense - Army Corps of Engineers

The USACE-New York District is the office Fort Drum interacts with regarding the Clean Water Act. The New York District reviews jurisdictional determinations, issues Regional General Permit (RGP) conditions or Regional Conditions for Nationwide permits, determines mitigation procedures, and is a member of the Interagency Review Team for wetland banking.

The USACE-Norfolk District is the office the Fort Drum Conservation Reimbursable Program is required to market saleable timber through via a contracting officer. An MOU between Fort Drum and the Norfolk District was last updated in 2009.

The USACE-Fort Worth District is the designated grants office in order to partner with and fund other entities in the Cooperative Ecosystem Studies Unit (CESU) Network.

Fort Drum also has partnered in various capacities with staff from the USACE-Engineer Research and Development Center (ERDC) in both Vicksburg and Champaign offices; as well as staff at Buffalo District Office.

3.1.2.3 US Department of Agriculture - Animal Plant Health Inspection Service

Fort Drum began partnering with USDA-Animal Plant Health Inspection Service-Plant Protection and Quarantine (APHIS-PPQ) in 2006 to provide additional insectary locations of flea beetles as a biocontrol agent for leafy spurge and assist with the management of invasive plants within the region. Fort Drum has continued to partner with APHIS-PPQ and has released other biocontrol agents for Purple Loosestrife and Spotted Knapweed and has surveilled for other species invasive species such as the Emerald Ash Borer (*Agrilus planipennis*) and Spongy Moth (European Gypsy Moth (*Lymantria dispar*)).

APHIS-PPQ is also responsible to assist in inspections and pre-clearances of aircraft, personnel, cargo, containers, packing material, and equipment, as well as to train DoD personnel for inspection, cleaning, and disinfecting of material and personnel. The Natural Resources Branch has no involvement in these activities.

Fort Drum had contracted with APHIS-Wildlife Services (APHIS-WS) in the past regarding beaver management and annually for WS Form 37 as part of the USFWS migratory bird depredation permit process. In 2018, APHIS-WS was contracted on a regular basis for beaver trapping and deer culling activities. Beginning in 2019, APHIS-WS was contracted for a full-time staff person to be stationed at Fort Drum for all human-wildlife conflict issues; extra assistance was contracted for deer culling activities. APHIS-Wildlife Services is invited twice a year to attend a Natural Resources Conservation Meeting chaired by the Garrison Commander.

3.1.2.4 US Department of Agriculture - Forest Service

The US Forest Service (USFS) is available to conduct forest pest suppression actions for Army Forestry Programs. If forest pest numbers ever reach a critical point, a request for forest pest suppression funding can be initiated and a USFS insect and disease specialist would come to the installation to conduct a biological evaluation of the problem and validate approaches to control outbreak. Once this is complete, funding is sought, and once obtained; the USFS conducts the proposed action. No project has ever been funded on Fort Drum.

In the 1990s and early 2000s, USFS personnel from the White Mountains National Forest in New Hampshire assisted with prescribed burns on Fort Drum.

In 2007, Fort Drum collaborated with the USFS, Forest Health Protection staff in Durham, NH to conduct a study with the invasive *Sirex* Wood Wasp (*Sirex noctilio*) and pine management.

An interservice agreement was created in 2007 for a USFS staff member to be hired and work at Fort Drum through 2009 whose primary focus was the development of the biological assessment for the federally-endangered Indiana Bat. This agreement was through the Northeastern Area State & Private Forestry program at Newtown Square, Pennsylvania with the Finger Lakes National Forest as the supervisory location.

3.1.2.5 US Department of Energy – Oak Ridge Institute of Research & Education

The Oak Ridge Institute for Science & Education (ORISE) program is intended to enhance current students or recent graduates with educational development and/or work experience by providing practical experiences in their chosen field of study. The US Army Environmental Command (USAEC) has established a formal Memorandum of Agreement with the Department of Energy for participation in ORISE. Fort Drum has had several ORISE participants from 1995-2015.

3.1.3 State Government Agencies

3.1.3.1 New York State Department of Environmental Conservation

Fort Drum is in NYSDEC Region 6. The primary office Fort Drum interacts with is the NYSDEC Regional Office in Watertown, New York. NYSDEC is responsible for management of all fish and wildlife species in NYS, state designated wetlands, and other natural resources concerns. NYSDEC is one of the signatory cooperators in the development and implementation of this INRMP in accordance with the Sikes Act.

Fort Drum Natural Resources staff are in regular contact with their NYSDEC counterparts related to conservation law enforcement, deer management, hunting, fishing, trapping, bats, Bald Eagles, wetland permits, and many other issues. NYSDEC is invited twice a year to attend a Natural Resources Conservation Meeting chaired by the Garrison Commander. These meetings include natural resources professionals from Fort Drum, USFWS and NYSDEC; law enforcement personnel from Fort Drum and NYSDEC; and other internal stakeholders. Topics at these meetings usually include the same items addressed in this INRMP: habitat management, federally-listed endangered and threatened species, migratory birds, human-wildlife conflicts, recreation, and any

other timely issues. Occasionally Fort Drum staff has been invited to participate in various NYSDEC fish and wildlife management meetings.

In 1959 the first cooperative plan, or agreement, for the conservation and development of fish and wildlife resources was signed by Fort Drum, NYSDEC, and USFWS; Fort Drum remains the largest Fish and Wildlife Management Act Cooperating Hunting Area in New York State. Cooperative agreements have been renewed periodically since 1959 with the most recent agreement as part of this INRMP—see the Memorandum of Agreement between Fort Drum, the USFWS, and NYSDEC in Appendix C2 of the Commander's Guide Supplemental. NYSDEC Environmental Conservation Officers have concurrent jurisdiction on Fort Drum for the enforcement of natural resources laws and regulations.

Fort Drum works with NYSDEC to receive Article 15 and/or Article 24 permits for proposed activities determined to impact designated waters and wetlands. Separate Article 24 permits are issued for beaver management activities. NYSDEC is also a member of the Interagency Review Team for wetland banking.

Fort Drum has been open to the public for deer hunting since 1959 as a part of NYSDEC Deer Management Unit 19; in 1998, NYSDEC established Fort Drum as its own Wildlife Management Unit (WMU) 6H. Fort Drum continues to work cooperatively with NYSDEC regarding deer management—NYSDEC has issued Deer Management Assistance Program (DMAP) permits to Fort Drum for taking antlerless deer in the Cantonment Area since 1999; Deer Management Permits (DMPs or "doe tags") for taking antlerless deer in WMU 6H since 2002; and Deer Damage Permits for wildlife control activities at WSAAF (since 2017) and in the Cantonment Area (since 2018).

NYSDEC continues to stock approximately 4000 trout on Fort Drum annually. See Table 4.53 for fish stocking information from 1995-2023.

Fort Drum and NYSDEC have worked cooperatively on two research projects—a bear demography project led by Cornell University and funded by Fort Drum (Wegan 2008) and a grouse mortality project (Skrip 2010) led by the State University of New York-College of Environmental Science and Forestry (SUNY-ESF) and funded by NYSDEC with one of two study sites on Fort Drum.

Fort Drum and NYSDEC have also worked together on various wildlife survey efforts. Fort Drum participated in state-wide Black Tern surveys in 1998, 2001, 2004, 2007, and 2010. Fort Drum staff has conducted state waterfowl surveys along the Indian River within a randomly selected 1-km^2 block from about 2000 to 2015. Fort Drum has facilitated access to NYSDEC personnel conducting a study of Golden-winged and Blue-winged Warblers from 2007-2009. Fort Drum has provided access and field tours for NYSDEC staff interested in grassland and early successional communities on the installation. NYSDEC has also conducted several fisheries surveys. Fort Drum and NYSDEC have also worked cooperatively on bat research and management since 2007. Fort Drum has facilitated NYSDEC Bald Eagle surveys of the installation at various times and worked with NYSDEC to create regulatory signage for the Bald Eagle nest on Fort Drum in 2020. Fort Drum and NYSDEC have also loaned equipment to one another for various projects as necessary.

Fort Drum was able to support a training mission to transport and deposit lime on acidified lakes in Adirondack Park in 2003.

Fort Drum's early successional forest management (see *Section 4.2.4.1.10*) that began in 2005, is already in line with NYSDEC's 2014 Young Forest Initiative that plans to establish a minimum of 10% of the forested habitat on each wildlife management area (WMA) as young forest, which will be maintained in perpetuity to provide habitat for those species that depend on young forest; to maintain existing shrublands; and to allow fields to become new shrub/woodlands on state wildlife management areas. Likewise, many of Fort Drum's other activities and monitoring efforts are tracking NYSDEC objectives in the State Wildlife Action Plan. See INRMP *Section 3.2 State Wildlife Action Plan* for a brief synopsis of the plan (NYSDEC 2015) and INRMP *Section 4.3 Fish & Wildlife Resources* for more information about the species or groups of species.

3.1.3.2 NYS Department of Agriculture & Markets

NYS Department of Agriculture & Markets are sometimes involved in surveillance and monitoring of forest pests such as the *Sirex* Wood Wasp and Emerald Ash Borer (*Agrilus planipennis*).

3.1.4 Non-Governmental Organizations

3.1.4.1 Fort Drum Mountain Community Homes

Fort Drum Mountain Community Homes (FDMCH) is a privatized military housing community established in 2004 through a partnership between Lend Lease (US) Public Partnerships and the US Army. FDMCH is a master-planned community of over 3,800 residential homes, 4 community centers, playgrounds, walking trails, splash parks and bark parks on Fort Drum. Natural Resources Branch personnel engage with FDMCH personnel on a number of shared issues in the Cantonment Area such as bats, ticks, deer, and invasive plants.

3.1.4.2 Ducks Unlimited

Ducks Unlimited (DU) is a nationwide private nonprofit conservation organization founded in 1937. The DU mission is to conserve, restore and manage wetlands and associated habitats for North America's waterfowl. DU has been Fort Drum's ACUB Cooperative Agreement partner from 2008-2022. The primary DU office for Fort Drum's ACUB program is the Manager of Conservation Programs-North Atlantic in Liverpool, NY. DU serves as the lead partner and coordinates administrative and reporting tasks and cooperates with local land trusts, primarily Tug Hill Tomorrow Land Trust. DU holds one easement in the ACUB program.

Fort Drum Natural Resources staff have engaged with Ducks Unlimited staff occasionally regarding potential projects.

3.1.4.3 Tug Hill Tomorrow Land Trust

Tug Hill Tomorrow Land Trust (THTLT) is a regional, private, nonprofit organization founded in 1990 by a group of Tug Hill residents, but encompasses approximately 2,100 square miles. The mission of THTLT is to protect the working farms, forests and

wildlands of Tug Hill and surrounding areas in Jefferson, Lewis, Oneida, Herkimer and Oswego counties. The THTLT office is located in Watertown, NY. THTLT operates as the primary sub-receipting partner and has also been involved with the ACUB program since the original Cooperative Agreement was signed in 2008. THTLT performs the majority of the outreach to private landowners, acquisition, and monitoring of ACUB parcels. As of November 2022 when the first ACUB cooperative agreement ended, THTLT held 31 of the 32 easements for the Fort Drum ACUB program including both fee simple easements.

3.1.4.4 St. Lawrence-Eastern Lake Ontario Partnership for Regional Invasive Species Management (SLELO-PRISM)

Because the management of invasive species is most effectively done on a regional basis, Fort Drum became a cooperating member of what is known now as the St. Lawrence-Eastern Lake Ontario Partnership for Regional Invasive Species Management (SLELO-PRISM) in 2006. SLELO-PRISM is a collaborative effort between principal and cooperating partners throughout Jefferson, St. Lawrence, Lewis, Oswego and Oneida counties (http://www.sleloinvasives.org/) to address the threat of aquatic and terrestrial invasive species in a cooperative, comprehensive, cost-effective way across a designated geographical area.

3.1.4.5 Cornell Cooperative Extension of Jefferson County

Cornell Cooperative Extension of Jefferson County is a subordinate governmental agency with an educational mission that operates under a form of organization and administration approved by Cornell University as agent for NYS and is tax-exempt under section 501(c)(3) of the Internal Revenue Code. The association is part of the national cooperative extension system, an educational partnership between County, State, and Federal governments. As the NYS land grant university, Cornell administers the system in NYS. Each Cornell Cooperative Extension association is an independent employer that is governed by an elected Board of Directors with general oversight from Cornell. All associations work to meet the needs of the counties in which they are located as well as state and national goals. The main office is in Watertown, NY; there are also additional offices at Fort Drum, but they are not related to natural resources management.

Cornell Cooperative Extension of Jefferson County and Fort Drum Natural Resources staff have primarily cooperated on educational and recreational programs. Fort Drum and Cornell Cooperative Extension work together for the annual Outdoor Adventure Day at Fort Drum in August. Fort Drum is the host location for Environmental Awareness Days organized by Cornell Cooperative Extension two days every September for sixth graders in the region. Fort Drum Natural Resources personnel have also given educational programs at Cornell facilities at 4H Camp Wabasso in Theresa and afterschool programs organized by Cornell Cooperative Extension.

3.1.4.6 St. Lawrence River Watershed Partnership (SLRwP)

This partnership formed in 2015 from Clinton, Franklin, Essex, Hamilton, Herkimer, Jefferson, Lewis, and St. Lawrence counties to encourage watershed partnerships and the implementation of conservation projects that promote, enhance, and protect natural resources and water quality. The majority of the Fort Drum (98%) is on the southern end of the St. Lawrence River watershed. SLRwP has published a St. Lawrence River

Watershed Revitalization Plan (SLRwP 2020) which mentions Black Creek as a "medium priority subwatershed (within the Indian River watershed) that has the following key issues: (1) nutrients and sediment from agricultural runoff and streambank erosion; (2) stormwater runoff and hydromodification; and (3) waters are largely unassessed with NYSDEC Waterbody Inventory/Priority Waterbodies List. West Creek is also mentioned within the context of municipal separate storm sewer systems.

3.1.4.7 Lake Bonaparte Conservation Club (LBCC)

Lake Bonaparte is the largest lake (1,248 ac / 505 ha) in the immediate area of Fort Drum. Although there is no direct access except through Mud Lake, Fort Drum owns approximately 2.3 mi (3.7 km) or almost 13% of the shoreline. There are approximately 350 private homes and cottages surrounding the remaining shoreline and it's these homeowners that established the LBCC in 1960 "to promote the proper use, protection, and maintenance of the ecosystem, comprising the lake and its surrounding wetlands and forested areas, as a high quality natural resource for the benefit of both the property owners and the general public."

Although Fort Drum does not actively manage Lake Bonaparte, Fort Drum has reached out to the LBCC to deal with shared interests, such as managing invasive species including Eurasian Watermilfoil (discovered in 2001), Starry Stonewort (*Nitellopsis obtusa*; discovered in 2008), and Bald Eagles. Although a few meetings have been held through the years, there has been no MOA signed.

3.2 State Wildlife Action Plan

In 2001, the Wildlife Conservation and Restoration Act was passed by the US Congress and signed into law, initiating the State Wildlife Grant (SWG) program. The primary goal of the federal SWG program was to prevent additional species from being federally-listed as threatened or endangered by implementing conservation actions before the species becomes critically imperiled which is also the expressed desires in Army Regulation 200-1 (28 Aug 2007).

The SWG program is administered by the USFWS, which disburses annual Congressional funding allocations by formula to states and territories. In order to receive SWG funding, states were required to complete a Comprehensive Wildlife Conservation Strategy (CWCS; usually referred to as a State Wildlife Action Plan or SWAP). The CWCS developed a list of Species of Greatest Conservation Need (SGCN), assessed threats to SGCN and their habitats, and described conservation strategies, monitoring plans, and public outreach efforts. The *New York State Comprehensive Wildlife Conservation Strategy Plan* (NYSDEC 2006) was approved in 2006. NYSDEC developed their second New York State Wildlife Action Plan in 2015 which was accepted by the USFWS in 2016 (NYSDEC 2015). The organization of the original CWCS (NYSDEC 2006) and how it was addressed in the earlier INRMP (Fort Drum 2011) was much different than the second SWAP (NYSDEC 2015) and is reflected in this INRMP.

NYSDEC identified 166 High Priority Species of Greatest Conservation Need; 200 Species of Greatest Conservation Need (SGCN), and 113 Species of Possible Conservation Need in NYS. Due to the number of species mentioned in the SWAP and for the purpose of this INRMP, Fort Drum is only addressing the High Priority SGCN. Of

the 166 High Priority SGCN, 38 species have been documented on Fort Drum—4 mammals (all bats), 23 birds, 4 reptiles (all turtles), 2 amphibians (both salamanders), and 5 insects (Table 3.1). See Appendix 5 for a listing of all 38 High Priority SGCN and their status in NYS and Fort Drum.

Threats to species were assessed and categorized using the International Union for the Conservation of Nature (IUCN) threat classification system. Threats that are most pervasive and of highest concern to SGCN include: pollution, invasive species, climate change, and loss of habitat to development. One of the threat categories (Human Intrusions & Disturbance) included a subcategory of "War, Civil Unrest & Military Exercises." Military exercises was cited as a threat to seven species of marine mammals (six whales and one porpoise) and all were related to the use of sonar and had nothing to do with Fort Drum.

Table 3.1 Number of High Priority SGCN found in NYS and on Fort Drum.

TAXA	TOTAL # IN NYS	# OF SPECIES ASSESSED FOR SWAP	# OF HIGH PRIORITY SGCN IN NYS	# OF HIGH PRIORITY SGCN ON FORT DRUM
Mammals	92	26	12	4
Birds	485	120	45	23
Reptiles	39	25	12	4
Amphibians	32	17	7	2
Freshwater Fish	165	53	15	0
Freshwater Mollusks	134	55	14	0
Lepidoptera	1437	63	27	0
Odonates	189	63	27	0
Beetles	-	-	8	1
Bees	-	-	6	3
Mayflies	-	-	1	1

Fort Drum staff was generally not included in the development of the SWAP, however, Fort Drum is mentioned in association with three different taxa in the document: Common Nighthawk, Whip-poor-will, and White Cedar swamps. Fort Drum was one of three sites listed in NYS where concentrations of Common Nighthawks are found in natural settings (i.e. not nesting on rooftops in urban areas); Fort Drum was one of six sites identified as concentration sites for Whip-poor-will in NYS; and Fort Drum was one of six sites determined to have the best northern White Cedar swamps in NYS.

The purpose of the SWAP is to serve as a guide for efforts to protect SGCNs in NYS by all partners and not just NYSDEC. In recognition of the SWAP, the status of all High Priority SGCNs that occur on Fort Drum are addressed in *Section 5.3 Fish & Wildlife Resources* and management actions (if any) are mentioned.

3.3 Public Access

Fort Drum began to manage its fish and wildlife resources in 1958 when the Department of the Army issued AR 420-74 requiring Army installations to open all or part of installations to the public for hunting and fishing, if feasible. Several laws and regulations (see *Section 4.4.1 Outdoor Recreation Regulations & Guidance Documents*) are specific

to allow public access if applicable. In 1959 the first cooperative plan, or agreement, for the conservation and development of fish and wildlife resources was signed by Fort Drum, NYSDEC, and USFWS which provided public access. See Appendix C2 of the *Commanders Guide Supplemental* for the most current tripartite agreement between Fort Drum, NYSDEC, and USFWS which continues to ensure public access. Fort Drum remains the largest cooperator in NYS as well as one of the largest contiguous tracts of federal land that allows public access for outdoor recreation in the northeastern US.

See INRMP *Section 4.5* and the *Fort Drum Recreation & Outreach Management Plan* for more information regarding public access and recreation on Fort Drum.

3.4 Off-Post Training

The 10th Mountain Division (LI) has enhanced its training mission by conducting training events off-post. Off-Post Training typically involve low impact actions and are compatible with designated land use of the property. These missions include activities on existing NYS lands and properties such as land navigation exercises in forests, hiking trails in the Adirondack Mountains, climbing and rappelling rock faces in state forests or conducting leader development activities at historic forts and battlefields. Units have also conducted high altitude training at private and public facilities such as ski slopes and city parks. Occasionally a unique mission request is submitted such as dropping military personnel from CH-47 helicopters into Lake Ontario for a drop/swim-to-shore scenario training or setting up a large ground and air support area to supplement an on-post training event.

Off-Post Training actions are not approved unless 32 CFR 651.29 Screening Criteria are met, there are no concerns or extenuating circumstances that warrant further review, or there is an approved Environmental Assessment. The 10th Mountain Division (LI) has had maneuver licenses for long-term land use for missions such as high-altitude helicopter flight training at Whiteface Mountain in Essex Co. and various ground vehicle and air movement training at the former Seneca Army Depot in Seneca Co.

In 2021 Fort Drum prepared a Programmatic Environmental Assessment (PEA) for the option to have large off-post ground missions. As part of the PEA Fort Drum formed an Ad Hoc Committee to develop procedures for reviewing proposed actions, locating sites, coordinating reviews for approval, establishing, using, and restoring potential training locations (when needed) and determining types of land use agreements appropriate for future off-post training missions. Fort Drum invited Army, Federal and State Agencies, Stakeholder Organizations/Groups, Indian Nation Partners, and interested parties to develop an Off-Post Training Site Selection and Approval Procedure to coordinate site selection, facilitate communications, and approvals for off-post land use and determined to exclude State Forest Preserve lands and sensitive areas from training. When a site is identified, Fort Drum will ensure the appropriate environmental review is completed. Approval and/or agreement must be obtained from the applicable NYSDEC region office or the landowner. Consultations occur with the USFWS, NYS Historic Preservation Office, and/or Indian Nation Partners when required.

3.5 Encroachment Management

“Encroachment” is defined as activities outside the fenceline that can impact training such as residential development, wind turbines, etc. Achieving “No Net Loss” of training

lands is the underlying philosophy and goal to manage encroachment. A few encroachment management strategies that impact natural resources are addressed below. Encroachment is addressed in more detail in the Fort Drum Encroachment Management Plan.

Army Compatible Use Buffer (ACUB) Program

The Army Compatible Use Buffer (ACUB) Program was created under the authority provided in Section 2811, National Defense Authorization Act of 2003 (codified at 10 United States Code Sec. 2684a), to establish buffer areas around Army installations to limit effects of encroachment and maximize land inside the installation that can be used to support the mission. As a secondary benefit, ACUB can conserve agricultural and forestry lands, wildlife habitats, cultural resources sites, and provide public recreation. In some cases, the ACUB Program can also be used to meet environmental regulatory requirements for endangered species conservation and off-post wetland mitigation which would further minimize the loss of training lands due to environmental restrictions, but this has not occurred at Fort Drum.

Fort Drum received approval in August 2007 to work with non-government organizations and/or other government agencies to develop an ACUB program. Partners work directly with willing landowners to secure easements or parcels and are responsible for all aspects of the program. The ACUB Program was once the responsibility of the Plans, Analysis and Integration Office (PAIO) (2007-2016) and then the DPW-Real Estate-Real Property Branch (2016-2017) with the DPW-Natural Resources Branch assisting in a supporting role when called upon. Beginning in 2017, the DPW-Natural Resources Branch became the lead for the ACUB Program working with Ducks Unlimited—and their partner Tug Hill Tomorrow Land Trust—to implement the program. The cooperative agreement with Ducks Unlimited expired in November 2022 with the result of 34 properties ranging in size from 46 - 1,265 ac (19 - 512 ha).for a total of 8,890 ac (3,598 ha) enrolled in the Fort Drum ACUB Program.

Town of LeRay Comprehensive Plan

The Town of LeRay adopted a Comprehensive Plan in 2009 that guides the town's long-range development. Approximately 40% of the Town of LeRay is occupied by Fort Drum including the Cantonment Area, Wheeler-Sack Army Airfield, and all known Indiana Bat roosts on Fort Drum. According to the JLUS (DANC 2018), the LeRay zoning laws allows the LeRay Planning Board to consult with Fort Drum prior to approve a site plan application (Section 158-142; although it is not required) and there is a lighting requirement that "Fixtures shall be 'dark sky' compliant" (Section 158-75). Regional Planning is primarily a PAIO responsibility. Natural resources professionals will assist in a supporting role whenever called upon.

Joint Land Use Study

In 2016 the Office of Economic Adjustment provided federal funding to support the first joint land use study (JLUS) for Fort Drum. JLUS is a cooperative land use planning effort between a military installation and affected local governments to provide a policy framework with rationale and justifications to support adoption and implementation of compatible development measures designed to prevent urban encroachment; safeguard the military mission; and protect the public health, safety, and welfare. The Development

Authority of the North Country (DANC) was the lead agency while Fort Drum was a supporting agency. The Fort Drum JLUS was completed in 2018 (DANC 2018). The implementation plan within the JLUS has several issues that are related to natural resources management (Table 3.2).

Table 3.2 Implementation plan recommendations related to natural resources management in the JLUS (DANC 2018). See the JLUS for the full recommendation.

JLUS Issue of Concern	Recommendation in JLUS
BIO-1A Utilize ACUB to acquire additional conservation land	Consider options for conserving listed species habitat through the ACUB program. Coordinate with USFWS to develop species habitat mitigation bank criteria. Explore Regulatory In-lieu Fee and Bank Info Tracking System for guidance on establishing appropriate mitigation and conservation banks for land outside of Fort Drum.
BIO-1C Coordinate the management of sensitive species	Work with partners and the NYSDEC and USFWS re: management of natural resources and areas suitable for sensitive species. Emphasis should be placed on habitat loss among all communities to ensure that Fort Drum is not unduly burdened with habitat protection efforts in region.
BIO-1D Incorporate green space/habitat protection into local zoning laws	Jurisdictions surrounding Fort Drum should update zoning laws to establish forest, field, wetland, and/or habitat preservation districts.
BIO-1E Incorporate green space/habitat protection into local planning documents	Jurisdictions surrounding Fort Drum should update comprehensive plans or other land use planning documents to incorporate policies for the protection of natural green space and species habitat when considering future development.
BIO-2A Public Education re: biomass facility	Develop educational materials to identify the process of receiving material for the biomass energy plant, the importance of working forests, and how forest management can support the region and Fort Drum.
LAS-2C Utilize ACUB lands for wetland mitigation credits or Indiana Bat habitat	Develop options for wetland mitigation credits for off-post wetlands or preservation of Indiana Bat habitat. Explore Regulatory In-lieu Fee and Bank Info Tracking System for guidance on establishing appropriate mitigation and conservation banks for land outside of Fort Drum.
LU-1H Encourage natural resource preservation	Local communities should encourage natural resources preservation through the establishment of parks, easements, recreational use areas, etc.
LG-1A Education on "Dark-Sky" standards	Communities should consider educating their constituents and in turn exploring implementation of "Dark Sky" lighting standards for all fixtures and adopt lighting regulations into zoning laws.

Fort Drum Regional Liaison Organization

The Fort Drum Regional Liaison Organization (FDRLO) was formed in 1990 to foster strong positive communications to enhance the interrelationships between the military and civilian population in the Fort Drum region. Since that time, FDRLO has been involved in several regional planning efforts including the Residential Communities Initiative (RCI) and other housing initiatives, an Economic Development Task Force and regional marketing initiatives, the creation of the Fort Drum Regional Health Planning Organization, and BRAC.

3.6 Global Climate Change & Resiliency

Various scientific studies have shown irrefutable evidence that global climate change is occurring due to human activities such as burning fossil fuels creating greenhouse gas (GHG) emissions (Knutson et al. 2017). Although the impacts of climate change are still uncertain, changes will have adverse effects on many ecological systems, human health, and economies around the world (Wuebbles et al. 2017).

In 2007, a group of retired generals and admirals issued a report suggesting that climate change may be considered a "threat multiplier" which may worsen political instability in various parts of the world (CNA 2007). Before being replaced by the National Defense Strategy, the *Quadrennial Defense Review Report* (DoD 2010, 2014) twice identified climate change as a key issue that may play a significant role in future missions while at the same time undermining the capacity of domestic support training facilities. DoD Directive 4715.21 – Climate Change Adaptation and Resilience (effective 14 January 2016) requires DoD to "adapt current and future operations to address the impacts of climate change in order to maintain an effective and efficient US military." The Annual Threat Assessment of the US Intelligence Community (DNI 2021) states: "We assess that the effects of a changing climate and environmental degradation will create a mix of direct and indirect threats, including risks to the economy, heightened political volatility, human displacement, and new venues for geopolitical competition that will play out during the next decade and beyond." In 2021, Executive Order (EO) 14008 *Tackling the Climate Crisis at Home and Abroad* was signed. In response, the *Department of Defense Climate Risk Analysis* was issued (DoD 2021) recognizing climate change as a high priority that must be considered in all current and future actions.

The *Report on Effects of a Changing Climate to the Department of Defense* (DoD 2019) evaluated the vulnerability of 74 DoD installations with natural resources to five climate/weather impacts (recurrent flooding, drought, desertification, wildfires, thawing permafrost) and only two reported no current impacts. The report states that DoD is incorporating climate resilience as a crosscutting consideration for planning and decision-making processes, and not as a separate program or specific set of actions. The Army Climate Strategy (US Army 2022) recognizes direct and indirect impacts of climate change and outlines a plan to decrease GHG emissions while becoming more resilient to climate change.

Along with the various DoD initiatives, the most significant to Fort Drum is the Climate Leadership and Community Protection Act (CLCPA) approved in NYS in 2019. CLCPA is the most aggressive climate and clean energy initiative in the nation striving for a reduction in greenhouse gas emissions by 40% below 1990 levels by 2030 and 85% by 2050. The overall goal is to achieve net zero emissions by 2050. Some of the highlights include:

- Decarbonization of the electric sector—70% of the electric generation in NYS must be from renewable resources by 2030 and 100% by 2050. The current biomass facility which generated power on and for Fort Drum from 2014-2023 is potentially closing because it is not a carbon-free energy source; a feasibility study by the US Army Corps of Engineer is currently underway to explore other renewable energy options for Fort Drum.
- Zero-emission Vehicles (ZEV) usage is being promoted with 3 million ZEVs on the road by 2030 with the transportation sector shifting to almost 100%

ZEVs by 2050. Fort Drum is currently undergoing plans to construct infrastructure for ZEVs for its civilian vehicle fleet.

- Approximately 85% of homes and commercial building space will be electrified by 2050. Industry will be expected to decrease GHG emissions through energy efficiency, switching to low-carbon fuels, decarbonizing the electric supply, and negative emissions. As mentioned, a new source of electricity is being studied; Fort Drum has been constructing solar walls in buildings for many years.

All the impacts to Fort Drum have not been identified. New York State Department of Environmental Conservation (NYSDEC) will promulgate enforceable regulations on GHG emission sources in 2024, but Fort Drum has already been notified that CLCPA regulations and emission standards will be included in the Title V Air Permit renewal in 2025. Although the Army is moving towards ZEVs for civilian vehicles, it is presumed that there will be a need to offset GHG emissions from the use of tactical vehicles, helicopters, etc. Fort Drum will also have to account for emissions from the "industrial complex" in the Cantonment Area.

Fort Drum does have extensive forest lands that presumably will account for some carbon sequestration credits. Although natural succession where once open areas become more heavily vegetated may be beneficial from a carbon sequestration standpoint, this growth of woody vegetation makes unmounted maneuvers difficult; mounted maneuvers impossible; and requires constant maintenance to keep various assets clear of woody vegetation including line-of-sight to targets, drop zones, landing zones, bivouac sites, and artillery firing points. To conduct vegetation management activities for the benefit of training, Fort Drum would also presumably be in a negative carbon sequestration balance. This will likely be a focus of effort that will include the Natural Resources Branch in the coming years.

Climate Change Impacts on Fort Drum

In partial response to Section 335 of the National Defense Authorization Act for Fiscal Year 2018, the DoD Climate Assessment Tool was developed by the US Army Corps of Engineers to assist installations to identify climate-related threats and impacts that could degrade mission readiness; while also guiding master planning and integrated natural resource management planning, and assist with budget development requests for climate resilience projects. The DoD Climate Assessment Tool assesses eight climate impacts with an emphasis on natural resources that installations typically consider through their INRMP planning. These impacts are assessed currently and projected in the years 2050 and 2085 under both low and high emission scenarios. A numerical score is calculated for each impact determined by a type of multi-criteria evaluation taking into account both the contribution of individual indicators to the estimate of exposure and the risk preference of the decision-maker which allows installation-level assessments of climate exposure and comparisons across installations and commands—the higher the score, the greater the exposure.

In general, the exposure to Fort Drum to climate change is relatively low compared to other installations (based on DoD Climate Assessment Tool accessed August 2021). For example, based on the High Emission Scenario in the Year 2085, Fort Drum ranks #125 out of all DoD installations assessed (n = 157) with a score of 378.28. (Naval Air Station Key West, FL is ranked #1 with a score of 526.27 and Elmendorf AFB, AK is ranked

#157 with a score of 300.97). Within the Army (n=50), Fort Drum ranks #41 (Aberdeen Proving Ground is #1 with a score of 517.46 and Fort Lewis is #50 with a score of 307.43). (See the Fort Drum Encroachment Management Plan for updated scores.)

Table 3.3 Results from *the DoD Climate Assessment Tool (August 2021) to determine potential climate impacts to Fort Drum and its relative ranking to 157 other DoD installations for the years 2050 and 2085. Only the high/faster warming scenario was considered. Color codes are not official and used only for ease of understanding based on the rankings in the first (red), second (yellow), or third (green) 33.3% of all installations.*

CLIMATE IMPACT	INDICATORS (For more information, see https://corpsmapr.usace.army.mil/cm_apex/f?p=118:7:1090849638979::NO) for indicator fact sheets.	HIGH EMISSION SCENARIO			
		2050		2085	
		Score	Rank	Score	Rank
Coast Flooding	Coastal Flood Extent, Coastal Erosion	0	n/a	0	n/a
Drought	Flash Drought Frequency, Drought Year Frequency, Aridity, Consecutive Dry Days, Mean Annual Runoff	70.14	144	77.62	139
Energy Demand	Heating Degree Days, Cooling Degree Days, 5-Day Minimum Temperature; 5-Day Maximum Temperature	57.89	37	54.93	124
Heat	Days above 95F, 5-Day Maximum Temperature, High Heat Days, Frost Days, High Heat Index Days	44.32	130	49.24	130
Historic Extreme Conditions	Tornado Frequency, Hurricane Frequency, Ice Storm Occurrence, Historical Drought Frequency, Wildlife Urban Interface, Hurricane Wind >50 knots, Hurricane Maximum Average Precipitation, Ice Jam Occurrence	48.32	78	48.32	78
Land Degradation	Fire Season Length, Aridity, Soil Loss, Coastal Erosion, Permafrost Hazard	25.89	152	27.60	151
Riverine Flooding	Riverine Flood Extent, Flood Magnification Factor, Maximum 1-Day Precipitation, Maximum 5-Day Precipitation, Extreme Precipitation Days	59.72	66	65.81	70
Wildfire	Fuel Abundance, Ignition Rate, Fire Season Length, Flash Drought Frequency	48.71	53	54.76	30

There are already signs of climate change in NYS and throughout the northeastern US (Clear Air-Cool Planet and Wake 2005; Frumhoff et al. 2007; Dupigny-Giroux et al. 2018): average annual temperatures are increasing; length of the growing season is increasing; bloom dates are earlier; timing of high spring flow and river ice-out is earlier; lake ice-in dates are later and lake and ice-out dates are later; snowfall is decreasing although winter precipitation (i.e. rain) is increasing while days with snow in the ground is decreasing. By 2035, and under both lower and higher models, the Northeast is projected to be more than 3.6°F (2°C) warmer on average than during the preindustrial era—this would be the largest increase in the contiguous US and would occur as much as two decades before global average temperatures reach a similar milestone (Dupigny-Giroux et al. 2018). The recent dominant trend in precipitation throughout the Northeast has been towards increases in rainfall intensity; there will be more two-day periods with heavy downpours (Frumhoff et al. 2007). Monthly precipitation in the Northeast may be about 1 inch greater for December through April by the years 2070–2100) (Dupigny-Giroux et al. 2018). However, as temperatures rise, snow is projected to appear later in the winter and disappear earlier in the spring decreasing 4-15 days/month when snow covers the ground.

Some examples of potential outcomes of climate change and their effect on natural resources on Fort Drum include:

- Less precipitation in the summer will cause drier soils, more droughts, less groundwater recharge, reduction in area and filtration capacity of wetlands, lowering of lake levels, and general decrease in water quality. The reduction in wetlands and streams will impact many of the state-listed plant species as well as wildlife species dependent on wetland and riparian habitat.
- With increased winter precipitation and lower summer precipitation, stream flow will be more extreme—higher in winter likely increasing floods and lower in summer exacerbating drought.
- Growing seasons are projected to increase 4-6 weeks by the year 2100 and "summer" is projected to begin 9-21 days earlier into the spring and extend 10-16 days longer into the fall (Frumhoff et al. 2007). Likewise, the blooming of certain flowers and the budding of leaves on trees will be earlier, approximately up to 1-2 days earlier every decade and almost 2-3 weeks earlier by the year 2100 (Frumhoff et al. 2007).
- In the short-term, northern hardwood forests may experience increased growth rates as a result of warmer temperatures, a longer growing season, and potential fertilization due to CO_2 increases. However, by the year 2100, growth may begin to decline due to temperature stress if not sooner due to other threats exacerbated by climate change such as disease, pests, drought, wildfire, and severe storm damage. Habitat suitable for many northern hardwood trees including maple, beech, and birch is projected to shift northward as southern oak-dominated forests (oak/hickory and oak/pine) cause their eventual replacement (with the likely exception of red maple) (Frumhoff et al. 2007).
- Sugar maples are projected to remain as a component of hardwood forests, but the ongoing winter warming is expected to further disrupt the pattern of freezing nights and warm days needed for optimal sap (and later syrup) production (Frumhoff et al. 2007). This means the trend of the past two decades, which has shifted the center of maple syrup production from the United States into Canada, is almost certain to continue (Karl et al. 2009).
- More favorable conditions for a number of pests (e.g., mosquitoes and ticks) and pathogens (e.g., Lyme disease) currently rare or unknown in northern New York (Monaghan et al. 2016). For example, ticks were practically non-existent until ca. 2005 and are now common.
- Some wildlife species will experience a change in their distribution. For example, some birds have shifted the southern margin of their range northward (e.g., pine siskin and bobolink) while others have shifted the northern margin of their range northward (e.g., Blue-winged Warbler and Prairie Warbler) (Zuckerberg et al. 2009). If unable to relocate, some species (e.g., brook trout) may disappear (Schlesinger et al. 2011). Other species may experience a shift in movement patterns such as migratory birds and bats by arriving earlier and leaving later or not at all.
- Survival of white-tailed deer will increase due to milder winter conditions (Dawe and Boutin 2016; Weiskopf et al. 2019) thus perpetuating issues with deer browse and forest health as well as ticks.

Fort Drum natural resource managers will monitor the installation for these potential changes. Adaptive management will be used to address these issue when/if they occur as predicted. See the Fort Drum Encroachment Management Plan for more information.

4. Natural Resources Management

This chapter outlines the five functional areas natural resources staff are responsible for managing: Aquatic Resources, Land Resources, Fish/Wildlife Resources, Human-Wildlife Conflicts, and Recreation/Outreach. Each section highlights the relevant regulatory requirements, current status of the resource, the management principles/philosophy, and strategies managers are implementing to reach the goals of this INRMP.

Every focal area has one or more management plans with more detailed information regarding history, methods, procedures, analyses, actions, and/or recommendations. The titles of the management plans are listed in Appendix 2. Guidelines to minimize environmental impacts from management action within each functional area are listed in Appendix 6.

4.1 Aquatic Resources

Aquatic resources include watersheds, rivers and streams, lakes and ponds, wetlands, riparian areas and floodplains, and significant aquatic communities and aquatic plants. Management of aquatic invasive species related to aquatic resources and contaminants are included in this section. Fish and wildlife that utilize aquatic resources are discussed in *Section 4.3 Fish & Wildlife Resources*.

Historically, the focus of aquatic resources management on Fort Drum has been two-fold: (1) to ensure compliance with various state and federal regulations to avoid, minimize and mitigate impacts, and (2) to provide recreational opportunities. In the 2010s, a third focus of assessing water quality in all waterbodies, regardless if they are impacted by construction or not, began. These assessments were used to identify short term impacts and long term trends in Fort Drum's watersheds, to establish priority watersheds, and to inform land and water management decisions within each watershed. In the latter 2010s, a fourth focus was to re-establish aquatic connectivity.

DPW Environmental Division's Compliance Branch is responsible for managing stormwater, drinking water, hazardous waste/contaminants, and ground water through various plans and programs which are not addressed in this INRMP and are mainly concerned with the Cantonment Area and/or construction projects.

The Integrated Training Area Management (ITAM) Program within DPTMS-Range Branch is an Army-wide program that was originally created in response to the degradation of Army training lands and has the primary responsibility for controlling erosion caused by or affecting military training which may or may not impact aquatic resources.

4.1.1 Aquatic Resources Regulations & Guidance Documents

4.1.1.1 Federal Statutes & Regulations

Federal Water Pollution Control Act (33 USC 1251-1387) (Clean Water Act)
The primary objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical and biological integrity of the nation's waters including the elimination of the discharge of pollutants into navigable waters and, where attainable, the achievement of water quality sufficient to provide for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water. The CWA applies to waters of the US which include most rivers, ponds, and lakes, and many wetlands and streams. Although most surface waters are easy to identify and are relatively abundant—making up approximately 20% of the land area on Fort Drum—it also includes areas as defined by USACE and the Environmental Protection Agency (USEPA) as "…*areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions"* (USACE 1987). The CWA applies to the management of wetlands, soil and water, and fish and wildlife.

Section 208 of the CWA and Section 319 of the 1987 amendment of the CWA require resource managers and planners to assess the extent of non-point source water

pollution problems and develop and implement area-wide best management practices (BMPs) to prevent water pollution from non-point sources. This has led Fort Drum's Natural Resource programs toward a more watershed-based approach to management.

Section 303(d) of the Clean Water Act, requires evaluation of all available water quality-related data and information to develop a list of waters that do not meet established Water Quality Standard (WQS impaired) and those that currently meet WQS, but may exceed it in the next reporting cycle (WQS threatened). Fort Drum must develop a TMDL for every pollutant/waterbody combination on the list. An essential component of a TMDL is the calculation of the maximum amount of a pollutant that can occur in a waterbody and still meet WQS. The state allocates portions of the TMDL between the various point sources and non-point sources within the waterbody. Permits for point sources are issued through USEPA's National Pollutant Discharge Elimination System, or NPDES program.

Section 401(a) requires that federal agencies (i.e. Fort Drum) must obtain state certification (i.e., NYSDEC) that any discharge to waters of the United States is consistent with the CWA. This Section is tied closely to and incorporated under Section 404 permitting, whereby Section 404 must either be accompanied by a Section 401 Water Quality Certification (WQC), or included in coverage under a "blanket" WQC.

Section 402 establishes the National Pollutant Discharge Elimination System (NPDES) to authorize USEPA issuance of discharge permits (33 USC 1342). This is handled primarily by the Stormwater Program within the Compliance Branch. The Natural Resources Branch assists with NPDES projects only when stream habitats are involved.

Section 404 authorizes the Corps of Engineers to issue permits for the discharge of dredged or fill material into navigable waters including wetlands (33 USC 1344). This is the primary part of the CWA which requires authorization for activities resulting in the fill of jurisdictional wetlands and other waters of the US through a permitting process administered by the USACE and the USEPA. These activities are primarily construction-related and include but aren't limited to the placement of fill material, ditching activities when the excavated material is sidecast, mechanized land clearing, land leveling, most road construction, and dam construction.

Permits are activity-dependent. When an activity or project is deemed to have a potential impact on regulated wetlands based on National Wetland Inventory or in-house data, the wetland ecosystem in that project area must be delineated. Fort Drum's Natural Resources Branch will delineate wetlands and determine whether impacted areas are waters of the US in accordance with the 1987 Wetlands Manual (USACE 1987). The final delineations are reviewed by the USACE in a process known as a jurisdictional determination (JD). The JD verifies the location and extent of jurisdictional areas. Once the JD is completed by the USACE, impacts (typically in acres) are determined.

Sikes Act 16 USC 670 et seq.

The primary law regarding natural resource management policies and programs on military installations including the development of INRMPs, cooperation with the USFWS and state fish and game agencies, and ensuring professionally trained personnel are available and assigned to carry out natural resources management functions. To the extent practicable and appropriate, INRMPs must provide for fish and wildlife management; fish- and wildlife-oriented recreation; fish and wildlife habitat enhancement or modifications; wetland protection, enhancement, and restoration for support of fish, wildlife, or plants; and no net loss of the capability of the installation to support the military mission.

4.1.1.2 Executive Orders & MOUs

Executive Order 11988, May 24, 1977 - Floodplain Management

Requires government agencies to take action to reduce the risk of flood loss; to minimize the impact of floods on human safety, health and welfare; and to restore and preserve the natural and beneficial values served by floodplains. Each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain and consider flood hazards and floodplain management and consider alternatives to avoid adverse effects and incompatible development in floodplains.

Executive Order 11990, May 24, 1977 – Protection of Wetlands

Requires government agencies, in carrying out agency actions and programs affecting land use, to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

Executive Order 11987, May 24, 1977 - Exotic Organisms

Executive agencies shall, to the extent permitted by law, restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration; and, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States.

Executive Order 12962, June 7, 1995 – Recreational Fisheries

Federal agencies are required, where practicable, to increase the quality and quantity of recreational fishing activities by: developing partnerships with interest/user groups, monitoring water quality and fish habitat, restoring degraded waters and habitat, improving public access to fisheries, supporting outreach programs which educate anglers on fisheries conservation, and evaluating the effects of funded or permitted projects on recreational fisheries (e.g. construction along a stream).

Executive Order 13112, February 3, 1999 – Invasive Species; amended December 5, 2016 - Safeguarding the Nation from the Impacts of Invasive Species

Federal agencies are required to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

4.1.1.3 Department of Defense & Army Regulations and Policy

DoD Instruction 4715.03 Environmental Conservation Program (Incorporating Change 2, 31 Aug 2018)

Enclosure 3 - 3.b. & e. Biodiversity. Maintain or restore remaining native ecosystem types across their natural range and maintain ecological processes, such as hydrological processes, to the extent practicable. Invasive and noxious species will be identified, prioritized, monitored, and controlled whenever feasible.

Enclosure 3 - 4.b. Land Management. A watershed-based approach shall be used to manage operations, activities, and lands to avoid or minimize impacts to wetlands, ground water, and surface waters. Management of lands will ensure no net loss of size, function, and value of wetlands, and will preserve the natural and beneficial values of wetlands. When avoidance is not practicable, and impacts have been minimized, mitigation is encouraged and authorized.

Army Regulation 200-1 (28 Aug 2007)

4-2.a(1) Comply with applicable Federal, State, and local laws and regulations regarding water resources management and permitting.

4-2.a(6) Mitigation wetlands should, whenever possible, be sited within the same watershed as the affected installation wetlands and outside installation boundaries so installations can retain maximum land-use flexibility.

4-2.d(1) A watershed management approach should be used when evaluating projects and programs to satisfy environmental regulations, facility projects, and master planning that may impact the quality of water resources. Using a watershed approach means that installations should develop a framework or plan for coordinating, integrating and managing their mission activities that impact the quality of water resources located on (and those that migrate off) their installation. This approach also requires a strong commitment to involving stakeholders, both internal and external, in the management of these water resources.

4-2.g Utilize best management practices (BMPs) to minimize Total Maximum Daily Load (maximum amount of a pollutant that a body of water can receive while still meeting water quality standards) impacts.

4-3.d(1)(s) Ensure that turbidity and sediment levels do not irreparably degrade aquatic biota and habitat, or significantly impact shallow ground water aquifers.

4.1.1.4 NYS Laws & Regulations

NYS Environmental Conservation Law Article 15 & 24

Fort Drum is required to follow provisions of NYS Environmental Conservation Law (ECL) Article 15, Protection of Water, and Article 24, Freshwater Wetlands. Article 15 and 24 permits are often granted jointly with Section 401(water quality certifications and Section 404 permits (USACE), if they are mutually requisite.

Article 15 permits are required for activities that have the potential to disturb lakes and ponds with an area of less than 10 ac (4 ha) connected to a stream, or streams classified as either AA or A (used as a source of drinking water), B (used for swimming and recreation, but not drinking), C and D (supports fisheries). Waters with classifications A, B, and C may have a standard of (T) indicating it may support a trout population or (TS) indicating it may support trout spawning.

Article 24 permits are required for most ground or vegetation disturbing activities in and within 100 feet (30 m) of Regulated State Wetlands as identified on NYSDEC-provided maps with wetlands 12.5 ac (5 ha) and larger. Article 24 permits are also required for beaver management activities; however, Fort Drum currently has a General Permit-– Breaching/Removal of Beaver Dams that allow specific beaver management actions to proceed without individual permits in most cases.

4.1.1.5 Fort Drum Plans & Standard Operating Procedures

Fort Drum Wetland Mitigation Banking Instrument (2003)

Fort Drum has been using a wetland mitigation bank to provide credit in advance of and to support construction projects since 2003. Credits originate from wetlands built or protected to offset impacts from future projects. The Instrument is a binding legal document that sets guidelines and responsibilities for the establishment, use, operation, and maintenance of the Mitigation Bank.

Range-Wetlands Management Plan (2011)

The Range-Wetlands Management Plan was developed to address complaints about beavers impacting the Training Area and the perceived loss of training lands due to wetlands and ecological succession. This also serves as a culvert management plan. See INRMP *Section 4.4.4.8 Beaver* and the *Fort Drum Human-Wildlife Conflict Management Plan* for more information regarding beaver management.

Fort Drum Aquatic Species Management Plan

This management plan describes the distribution of fish and aquatic macroinvertebrate species on Fort Drum and their habitats, a history of Fort Drum aquatic surveys, results of fisheries and habitat surveys since 2008, and biotic indices based on benthic macroinvertebrate communities. The plan outlines management recommendations to

improve fish habitat, such as culvert and dam removals, in-stream pool construction, and riparian area buffering, as well as identifies knowledge gaps.

The Procedure for Analyzing Fort Drum's Flowing Waters using Aquatic Macro Invertebrates

The protocol for bioassessment surveys includes macroinvertebrate, fish collection, water quality, and habitat collection methods. This was the basic protocol used for fisheries surveys from 2010 to 2013.

Fort Drum Noxious and Invasive Plant Management Plan

This management plan describes the distribution of invasive species on Fort Drum, management options, and treatment locations.

Fort Drum Significant Community & Rare Plant Management Plan

Fort Drum is developing a management plan focused on significant ecological communities and state-listed plants.

Fort Drum Herptofaunal Management Plan

This plan provides the most up-to-date information on reptile and amphibian species found on Fort Drum and their distribution and management. Although the plan does not exclusively focus on aquatic resources, water quality measurements feature prominently at 26 amphibian monitoring sites.

Watershed Management Plan

A Watershed Management Plan is currently being developed to serve as Fort Drum's water resources management plan. This complies with Clean Water Act Sections 208 and 319, both of which require resource managers such as Fort Drum's Natural Resources Branch, to assess the extent of non-point source runoff pollution.

4.1.2. Status of Aquatic Resources

This section discusses the current status of aquatic resources, data collection efforts, and data gaps.

4.1.2.1 Watersheds

A watershed is defined by the USEPA as an area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake, or ground water. Activities throughout a watershed not only manifest their impacts in upland areas, but downslope into riparian areas, wetlands, streams, and lakes. A watershed is therefore a natural, distinct geologically-defined unit that can define an area to be managed.

The Indian River watershed makes up 84.9% of Fort Drum followed by the Oswegatchie River watershed (12.5%) and Black River watershed (2.6%). The three watersheds can be further broken down to 14 sub-watersheds of varying overall size and proportion on Fort Drum (Table 4.1; Appendix 9, Figure 4).

Table 4.1 Watersheds on Fort Drum based Hydrologic Unit Codes 8 and 12 representing the standard used by US Environmental Protection Agency, US Geologic Survey, and NYS Department of Environmental Conservation.

WATERSHED Name	TOTAL ACRES	ACRES / % on Fort Drum	FORT DRUM WATERBODIES
Black River	**1,220,581**	**2,854 (0.2%)**	
Pleasant Lake-Black River	36,380	**2,652 (7.2)**	No known perennial waters, some storm water outfalls and stormwater drainage from WSAAF
Kelsey Creek – Black River	29,358	202 (0.7%)	Inconsequential – not included in further analysis
Oswegatchie River	**672,168**	**13,634 (2.0%)**	
Hawkins Creek-Matoon Creek	20,672	8,011 (38.8%)	• Matoon Creek and Matoon Marsh in TA17 • Hawkins Creek in TA17
Sawyer Creek	20,161	5,566 (27.6%)	• Sawyer Creek • FAARP Mitigation Site; Range 48 Mitigation Site; Borrow Pit Mitigation Site; Oak Road Mitigation Site
West Branch Oswegatchie River	23,997	56 (0.2%)	Inconsequential – not included in further analysis
Indian River	**360,053**	**92,366 (25.7)**	
Bonaparte Creek with Mud Lake	14,691	3,609 (24.6%)	• Bonaparte Creek • Lake Bonaparte (1263 ac) and Mud Lake (112 ac) in TA19 • Range 23 Mitigation Site
Blanchard Creek – Upper Indian River	21,761	4,068 (28.6%)	• Indian Lake (180 ac) and Narrow Lake (41 ac) in TA19D • Indian Pond (84 ac) in TA19C • Indian River (including Indian River causeway) in TA14 and 19. • Quarry Pond (4 ac) and Quarry Pond Mitigation Site in in TA14B
Rockwell Creek-Indian River	32,781	32,781 (100%)	• Indian River, Rockwell Creek, Deerlick Creek, and Cold Creek in the Main Impact Area • Range 20/22 Mitigation Site and Range 23 Mitigation Site
Hunter Creek – Indian River	13,881	9,714 (70.0%)	• Indian River • Hunter Creek and Hardened Crossing • Antwerp Wetland Mitigation Bank and Range 37 Borrow Pit Wetland Mitigation Bank • Belvedere Pond, Range 37 Mitigation Site, and CACTF Mitigation Site
Beaver Meadows – Lower Black Creek	10,262	8,132 (79.2%)	• Black Creek • Beaver Meadow and Cedar Swamp • Reedville Mitigation Site and Peat Bog Mitigation Site
Buck Creek – Upper Black Creek	14,570	8,800 (60.4%)	• Black Creek and Buck Creek • Conservation Pond (3 ac) • Airfield Mitigation Site
West Branch Black Creek	15,044	8,129 (54.6%)	• West Branch of Black Creek in TA7 • Warren Swamp in TA7
Trout Brook – Indian River	18,482	2,688 (14.5%)	• Indian River • Trout Brook • Town of Philadelphia water supply • 3E Mitigation Site
West Creek (with Pleasant Creek)	20,391	14,355 (70.4%)	• West Creek • Pleasant Creek in Cantonment Area and TA3 • North Corner Wetland Mitigation Bank

Watershed conditions continue to be assessed. Conditions are dependent on vegetative ground cover, soils, and topography which together influence a watershed's ability to withstand heavy precipitation, contain and process water (evapotranspiration), filter

water, and mitigate various impacts such as pollution and erosion. For example, sandy soils erode continually, while clay soils erode slowly but compact easily and fail as distinct events (e.g., collapsing stream banks.) Hydric soils are indicative of existing or past wetland conditions. All soil types determine and are influenced by land use. Watersheds with higher proportions of highly erodible lands (HEL) have a lower "resiliency" or ability to withstand impacts. Conversely, a watershed with little or no highly erodible lands has a greater ability to withstand impacts. Watersheds with higher proportions of mature forest cover have greater resiliency or ability to withstand impacts; conversely, a watershed with little or no cover (and higher acreage in disturbed / developed condition) has little ability to withstand impacts. Obviously the more land use that occurs on a watershed, the greater the potential impact so variables such as the number of impassable culverts, number of training activities, and the number of other land management activities are considered on each watershed. All of these factors are determined and calculated to develop a Watershed Condition Index (WCI) for each watershed. More information about the WCI can be found in the Fort Drum Watershed Management Plan (in progress). Certain parameters within watersheds will continue to be recorded to calculate the WCI for all watersheds on Fort Drum.

4.1.2.2 Surface Waters: Rivers, Streams, Lakes & Ponds

There are two rivers and eight primary named streams on Fort Drum totaling about 91.9 mi / 147.9 km (Appendix 9, Figure 4). Minor streams and tributaries are widespread throughout the installation. The Indian River is the longest drainage on Fort Drum, winding 27.4 mi (44.1 km) across the installation. In general, most rivers and streams on Fort Drum are meandering, low gradient, and heavily influenced by beaver activity. Streams generally gain volume through seeps, springs, and confluences with tributaries. Most streams on Fort Drum are classified by NYSDEC as Class C or Class D surface water bodies. Class C and D are suitable for fishing, fish survival, and primary and secondary contact recreation; Class C waters are additionally suitable for fish propagation. (Class A and AA waters are for a source of drinking water; Class B is for swimming other contact recreation, but not drinking. Stream classifications were established in 1965 and are outlined in 6 NYCRR Part 701.)

There are seven primary lakes and ponds totaling approximately 450 ac (182 ha) of surface area on Fort Drum (Appendix 9, Figure 4). The largest waterbody on Fort Drum is Indian Lake (180 ac / 73 ha) which is adjoined to Narrow Lake (41 ac / 17 ha) through a narrow channel. The largest lake in the area is Lake Bonaparte (1,263 ac / 511 ha) which shares approximately 2.1 miles (3.4 km) or 12.7 % of the total shoreline with Fort Drum. All of the natural lakes and ponds are found in the Western Adirondack Transition ecoregion. Two ponds, Remington Pond (26 ac / 11 ha) and Conservation Pond (3 ac / 1.2 ha), are impounded creeks created by dams; Mud Lake and Lake Bonaparte are deepened by Alpina Dam. Most lakes on Fort Drum are considered oligotrophic to mesotrophic, meaning they have medium to low amounts of nutrients, but Fort Drum's lakes tend to have high summertime densities of aquatic vegetation wherever light is able to penetrate the water column. Most lakes on Fort Drum are categorized as warm water lakes due the makeup of their fish communities.

Biological and physical data for lakes and ponds are summarized in the USFWS *Report on the Results of 1994-1995 Fishery Resource Surveys, Fort Drum, New York (Part I)* (McCosh and Lowie 1996) and the *Fort Drum Aquatic Species Management Plan*. A list of extant aquatic fauna on Fort Drum is found in Appendix 4. A detailed description of

the physical aspects of Fort Drum waterbodies will be found in the Watershed Management Plan (in progress).The most detailed description of waterbodies is found in the *Aquatic Species Management Plan* for the following: West Creek, Pleasant Creek, Trout Brook, West Branch of Black Creek, Black Creek, Beaver Meadow Creek, Hunter Creek, Indian River, Bonaparte Creek, Sawyer Creek tributaries, Shingle Creek, Indian and Narrow Lakes, Indian Pond, Quarry Pond, Conservation Pond, Mud Lake, and Remington Pond.

Historically, measurements of temperature and nutrients were collected during numerous waterbodies by the NYSDEC (1931, 1972) and USFWS (1999, 2000, 2001, 2002) in association with larger fisheries projects. The NYSDEC has also sampled macroinvertebrate taxa to examine water quality on Fort Drum as a part of their Rotating Integrated Basin Studies program (http://www.dec.ny.gov/chemical/30951.html). From 2008-2019 when Fort Drum had a dedicated fisheries biologist, a more comprehensive assessment occurred on Fort Drum waterbodies. These assessments began again in 2023 with the hiring of a new fisheries biologist.

Water quality is monitored to establish baseline conditions, to detect changes in baseline conditions, and to identify conditions that are nearing or exceeding regulatory thresholds. Since 2015, physical and productivity measurements for water quality, habitat, and biota have been collected at long term monitoring (LTM) locations. There are currently 13 LTM locations established at Pleasant Creek, West Creek, Black Creek, the West Branch of Black Creek, Hunter Creek, Indian River, and Black River (added in 2017). Sites were selected based on the potential for negative impacts to these streams from human activities including urbanization, road density, land management, and military training. Paired sites were generally selected on streams that originate off the installation and pass through its interior to enable “before/after” comparisons of water quality within Fort Drum’s borders; single sites were selected on streams with headwaters on Fort Drum. Water quality monitoring includes physical measurements like stream temperature, total suspended solids, turbidity, and conductivity; chemistry including pH, alkalinity, salinity, total suspended solids, dissolved oxygen and percent saturation; productivity indicators including nitrates, nitrites, total phosphorous, orthophosphate; biological oxygen demand (BOD), fecal coliform, and chlorophyll A. Aquatic macroinvertebrates (2015-2016), fish (2015-2016), and sediment (2016) have also been sampled at each site. Summaries of the LTM data will be incorporated annually into the Watershed Management Plan (in progress). To date, LTM data has shown that most sites meet regulatory thresholds.

Besides monthly water quality monitoring, data collection at the LTM sites includes calculations of discharge. To understand long-term trends in biological communities, a fish survey and invertebrate survey should be conducted at least every 3-5 years at LTM sites. Event-driven (training or precipitation/snowmelt) sampling could also be conducted including flow and turbidity measurements.

Surface water quality assessments by Fort Drum biologists began in 2008 to understand aquatic biota and their habitats on Fort Drum streams. Direct water quality measurements of pH, temperature, dissolved oxygen levels, and conductivity were collected. These data were collected in Pleasant Creek and its tributaries in 2008, 2012, and 2013, West Creek in 2009 and 2013, West Branch Black Creek in 2010, Black Creek in 2011, Trout Brook, Beaver Meadow Creek, and Hunter Creek in 2012, and Sawyer and Shingle Creeks in 2014. Reach-based habitat data was collected at all the sites in addition to water quality data. Unit-based stream habitat assessments were

conducted in 2013 for North Branch Pleasant Creek, upper and lower Airfield Creek, and Rising Warrior Creek in the Cantonment Area. Surveys of aquatic biota and water quality were also collected from selected reaches in these creeks.

Aquatic macroinvertebrates are integral to aquatic ecosystems and are also indicators of water quality (Barbour et al. 1999). Large samples of aquatic macroinvertebrates have been collected on Fort Drum in most years since 2005; exact protocols used to collect these samples vary and can be found in several watershed reports and the Aquatic Species Management Plan. Indices of Biological Integrity (IBI, 2005-2008) and Biological Assessment Profiles (BAP, 2009-2012) have been calculated for each site which are meant as proxy measurements for stream health (Barbour et al. 1999). Pleasant Creek and its tributaries were sampled in 2008, 2012, 2013, 2015, 2018); West Creek and its tributaries (2009, 2013, 2014, 2015, 2016); West Branch of Black Creek (2010, 2016); Black Creek (2011, 2016); Beaver Meadows Creek (2012); Hunter Creek and its tributaries (2012, 2015, 2016); Trout Brook (2012); Bonaparte creek (2014); Rockwell Creek (2014); Sawyer Creek (2014); Shingle Creek (2014); Indian River and its tributaries (2016, 2017, 2018), Black River (2017), Indian Pond (2018), Matoon Creek (2018), Quarry Pond (2018). A summary of information is found in the *Fort Drum Aquatic Species Management Plan* and a database of all sampling data since 2010 (titled *Invertebrate Master*) is on the server.

Most waterbodies have had some sort of water and/or biota assessment except for Deerlick Creek and tributaries of the Indian River.

4.1.2.3 Wetlands

Wetlands are prevalent throughout the installation. Approximately 20,200 ac (8,175 ha)—or approximately 20% of the surface area on Fort Drum—is wetlands (See Appendix 9, Figure 3). This includes 6090 acres of NYSDEC classified wetlands and 2864 acres of their 100 feet protected buffers which are protected under the NYS Article 24 permit process. One of the largest wetland complexes on Fort Drum is Warren Swamp in Training Area 7. Other large wetland complexes exist in Training Area 17 around Matoon Creek and throughout Training Area 19.

Similar to the rest of NYS, wetland habitats declined dramatically in the region from 1900 to the 1970s (NYSDEC 2006). During this time, it was common practice to drain marshes for agriculture and other land uses. However, on Fort Drum it is highly unlikely wetlands have been lost over time. Many areas on Fort Drum that had been drained for agriculture before 1940, have been returned to their natural state either through wetland mitigation measures or as drainage mechanics have fallen into disrepair. Beginning in 2010, the historical extent of wetlands was assessed and compared with current wetland land cover information as part of a *Range Wetland Management Plan*.

There are three main types of wetland habitats: riverine, lacustrine, and palustrine. Wetland boundaries change frequently due to changing hydrology, ecological succession, and beaver activity.

The most common type on Fort Drum is palustrine wetlands (including marshes, swamps, bogs and fens) which are dominated by trees, shrubs, or persistent herbaceous and woody emergent vegetation. Palustrine habitats account for approximately 77% of all aquatic habitats (approximately 15,500 ac / 6,273 ha).

There are approximately 3,900 ac (1,578 ha) of riverine wetlands. A riverine habitat is contained in a channel within an average watermark and lacks persistent emergent vegetation. Within an average watermark, aquatic beds and nonpersistent emergent plant communities exist.

There are approximately 800 ac (324 ha) of lacustrine wetlands. Lacustrine habitat is typically a permanent deepwater habitat exceeding 20 ac (8 ha) and tree, shrub, or emergent cover is less than 30%. Aquatic beds, nonpersistent emergent vegetation and unconsolidated shorelines are common in lacustrine systems. Lacustrine habitats can be less than 20 ac (8 ha) with the deepest portion exceeding 6.6 feet (2m), or if an active wave-formed or bedrock shoreline exists.

Many of the wetland areas on Fort Drum are beaver ponds which provide high quality habitats for many species of wildlife. One of the most productive wetlands for birds is Matoon Creek in Training Area 17B. Some of the highest waterfowl concentration areas on Fort Drum in the past have included Indian Lake, Mud Lake, Matoon Creek, Training Area 14B, and Quarry Pond (Claypoole et al. 1994). Waterfowl use of these areas is variable within and across years. There are an unknown number of great blue heron rookeries on Fort Drum, but most appear to have a small number of nests. At least one or two pairs of ospreys nest every year on the installation.

Fort Drum has also constructed wetlands on 13 compensatory mitigation wetlands sites on Fort Drum with an additional two off-post that total approximately 115 ac (47 ha) on-site and additional 10 ac (4 ha) off-post to compensate for the loss of wetland function and extent as the result of past construction projects. Fort Drum has also constructed a wetland mitigation bank (Fort Drum 2003) which consists of constructed wetlands including protection and preservation of surrounding uplands and wetlands. The bank's wetland sites were constructed to provide mitigation in advance for impacts resulting from subsequent construction projects. Over 130 ac (53 ha) of Fort Drum are set aside for the Bank. The three Bank sites (North Corner, Antwerp, and Range 37 Borrow Pit) will provide a maximum of 24 credits upon attaining full performance of wetlands at the three sites. Through January 2021 the Bank has debited 5.15 credits on over 4.74 ac (1.9 ha) of wetland lost for 18 projects.

Twenty-six wetland sites have assay water-chemistry conducted as part of an amphibian monitoring plan. These wetland sites are divided among the five ecoregions comprising Fort Drum with each ecoregion containing at least one semi-permanent, one open-emergent wetland, riparian wetland, one seasonally-flooded forested open-canopied wetland, and one seasonally-flooded closed-canopied wetland. Water quality characteristics assayed are: pH, specific conductance, turbidity, dissolved oxygen both ppL and percent, nitrogen ($N\text{-}NH_4$), temperature, maximum depth, and hydroregime. More information can be found in the *Fort Drum Herptofaunal Management Plan*.

4.1.2.4 Riparian Areas & Floodplains

Riparian areas are transitional areas between water and land resources. They are defined by their vegetation, land form, and stream banks. Riparian areas serve multiple functions including catching sediment from runoff before it enters a stream, regulating the flow of surface waters into streams, decreasing stream temperatures through shading, reducing erosion by stabilizing stream banks, providing areas where rare plants

can grow, being an important source of terrestrially-derived food and shelter for aquatic organisms, and providing habitat for many wildlife species including the Wood Turtle (*Glyptemys insculpta*) which has been petitioned for Federal legal status (CBC 2012). An additional component of riparian areas is underground springs. To date, Fort Drum's riparian areas have been assessed in conjunction with fisheries surveys; no overarching survey of the installation's riparian areas has been completed. More data is needed on riparian areas to improve WCI calculations, to understand bank stability, and to predict potential distribution of rare riparian area biota.

Though all water bodies on Fort Drum have floodplains, the only one with a FEMA-defined 100-year floodplain is the Black River. However, we recognize the importance of limiting development within all of Fort Drum's floodplains to facilitate natural hydrological function.

4.1.2.5 Aquatic Plants

Dense aquatic plant growth is typical of most lakes and ponds on Fort Drum. Aquatic plants are obligate wetland plants that grow in or on water. Surveys for aquatic plants in 2014 on Conservation Pond, Remington Pond, Mud Lake, Indian Lake, Indian Pond and Narrow Lake (Whitman and Smith 2014) found the most widely distributed species were chara (*Chara spp.),* Fragrant Water Lily (*Nymphaea odorata*), watermilfoils (*Myriophyllum spp.),* various species of bladderwort (*Utricularia spp.*) and various species of pondweed (*Potamogeton spp*.). The densities of these plants vary with annual photoperiods with the greatest aggregate plant densities occurring from July-August.

For more information on aquatic plant distributions see Whitman and Smith (2014). Aquatic plant surveys in lotic waters have been limited to waters within fisheries survey reaches and the downstream section of the Indian River. No surveys have been conducted on algal species, therefore our knowledge of those found on Fort Drum is extremely limited.

Wetland graminoid communities are not prevalent on Fort Drum because most wetlands have tree and shrub components exceeding 25% of areal cover. However where they do exist they are typically dense monocultures. Examples of wetland graminoids that create these dense monocultures are Reed Canary Grass (*Phalaris arundinacea*), Rice Cutgrass (*Leersia oryzoides*), and Canada Bluejoint (*Calamagrostis canadensis*). Some inundated drainages are inhabited by Tussock Sedge (*Carex stricta*), a sedge that forms colonies of tussocks that spread via rhizomes. Where graminoid wetlands exist without the monoculture aspect the typical conglomeration of species are bulrushes (*Scirpus cyperinus, S. atrovirens*), Soft Rush (*Juncus effusus*), sedges (*Carex* spp.), Redtop (*Agrostis alba*), mannagrass (*Glyceria* spp.), and Fowl Bluegrass (*Poa palustris*).

Wetland forb communities are not as prevalent because they generally have a shrub or tree component over 25% (classifying them as a shrubland or forest). The most common wetland forblands are dominated by Broad-leaved Cattail (*Typha laifolia*) and Narrow-leaved Cattail (*T. angustifolia*). These are generally found in roadside drainages and on the shores of inundated areas. Other wetland forblands are typically a mix of species. Inundated areas are typically inhabited by Water Plantain (*Alisma triviale*), Water Purslane (*Ludwigia palustris*), bur-reeds (*Sparganium* spp.), and Duck Potato (*Sagittaria latifolia*). The seasonally flooded and saturated forblands are generally inhabited by Sensitive Fern (*Onoclea sensibilis*), beggars-ticks (*Bidens* spp.), Joe Pye

Weed (*Eupatorium maculatum*), Boneset (*Eupatorium perfoliatum*), willow-herbs (*Epilobium* spp.), goldenrods (*Solidago* spp.), and asters (*Aster* spp.).

Wetlands dominated by shrubs are typical in drainage features across Fort Drum. Slender Willow (*Salix petiolaris*) and speckled alder are common wetland shrubs that can tolerate prolonged inundation. Meadowsweet (*Spiraea alba*), Pussy Willow (*Salix discolor*), Red-osier Dogwood (*Cornus sericea*), and Silky Dogwood (*Cornus amomum*) are more common species in seasonally flooded wetlands.

4.1.2.6 New York State Significant Aquatic Communities

Seven significant communities have been documented on Fort Drum (NYNHP 2013) and six are aquatic communities (Table 4.2). (See *Section 4.2.2.6.2 Northern Sandplain Grasslands* for more information on the one upland significant community.) These communities are not afforded any special regulatory protection, but are considered important due to their uniqueness and typically contain rare flora and fauna.

Table 4.2 Significant aquatic communities found on Fort Drum Military Installation.

Natural Community	Global and State Rank	Training Area
Hemlock-hardwood Swamp	G4 G5 : S4	3C
Northern White Cedar Swamp	G4 : S2 S3	7C, 13A, 14C, 15C, 16A, 17C, 19A, 19C
Silver Maple-ash Swamp	G4 : S3	10B
Medium Fen	G3 G4 : S2 S3	14C, 19C
Black Spruce-tamarack Bog	G4 G5 : S3	14C, 18A, 18B
Dwarf Shrub Bog	G4 : S3	19A, 19C

Bogs are typically open-canopied forested wetlands with a large component of sphagnum moss making them somewhat acidic (though many may be neutral pH due to presence of specific plants) and form relatively deep strata of peat. Bogs are isolated from other water sources therefore are hydrologically dependent upon high water tables and/or rainfall. Due to their unique features accordingly they have unique plant and animal components and are important habitat to several native species (i.e., Dragon's tongue, *Arethusa bulbosa*).

Fens are typically permanent open-emergent wetlands or seeps formed through high water tables and subsurface springs. The groundwater springs that feed these wetlands typically carry a high mineral load making these fens calcareous with a higher pH (alkaline) than acidic bogs. Fens may often be ice-free during winter months and provide important mineral and watering points for animals.

Most of the significant communities are in the northeastern part of the installation. A great deal more work needs to be conducted to identify these unique wetlands as well as to survey plant and animal communities found within. The installation-wide invasive plant survey beginning in 2021 will begin to document the impact or threat of invasive species to these natural communities. Ideally, known significant communities—or selected communities that offer the largest degree of diversity—would be monitored annually to determine their status and any potential impacts from invasive species, deer browse, erosion, training impacts, etc.

Vernal pools are an abundant wetland type that has received little attention to date with the exception of one vernal pool survey effort with the USACE-Buffalo District in 2016. Vernal pools are best described as seasonally-flooded non-peat forming fishless wetlands that fill with snowmelt (and sometimes autumnal rains), typically being dry before mid-summer. Although these seasonal wetlands persist for a brief time they are often the first wetlands to be ice-free in the spring and are important for migratory birds and ephemeral animal species such as mole salamanders (*Ambystoma sp*.) or Boreal Chorus Frogs (*Pseudacris maculatum*) that require these fishless environments to breed. There are numerous seasonal wetlands throughout Fort Drum but they are difficult to detect due to their short hydroregime. One project attempted to use GIS data to predict the location of vernal pools, but it was of limited success (Voorhees 2016). The other project (USACE 2016) to assess vernal pool density calculated approximately 0.84 vernal pools/study site acre across the three largest ecoregions which extrapolates to over 90,000 vernal pools on the installation during a dry year. The Western Adirondack Transition ecoregion had the largest vernal pools while the Eastern Ontario Plains ecoregion had the greatest density of vernal pools (USACE 2016). More work remains to be conducted on vernal pools.

See the *Fort Drum Significant Community & Rare Plant Management Plan* (in progress) for more information on significant communities.

4.1.2.7 New York State Endangered, Threatened and Rare Aquatic Plant Species

The status of state-listed Endangered, Threatened and Rare plants is challenging. The best available status information is from the New York Flora Atlas web site (http://newyork.plantatlas.usf.edu/default.aspx). Fort Drum has at least 15 state-listed plants and nine are aquatic species (Table 4.3).

Table 4.3 NYS endangered, threatened, and rare plants found in aquatic areas on Fort Drum Military Installation.

Common Name	Scientific Name	Global / State Status	Training Area
Common Mare's-tail	*Hippuris vulgaris* L	G5 / S1 : State Endangered	19C
Swamp Pink/ Dragon's Mouth Orchid	*Arethusa bulbosa* L	G4 / S2 : State Threatened	19C
Brown Bog Sedge	*Carex buxbaumii*	G5 / S2 : State Threatened	19D
False Hop Sedge	*Carex lupuliformis*	G4 / S2 : State Threatened	19A
Hill's Pondweed	*Potamogeton hillii*	G3 / S2 : State Threatened	8B
Lake-cress	*Rorippa aquatica*	G4 / S2 : State Threatened	17A
Small Bur-reed	*Sparganium natans*	G5 / S2 : State Threatened	14
Boreal Aster	*Symphyotrichum boreale*	G5 / S2 : State Threatened	19C
Ram's Head Lady's Slipper	*Cypripedium arietinum*	G3 / S2 : State Threatened	16A

The New York Natural Heritage Program (NYNHP) conducted surveys on Fort Drum in 2012 for state-listed plant species, but this effort was more focused on verifying past records rather than finding new locations. Another survey for rare plants was conducted in 2014 when northern white cedar swamps were searched for the Calypso Orchid (*Calypso bulbosa*) which was believed to have been extirpated from NYS. The survey

instead found a Ram's Head Ladyslipper (*Cypripedium arietinum*), a tiny orchid species found in some swamps, which had not been documented on Fort Drum previously. New locations of rare plants continue to be documented and historic sites are re-visited, but not in a comprehensive manner.

See the *Fort Drum Significant Community & Rare Plant Management Plan* (in progress) for more information on plant species.

4.1.2.8 Aquatic Invasive Species

Invasive species impact aquatic communities in similar ways as terrestrial systems. Major impacts are displaced native plants, decreased biodiversity, and increased erosion potential. Their tendency to spread very quickly makes their suppression, control and potential eradication more difficult. The hydrology of aquatic sites increases the difficulty of detecting and controlling aquatic plants. Specialized equipment such as boats, rakes, and/or snorkel/scuba gear are needed to identify submerged aquatic invasives in deep water. Mechanical treatments are difficult and added care should be used when using chemicals to limit negative impacts to the aquatic ecosystem.

Table 4.4 Priority aquatic invasive species of concern for Fort Drum.

Common Name	Scientific Name	Training Area
European Frog-bit	*Hydrocharis morsus-ranae*	7, 13, 15, 17
Yellow Iris	*Iris pseudocrus*	CA
Purple Loosestrife	*Lythrum salicaria*	CA, 9, 11, 12, 13, 14, 19
Eurasian Watermilfoil	*Myriophyllum spicatum*	Mud Lake
Reed Canary Grass	*Phalaris arundinacea*	CA, THROUGHOUT TA
Common Reed	*Phragmites australis*	CA, THROUGHOUT TA
Curly-leaf Pondweed	*Potamogeton crispus*	CA, 3B

Common Reed (*Phragmites australis*), Purple Loosestrife (*Lythrum salicaria*), European Frogbit (*Hydrocharis morsus-ranae*) and Eurasian Watermilfoil (*Myriophyllum spicatum*) are the main invasive species found in aquatic systems on Fort Drum. To date, Common Reed has been documented at over 350 sites—mostly in drainage ditches and stormwater retention ponds. Purple Loosestrife has been documented at over 350 locations. Occurrences of Eurasian Watermilfoil were primarily identified during 2014 targeted aquatic plant surveys (Whitman and Smith 2014). Reed Canary Grass (*Phalaris arundinacea*) is considered invasive by many botanists; however it is abundant across the landscape and it is not currently recorded as an invasive species on Fort Drum.

No comprehensive survey has been conducted for any invasive plant species to date; but a large-scale invasive plant survey began in 2021.

4.1.2.9 Contaminants

Contaminants have been identified in the tissue of fishes on Fort Drum. These contaminants can be detrimental to fish health, including limiting fish productivity and survival (USEPA 1975, USDHHS 2002). They also limit recreational fishing opportunities when contaminant levels are high enough to warrant fish consumption advisories.

NYS Department of Health (NYSDOH) has established a state-wide fish consumption advisory to limit exposure to potentially harmful levels of mercury in fish tissue. Mercury, like many other contaminants, bioaccumulates through the food chain, with higher trophic level fish (e.g., gamefish like bass and Northern Pike) generally containing higher mercury levels. NYSDOH has also issued a state-wide consumption advisory recommending against consumption of mergansers (Fort Drum has three species); these are the most heavily contaminated waterfowl species because they are primarily fish eaters (NYSDOH 2023). No aquatic or semi-aquatic species other than fish (e.g., Osprey, Mink, River Otter, Snapping Turtles) have been sampled for mercury or other contaminants on Fort Drum.

In 1982, after testing Indian Lake fish for contaminants and finding high levels of mercury, the NYSDOH issued a stricter fish consumption advisory for Indian Lake. The NYSDEC resampled the lake in 1993 and 1995 and found that high mercury levels in fish tissue persisted.

In 2004, because of concerns associated with an upstream petroleum plume and past local Dichlor-diphenyl-trichloroethane (DDT) use (Felley 1967), Remington Pond fish species were tested for heavy metals, pesticides, PCBs and semi-volatile organic compounds (Malcolm Pirnie 2005). Elevated levels of arsenic, mercury, molybdenum, Aroclor 1260 and DDT and its metabolites were found in Brown Bullheads, Pumpkinseeds, and Largemouth bass. The result of these data was the continuation of a catch-and-release policy for the pond to reduce human exposure to these toxicants.

More recent 2011-2015 surveys of Largemouth Bass and Brown Bullhead on five Fort Drum waterbodies (Indian Lake, Indian Pond, Indian River, Mud Lake, and Remington Pond) conducted by Fort Drum Natural Resources biologists found detectable levels of mercury, lead, PCBs, and pesticides in fish tissue. Mercury levels were high enough in most water bodies that risk-based calculations suggest that the current Adirondack region NYSDOH fish consumption advisory should apply to all of Fort Drum's major water bodies; lead, PCB and pesticides weren't as widely distributed in fish as mercury (Table 4.5).

Sediment samples were collected in 2016 from each LTM site and tested for some contaminants (e.g., not pesticides or PCBs). Contaminants that exceeded screening limits was zinc (160 mg/kg with a screening level of 120 mg/kg) and lead (35.8 mg/kg with a screening level of 41 mg/kg). The Operational Range Assessment Program (ORAP) tested sediment from Indian River in 2019 to determine whether contamination from military training was occurring and those results also found higher than environmental baseline levels of lead and zinc.

Assessing contaminants in fish will continue potentially on an approximate 10-year cycle.

4.1.3 Aquatic Resources Management Principles and Methods

4.1.3.1 Manage Watersheds to Avoid Impacts and Limit Point and Non-point Source Pollution

Human presence has greatly impacted the natural environment. Impacts such as sedimentation caused by rapid storm water runoff into streams can prevent species from inhabiting otherwise favorable habitat. The aim is to return Fort Drum's aquatic

ecosystem to a more natural state to allow species to repopulate streams and rivers. Having more and larger populations of organisms can promote ecological resilience in the wake of natural (i.e. floods) and unnatural (i.e. spills) disasters.

Many of Fort Drum's culverts were placed with little regard to their interaction within, and effects upon floodplains, and this has contributed to their failure, particularly washing out and flooding over. When replacing culverts and other crossings, natural floodplain functions will be mimicked. This includes designing crossings which follow the angles of streams' most natural paths, which are wide enough to function as a natural floodplain during 50-year floods in most places, and which transport sediment naturally.

4.1.3.2 Restore Impacted Aquatic Resources and Increase Aquatic Connectivity

The goal is to maximize bidirectional movement of aquatic organisms in the stream and to mimic natural floodplains and sediment movement processes. This can be accomplished by removing passage barriers and/or replacing them with passage-friendly structures.

Upstream populations of aquatic organisms which are prevented from freely migrating through the stream can experience inbreeding depression, which can make them genetically more vulnerable to disturbances such as disease. Instream barriers can also prevent organisms from reaching critical spawning or rearing habitat. Impounded waters behind barriers often form wetland habitat where streams once existed, resulting in more stagnant conditions, increasing water temperature and nutrient levels, and eliminating some stream species, specifically trout, an important indicator of water quality. Barriers also disrupt natural sediment cycling processes and can fill or scour instream habitats.

4.1.3.3 Manage Aquatic Resources for Biodiversity

Biodiversity is the total number of species and their abundance in a given area. Healthy, well-functioning natural communities tend to be diverse—they contain many different species within a balanced but dynamic web of life sustained by natural ecological processes. Maintaining biodiversity is not only important ecologically, but supports the military mission by: (1) aiding in environmental compliance and averting legal conflicts; (2) providing realistic training conditions for Soldiers to train as they expect to fight, and (3) assisting in maintaining quality of life for installation personnel and its neighbors. For this reason, we recognize the importance of maintaining the varied habitat types across the installation to support high levels of biodiversity.

4.1.3.4 Monitor Water Quality Parameters

Long-term monitoring data for Fort Drum's surface water quality is lacking. Understanding the chemical, physical, and microbiological properties of Fort Drum's waters will enable us to generate water quality improvement projects in waters identified as impaired under section 303(d) of the CWA or under NYS stream classification total maximum daily load TMDL standards. Additionally, these data will allow us to understand if there are chemical or physical habitat features which reduce aquatic species survivorship and productivity.

4.1.3.5 Manage Aquatic Resources for Recreational Opportunities

To enhance habitat to support recreational fisheries we will identify areas where habitat is limiting gamefish populations and their sizes at maturity. That knowledge will be used to design and implement habitat enhancement projects to increase gamefish populations and sizes.

4.1.3.6 Survey and Eradicate Aquatic Invasive Species Utilizing Integrated Pest Management

Aquatic resources must be protected from invasive species due to the many negative impacts that can occur due to their presence and proliferation. Invasive species can dominate and outcompete all other vegetation (e.g., Eurasian Watermilfoil); decrease quality of wildlife habitat (e.g., Purple Loosestrife, Common Reed); and impact outdoor recreation (e.g., Eurasian Watermilfoil). Impacts to our wetland ecosystems and waterways is essential to preserving our freshwater habitats for future generations. Decreasing invasive species throughout the installation is an act of stewardship and proactive management for the sustainability of training lands. Displacing native species could lead towards regulatory actions for such species. Regulations could possibly decrease the ability of lands used for training in order to preserve native communities if they happen to become rare.

4.1.4 Aquatic Resources Management Strategies

4.1.4.1 Avoid Impacts to Aquatic Resources

Avoidance is a part of environmental sequencing which is a planning process to avoid, minimize and mitigate for impacts by proposed projects and activities. Compliance with the Clean Water Act and state law establishes procedures for potential impacts to aquatic resources. Most Army and Fort Drum regulations avoid impacts; BMPS are established to avoid or minimize impacts. See Appendix 6 for guidelines to avoid, or minimize, impacts to aquatic resources. Where there are no specific rules or regulations to avoid impacts, most aquatic resources are de facto avoided due to the difficulties maneuvering in these areas.

4.1.4.2 Controlling Erosion, Transport, and Deposition of Sediment

The erosion, transport, and deposition of sediment can have devastating effects on the physical habitat and biology of streams. On Fort Drum, the primary source of erosion is construction activities, particularly within the Eastern Ontario Plains ecoregion where sandy soils can impact streams due to poor planning and/or land management practices. Transport of eroded sediment can “sandblast” aquatic life, and deposition buries aquatic life and habitat.

The goal is to have at least one project underway in the design and/or construction phase at any given time to address issues with erosion, transportation, and deposition of sediment. The process begins with identifying areas currently or historically impacted by erosion and sedimentation. The next step is to conceptualize and design sediment remediation and stream habitat restoration projects. Areas identified include: Airfield Creek, LeRay Reflecting Pool, LeRay Stream, and Remington Pond's Beach.

The stream identified as most in need of controlling erosion, transport, and deposition of sediment is Airfield Creek, the secondary tributary to Lower Sculpin Creek that arises from a spring on WSAAF (Appendix 9, Figure 5). This stream's headwaters are located between those of Upper Sculpin Creek and Fish Creek. WSAAF development in the late 1990's directed a majority of the storm drainage of all three streams into upper Airfield Creek. Storm water models predict a least a 3.5x multiplier of 25-year flood discharges into Airfield Creek. This increase appears to have occurred, and resulted in a "water cannon" effect of flows out of a culvert in the stream's upper reaches.

The effect of excessive velocities upon Airfield Creek's stream channel bed and banks has caused catastrophic erosion of hillslopes, toppling of oak, maple, and pine trees, and channel down cutting of 2-4 ft for a distance of nearly 0.5 mi downstream. Some of the eroded banks in this erosive reach are as high as 30 ft vertical. These steep ravines taper off somewhat for a distance of ~700-800 ft downstream from the culvert, and floodplain benches begin to emerge in this lower erosive reach. Below the erosive reach is a "transitional" reach of extreme fluctuation between channel erosion and sedimentation beginning approximately 0.5 mi distance downstream. Below the transitional reach is the "depositional reach" characterized by excessive infilling and burying of nearly all stream habitat. These drastic changes in stream behavior indicate a very unstable stream.

In addition to having a "devastated" physical habitat, Airfield Creek has a similarly impacted biota. Aquatic macroinvertebrate-based scores and electrofishing survey results reflect a nearly "lifeless" biota. In contrast, scores and electrofishing results in Fish Creek, an adjacent, similar "reference" stream, indicate a high-quality trout stream. Airfield Creek's co-tributary to Lower Sculpin Creek—Upper Sculpin Creek—is also a high quality trout stream. Brook Trout have been seen ascending Airfield Creek to spawn (personal observation, 2020) and the quality conditions of the connected waterbodies would potentially be a "seed source" to restore the entire system with the rehabilitation of Airfield Creek.

Fort Drum has completed two phases of remediation for Airfield Creek and is currently planning a third and final phase. Phase 1 was completed in 2021 by Fort Drum NR staff who designed and constructed 7 structures in the upper limits of the lower erosive zone. Phase 2 was completed in 2023, 10 structures were constructed in the downstream end of the lower erosive zone. These structures successfully stabilized banks, captured sediment, redirected stream flows and established grade control. The third and final phase will build upon these structures to reestablish the original elevation of the natural stream bed. By building the stream bed back to its natural elevation, the stream will be able to utilize the natural floodplain to mitigate the effects of excess flow during storm events. Phase III will also incorporate a sediment settling pool at the interface of the transition and depositional zones to prevent further sedimentation of the depositional zone. This pool will be monitored and regularly dredged of all captured sediments.

In addition to Phase I,II and III; Fort Drum also dredged a sediment settling pool just upstream of culvert 3D4D1. This will capture any sediments leaving the depositional zone downstream and ultimately off the installation. Fort Drum regularly monitors the pool and dredges captured sediment when needed. This pool will be of utmost

importance when culvert 3D4D1 is replaced with a culvert of the correct size and elevation.

Fort Drum expects to replace culvert 3D4D1, a complex of three (3) dysfunctional, undersized, and perched 2.5-3 ft circular culverts on Lower Sculpin Creek on Pleasant Road, in 2024. Regulatory guidelines call for an 8.5-9 ft wide culvert. While this is primarily an infrastructure project, it will have beneficial effects in terms of sediment transportation and deposition, as it is expected to restore floodplain connectivity and aquatic organism passage (AOP), and re-distribute upstream-accumulated sediment from Airfield Creek. Thus, this project can also be considered a remediative sediment erosion, transport, and deposition project.

4.1.4.3 Hardened Stream Crossings

During training and land maintenance activities, vehicles cross stream channels where no established crossing exists. This often results in erosion and compaction of stream banks and damage to the stream channel and its organisms through sedimentation. The preferred solution to minimize damage to vulnerable stream channels at these crossings is to establish hardened low water crossings which reduce bed and bank erosion and stream sedimentation while still allowing for natural channel function. The Natural Resources Branch will continue to work with ITAM to identify locations for and to construct hardened water crossings.

4.1.4.4 Decommissioning Unused Roadways

Decommissioning unused roadways and trails in riparian areas is another way to protect riparian area function.

The current primary project is the northern end of Plank Road which is planned for 2022. The project will also involve the removal of culverts 5B5B3, 5B5B4, and 5B5B5 on tributaries crossing Plank Road; the construction of a hardened water crossing; and the removal of culvert 5B5B2 on the mainstem of Trout Brook which will reconnect floodplains and restore fish habitat. The Plank Road project achieves multiple strategies: Section *4.1.4.2 Controlling Erosion, Transport, and Deposition of Sediment*; Section *4.1.4.3 Hardened Stream Crossings*; Section *4.1.4.6 Restore Stream Connectivity/Fish Passage & Culvert Management by Removing/Improving Artificial Barriers*; and Section *4.1.4.9 Improving Fish Habitat.*

4.1.4.5 Contaminants

The Natural Resources Branch will continue to test game fish for emerging and existing contaminants and will alter consumption advisories on Fort Drum waters as appropriate.

Transparency, education, and making informed decisions are our main courses of action.

Because Fort Drum anglers are often temporary military residents who are potentially unaware of statewide or regional fish consumption advisories, it is important for the Natural Resources Branch to educate anglers on contaminants levels so they can make informed decisions regarding the consumption of the fish they catch. Identifying

contaminants which are present at elevated levels in Fort Drum's fish is the first step in educating Fort Drum recreationists about the health risks associated with consuming locally caught game fish.

Water body-specific fish consumption advisories to protect human health based on contaminants levels have been calculated and are listed in Table 4.5. For all waters except for Indian Lake, Narrow Lake and the Indian River, Fort Drum has adopted the Adirondack region consumption advisory which suggests that males older than 15 and women older than 50 eat no more than 4 fish meals per month of any species, while women under 50 and males under 15 shouldn't eat any Largemouth or Smallmouth Bass, Northern Pike, Chain Pickerel, or Walleye, nor should they consume more than a combined four servings a month of Yellow Perch less than 10", Trout, Crappie, Sunfish, Bullheads, and any other fish species. For more detailed information see *Consumption Advisories for Fish from Fort Drum Waters* (Cowger 2020) and Health Advice on Eating Sportfish and Game (NYSDOH 2023).

Table 4.5. A summary of the monthly consumption advisories for Brown Bullhead and Largemouth Bass at the various waterbodies on Fort Drum. Data reported in this table only includes results from 2011-2013 sampled fish. Asterisks (*) are used to identify consumption advisories calculated from suspect laboratory results. (Table from Cowger 2020)

Waterbody	Fish Species	Women over 50 and Men over 18	Women under 50	Children under 18	Toxicant(s) Present
Remington Pond	Largemouth Bass	2	2	1	Mercury DDE
	Brown Bullhead	10	8	2	
Indian Lake	Largemouth Bass	1	1	0	Mercury Aldrin
	Brown Bullhead	4	3	1	Mercury
Indian Pond	Largemouth Bass	4	3	1	Mercury
	Brown Bullhead	0*	0*	0*	Lead* PCBs
Indian River	Largemouth Bass	4	3	1	Mercury Aldrin Endosulfan I
	Brown Bullhead	65	54	18	Tributyltin
Mud Lake	Largemouth Bass	1.9	1.6	0	Mercury
		0*	0*	0*	Lead* Cadmium* Selenium* Arsenic*
	Brown Bullhead	0*	0*	0*	Lead* Cadmium* Selenium*

4.1.4.6 Restore Stream Connectivity/Fish Passage & Culvert Management by Removing/ Improving Artificial Barriers

The identification of structures (e.g., culverts, old mills, old dams) on Fort Drum streams that interrupt natural hydrological processes, impound water, and/or hinder the passage of aquatic organisms is the first step in restoring stream connectivity. This was

accomplished for over 100 culverts on perennial and intermittent stream crossings from 2018-2020 utilizing the North Atlantic Aquatic Connectivity Collaborative Stream Crossing Instructions Manual for Aquatic Passability Assessments in Non-tidal Stream and Rivers (Abbott and Jackson 2019). The NAACC assessment is a numeric scoring system that assesses 13 variables (inlet grade; outlet drop; physical barriers; constriction; water depth; water velocity; scour pool; substrate matches stream; substrate coverage; openness; height; outlet armoring; internal structures) and provides a score between 0 (no aquatic passability) and 1 (full aquatic organism passage).

The second step is to replace those structures—primarily culverts--with structures that optimize aquatic organism passage and/or natural floodplain and sediment movement processes. The opportunity to implement this strategy often arises from the need to replace failing road infrastructure. At a minimum, at least one stream crossing will be identified and replaced strictly for aquatic organism passage (AOP) annually, but numerous other crossings with both infrastructural and passage issues will be targeted for replacement.

Fort Drum began an intensive in-house culvert replacement program in 2014. From 2017-2023, a total of 109 crossings have been targeted for removal and replacement with 74 crossings (includes 1 bridge). As of 2020, 69 failing or passage-ineffective culverts have been removed and replaced with 52 culverts. Many of these were formerly complexes of multiple undersized and/or perched culverts which were prone to clogging and Beaver activity. Their replacement with larger single culverts made the crossings more effective.

Most culverts replaced in trout streams were originally undersized and perched. Some 2 ft circular culverts were replaced with 4 ft H x 6 ft W pipe arches; some 3 ft circular culverts were replaced with up to 5 ft H x 7 ft W pipe arches. These included culvert 14C14E1 in Blanchard Creek; Bridge 38 in upper West Branch Black Creek and culvert 7F7E1 on one of its tributaries; culverts 14F14D3, 14C14D1, and 14C14D2 on Moussaw Creek; culvert 14D14E3 on Mill Brook, culverts 14D14E2 and 14D14E4 on other Black Creek tributaries; culvert 3E4E5 as a new box culvert on Pleasant Road and culvert 5C5B2 on Antwerp Tank Trail on the Trout Brook mainstem; and culvert 4D4E2 on Sculpin Creek.

General field observation of these crossings revealed that they maintain stream width, depth, substrate, and gradient through their length. These results are supported by drastic increases in their NAACC scores, often exceeding 0.90 (0 is worst, 1.0 is best) post-project. These scores are measures that capture the degree of matching the stream's width, depth, substrate, and gradient as it passes into, through, and out of the culvert. The more a crossing mimics the stream, the better the crossing ecologically. Connectivity has been restored or facilitated on more than 10 miles of trout stream since 2017.

For the foreseeable future (2021-2026) there still remain numerous significant culvert replacement projects. The largest of the in-house projects is culvert 3D4D1 on lower Sculpin Creek on Pleasant Road. This is planned as a 6.2 ft H x 8.2 ft W pipe-arch culvert, replacing three (3) perched 2.5-3 ft circular culverts. Other large projects planned include 5, 6, and 7 ft W culverts in the Mattoon Creek and Sawyer Creek watersheds. Of these, the C(t) reach of Sawyer Creek crossing North Tank Trail will require extensive planning and may not occur until 2024. The most ambitious project—

replacing the 4 perched and failing culverts on the mainstem of West Branch of Black Creek—will likely involve bridge construction. The Putney Lane Crossing Replacement on West Creek is another ambitious project that would drain the extensive impoundment upstream of the crossing. Macroinvertebrate and fisheries surveys show that Brook trout are common, stream temperatures are significantly lower, and higher macroinvertebrate-based scores prevail in the stream reach above the pond vs. the possible disappearance of Brook trout, higher temperatures, and lower scores downstream of the pond. Algae blooms also proliferate in the pond and elevated levels of fecal coliform indicative of highly degraded waters have been recorded.

Another project that has connectivity implications but is primarily planned to fulfill other INRMP requirements include: Replace Crossing on Town of Philadelphia Reservoir Access Road (which is discussed in Section *4.1.4.9 Improving Fish Habitat*. Likewise, the Plank Road project mentioned in Section *4.1.4.4 Decommissioning Unused Roadways* also improves connectivity although that is not the primary purpose.

Table 4.6 Priority management actions to restore stream connectivity/fish passage with culvert management on identified watersheds completed on Fort Drum 2017-2023.

Priority	WATERSHED Name	COMPLETED MANAGEMENT ACTIONS
1	Hunter Creek – Indian River	• Replaced 12D13B2 and 13B16C4 on Duck Pond Creek; 17B17A6, on small tributary
2	Hawkins Creek-Matoon Creek	• Replaced Carr Road culverts 16C16C2; (x2) with 17D17A5; 17B17A6, 17C17A2, 17C17A2, and North Tank Trail culverts (x3) with 17A17A1, 18A18A6 and 18A18A7; unnamed culvert on Range 44
3	Blanchard Creek – Upper Indian R.	• Replaced (x2) culvert with 14C14A1
4	West Branch Black Creek	• Replaced Bridge 38 on upper West Branch Black Creek • Replaced Culverts (x2) with 7F7E1 on C(t) stream; 7G7F3 and 7G7F4 on tributary
5	Beaver Meadows – Lower Black Creek	• Replaced culvert 12B13A1
6	Bonaparte Creek with Mud Lake	• Replaced (x4) culverts with 14B14C2 and 14B14C3 on a small tributary
7	Buck Creek – Upper Black Creek	• Replaced culverts 14F14D3; and (x4) with 14C14D1 and 14C14D2 on Moussaw Creek C(t) Black Creek tributary • Replaced Culverts (x2) with 14D14E3 on Mill Creek C(t) stream; Replaced culverts 9B9A2, 9B9A4, and (x2) with 10A8C1 on small Black Creek tributaries.
8	Trout Brook – Indian River	• Replaced culvert 3E4E5 with large box culvert; and 5C5B2, both on C(t) Trout Brook mainstem • Replaced Culvert X on Trout Brook tributary • Replaced Culvert 15E4E6 on Mosquito Creek tributary to Trout Brook
9	West Creek (with Pleasant Creek)	• Replaced failing culvert 4DWS1 on Fish Creek C(t) stream • Stabilized culvert # 33X outlet from Airfield
10	Rockwell Creek-Indian River	• Replaced culverts 14F14E2, 9C14G1, 9C14G2,, , 13A16A3, 13A16A4; 11C10C3; + 4 more on Ranges 25/50

Table 4.7 Priority management actions to restore stream connectivity/fish passage with culvert management on identified watersheds scheduled to be completed on Fort Drum 2024-2027.

Priority	WATERSHED Name	PLANNED MANAGEMENT ACTIONS
1	Hawkins Creek-Matoon Creek	• Replace culverts (x2) with 17A17A3, (x2) with 17A17A4, (x2) with 17A17A5
2	West Branch Black Creek	• Replace (x4) culverts with Bridge on Tower Road • Replace (x3) culverts on ASP C(t) tributary with 8B8B4 • Replace (x2) culverts with 8B8B3; and 5D8B1 on tributary
3	Trout Brook – Indian River	• Remove culverts 5B5B3, 5B5B4, and 5B5B5 on tributaries crossing Plank Road; replace with hardened crossings, and reduce road status • Replace Reservoir Access Road crossing (x2) with a mainstem and tributary culvert, and remove culvert 5B5B2
4	West Creek (with Pleasant Creek)	• Replace Impassable culverts and reduce turbidity culverts (x3) with 3D4D1 on Pleasant Road Lower Sculpin Creek, C(t) stream • Replace culverts 3A4B4 and 4B4A1 • Remove Putney Lane Impoundment
5	Sawyer Creek	• Replace culverts (x4) with 18A18A13 C(t) mainstem C(t) stream on North Tank Trail • Replace Range 48 culvert 48_14 C(t) stream
6	Rockwell Creek-Indian River	• Replace culvert 13A11D3 • Replace culvert 10193 on Deerlick Creek / Quarry Pond Road: Range 25 culvert 23381 on Deerlick Creek

4.1.4.7 Significant Aquatic Community/Rare Plant Management to Support Biodiversity

No laws or regulations currently restrict training or other activities related to significant communities or rare plants. However, avoidance would be the primary strategy for preventing impacts to unique habitats and known rare plant populations. This can be accomplished through the NEPA process. Managers can facilitate coordination by viewing upcoming training events scheduled through the Range Facility Management Support System (RFMSS) and also review submitted RECs from military units. Using these tools, suggestions can be made to trainers regarding any potential impacts to unique and rare resources. For the most part, aquatic areas are avoided due to difficulties of maneuvering, therefore we do not see any incompatible use between military training and significant aquatic communities.

4.1.4.8 Monitor to Improve Water Quality

Monitoring will be conducted by collecting hourly conductivity, water depth, and temperature readings from 13 Long term Monitoring (LTM) sites, collecting monthly water samples for analysis, collecting monthly on-site water quality data with a multi probe, collecting discharge data on a regular basis, and calculating aquatic macroinvertebrate-based index scores from each site every three years or more often as results or events indicate. Additionally, monitoring for contaminants in streambed sediments to determine if they are present at each LTM site will also occur. Some event-driven (training or precipitation/snowmelt) sampling will also be undertaken, including flow and turbidity measurements at LTM sites and other locations of interest.

4.1.4.9 Improving Fish Habitat

To enhance habitat to support recreational fisheries, areas where habitat is limiting gamefish populations and their sizes at maturity have been identified (Table 4.8). The goal is to have at least one project underway in the design and/or construction phase at any given time to address fish habitat issues—this may be a project that has already been identified in Sections *4.1.4.2 Controlling Erosion, Transport, and Deposition of Sediment* and/or *4.1.4.6 Restore Stream Connectivity/Fish Passage & Culvert Management by Removing/ Improving Artificial Barriers.*

Discussions of all other work not directly supporting fish habitat restoration, such as planning level surveys of aquatic macroinvertebrates or fish on non-project waters is discussed in Section *4.3 Fish/Wildlife Resources*. Likewise, recreational projects on lakes, streams, and other waters is discussed in *Section 4.5 Natural Resources Recreation and Outreach*.

Airfield Creek has already been described in Section *4.1.4.2 Controlling Erosion, Transport, and Deposition of Sediment*.

The other fish habitat improvement project undergoing any level of design is “Replace Crossing on Town of Philadelphia Reservoir Access Road”. A 2018 electrofishing survey by NR Branch personnel revealed that this crossing’s stream reach could have the most productive spawning Brook trout population on Fort Drum, with many individuals approaching catchable-size. This reach of stream also still maintains cool, trout-friendly “spring-fed” temperatures. However, high quality habitat is lacking upstream of the crossing due to accumulations of sediment above the inadequately-elevated culvert. In 2020, cross sections across the project reach were surveyed, primarily on the downstream end. This project is at the forefront of fish habitat improvement projects as well as infrastructure upgrades because of the excessively small culvert and propensity to impound water and submerge the road, but there are several complicating factors to be addressed. A design will be developed in 2021 that will incorporate both fisheries enhancement and infrastructure needs with construction to be in 2022 or later.

The two projects on West Branch of Black Creek to Improve Summer Brook Trout Habitat—(1) Construct Pools between Highway 3A and Warren Swamp and (2) Construct Pools between Bridge 38 and Highway 3A— will require extensive design including access, acquisition of materials and assurance of equipment and operators, and eventual excavation and structure placement. Field trips to these sites by Natural Resources staff in early 2020 reinforced the need for stream restoration. In the former, there is a highly sinuous and unstable reach with eroding banks, shallow/filled pools, and sediment accumulations. In the latter, the channel is highly stable, but consists of shallow homogeneous accumulations of cobble and boulders as run habitat, and nearly no pool habitat. Typically, Brook trout stocked upstream of these reaches wash through the system to downstream reaches because there is a lack of pool habitat for holding these catchable-sized fish. A recognized lack of pool habitat in the shallow bedrock reach on the West Branch’s downstream-most reach could also be remediated, through blasting or other efforts to deepen the habitat. To gain prior data and evaluate the success of the follow-on projects, the “Monitor the Pre/Post Summertime Usage of Created Pool Habitat in the West Branch of Black Creek” would be beneficial over a 5-year period from before to after the 3-year duration of the 3-reach project.

Table 4.8 Proposed Fish Habitat Improvement Projects and their Support Projects and Studies within Fort Drum Watersheds on Fort Drum, 2021-2027.

Priority	WATERBODY Name	PLANNED MANAGEMENT ACTIONS (EXECUTION YEAR)
1	Airfield Crk / Pleasant Crk	• Design/construct Airfield Creek stabilization, sediment remediation, and stream restoration (2021-2024) • Remove Sediment Downstream of Airfield Creek (2023-2025)
2	Trout Brook / Indian River	• Remove culverts 5B5B3, 5B5B4, and 5B5B5 on tributaries crossing Plank Road; replace with hardened crossings, and reduce road status (2022) • Replace Crossing on Town of Philadelphia Reservoir Access Road (x2) with a mainstem and tributary culvert, and remove culvert 5B5B2 (2022) • Plant riparian and floodplain trees in bare areas from 2020-2022 culvert replacement projects (2023)
3	West Branch Black Creek	• Monitor the Pre/Post Summertime Usage of Created Pool Habitat in the West Branch of Black Creek (2021-2026) • Construct Pools on the West Branch of Black Creek between Highway 3A and Warren Swamp to Improve Summer Brook Trout Habitat (2023) • Construct Pools on the West Branch of Black Creek between Bridge 38 and Highway 3A to Improve Summer Brook Trout Habitat (2024) • Excavate/blast pools in Lower West Branch Black Creek Bedrock Reach (2025)
4	Indian/Narrow Lake	• Indian Lake/Narrow Lake Bathymetry Study to Determine Lake Volume and Submerged Structures (2024-2025) • Indian Lake Fish Habitat Improvement Project to Increase Submerged Substrate and Support Larger Populations of Black Bass and Black Crappie (2023-2024) • Walleye Spawning Habitat Improvement Project to increase access to adequate spawning habitat and improve recruitment (2024-2025) • Indian Lake Walleye Habitat Usage Study to determine how walleye use the system throughout the year (2023-2025)
5	Black Creek	• Stream temperature study and plant riparian and floodplain trees on Black Creek tributaries with bare areas from 2017-2022 culvert replacement projects (2021-2022)
6	Conservation Pond	• Pre-Project Data Collection for Conservation Pond Dredging Including Bathymetric Data, Sediment Analysis, and Dam Structure Strength Analysis (2023-2024) • Dredge Conservation Pond to Increase its Volume and Improve Largemouth Bass Fishery (2024)
7	Pleasant Crk / Remington Pond	• Remove Sediment from LeRay Reflecting Pond (2024) • Rebuild Half of LeRay Pond Dam (2021) • Plant Riparian Zone Trees along Po Valley Stream (2025)
8	West Creek (with Pleasant Creek)	• Remove Putney Lane Impoundment (2025) • Rising Warrior Stream Restoration and Recreation Project (2025) • Plant Riparian Zone Trees along Rising Warrior Creek (2025)
9	Sawyer Creek	• Replace culverts (x4) with 18A18A13 C(t) mainstem C(t) stream on North Tank Trail (2024)
10	Rockwell Creek / Indian River	• Plant riparian and floodplain trees in bare areas from 2017-2022 culvert replacement projects (2023-2025)
11	Hunter Creek / Indian River	• Remediate Bank Erosion on Hunter Creek (2025)
12	Beaver Meadows / Black Creek	• Remediate Bank Erosion on Beaver Meadows Creek (2025)

The “Indian Lake/Narrow Lake Bathymetry Study to Determine Lake Volume and Submerged Structures” project will be necessary for development of the ensuing proposed habitat improvement project.

Prior to dredging Conservation Pond and associated work, the “Pre-Project Data Collection for Conservation Pond Dredging Including Bathymetric Data, Sediment Analysis, and Dam Structure Strength Analysis” project will be necessary.

The Walleye Spawning Habitat Improvement Project will improve spawning recruitment for walleye, resulting in a more robust sport fishery

The “Replace Putney Lane Crossing on West Creek” would result in improved fish habitat but is also a connectivity restoration project and mentioned in Section *4.1.4.6 Restore Stream Connectivity/Fish Passage & Culvert Management by Removing/ Improving Artificial Barriers*

4.1.4.10 Aquatic Invasive Species Management

The overall strategy for invasive species management is to survey and monitor populations then (1) rapidly respond and eradicate newly discovered species and (2) suppress reproduction and control existing populations in specific areas with identified conservation values. Because resources are limited, management must be prioritized.

(1) Early Detection/Rapid Response: Natural Resources Branch (or DPW-Pest Control) should be rapidly responding to species newly discovered on the installation in order to eradicate before it becomes established. A component of this is also conducting annual surveys.

- Conduct surveys in a similar manner that has already begun with NYNHP on a 15m grid basis—priorities may be adjusted to focus high priority areas with conservation value rather than one entire TA at a time.
- Rapidly respond to new discoveries and eradicate as necessary (either NR or Pest Control). (This would include Watch List species such as Water Chestnut or other species to be determined.)

(2) Regulated species: Invasive species that impact species managed by the Natural Resources Branch under federal/state regulations (e.g., ESA, CWA, MBTA, etc.)

- Common Reed growing in wetland mitigation sites

(3) Biodiversity -- It is acknowledged that invasive species decrease biodiversity---but this category focuses on certain species that become so dense that they create functional monocultures and preclude native flora and fauna. Where management occurs can be debated—starting with priority conservation areas, where spread is most likely to occur, roadsides, etc.

- Common Reed – dense stands (wetland impacts)

(4) Priority Conservation Areas. These communities are not afforded any special regulatory protection, but are considered important due to their uniqueness of flora and/or fauna.

- Hemlock-hardwood Swamp
- Northern White Cedar Swamp

- Silver Maple-ash Swamp
- Medium Fen
- Black Spruce-tamarack Bog
- Dwarf Shrub Bog

(5) SocioEconomic benefit of Natural Resources – Forestry, Agriculture, Recreation, Aesthetics

- Common Reed – recreation

Integrated pest management (IPM) will be used as outlined in the principles. In aquatic areas, mechanical control options are difficult and limited due to the hydrology of the sites involved and the ability of many invasive aquatic plants to reproduce via fragmentation. We will use mechanical means in certain areas if hand pulling and biological control options are not available. Special care should be taken in order to protect water resources from any contaminants such as petroleum products, oil and lubricants (POL). If possible we will use environmentally friendly products to minimize risk to the resources. Care must also be taken to ensure environmental conditions are not impacted by earth moving or rutting. Treatment using heavy machinery could impact the landscape.

Specially formulated chemicals are used in aquatic sites. These chemicals are considered compatible with the aquatic environment when used appropriately. Impacts to fish, animals and non-targeted plant species should be minimal if all appropriate precautions are taken and label instructions are followed.

Table 4.9 Management priorities and recommended control methods for invasive plants in aquatic systems on Fort Drum.

Invasive Species	Priority	Pull	Cut/Mow	Herbicide	Biological
Common Reed	High		**X**	**X**	
Purple Loosestrife	High	**X**		***X***	**X**
Reed Canary Grass	Low		**X**		
Curly-leaf Pondweed	Low	**X**	**X**	**X**	
European Frog-bit	Low	**X**		**X**	
Eurasian Watermilfoil	Low			**X**	
Yellow Iris	Low			**X**	

Various types of wetland sites will require active management to control invasive populations. Drainage ditches, storm water retention ponds and many other manmade features are often plagued by invasives. Multiple treatments using mechanical and chemical applications will be conducted whenever feasible. Some areas may only receive chemical treatments.

Common Reed/*Phragmites* and Purple Loosestrife are the most common aquatic invasive species and hence are the most frequently managed. These two species are typically chemically treated each season. Imazapyr or glyphosate-based products are used on a rotating basis in order to limit herbicide resistance. Approximately 150 of the known 350 Common Reed sites are treated annually prior to the first frost—100% of sites are not treated simply because of workload issues during the optimal spraying time; as well as timing difficulties if the weather changes too quickly and the plants senesce before being treated. There are no biocontrol agents for Common Reed in NYS at this

time. All 350 Purple Loosestrife sites are treated annually if possible, however, workload issues, weather, and access to sites sometimes prevent 100% treatment every year. *Galerucella spp.* beetles have been released in the past and continue to be released as a biocontrol agent for Purple Loosestrife.

Beginning in 2021, the Natural Resources Branch began conducting a new systematic and comprehensive survey for invasive species based on 15 m grids to fully assess the invasive infestations for all known invasive species on Fort Drum as well as the possible presence of Giant Hogweed. New York Natural Heritage has conducted this survey primarily in upland areas, but some wetland invasive species have been identified. No comprehensive survey is planned to be conducted for aquatic invasive species at this time.

For more information on species or site specifics refer to the *Fort Drum Noxious and Invasive Plant Management Plan.*

4.2 Land Resources

Land resources are the non-aquatic or upland areas which include forests, shrublands, and grasslands. This section also includes the management of wildlife habitat and invasive terrestrial plant species. Forest pests are addressed in the Section *4.4.4.9 Invasive Forest Pests*.

Land management activities are primarily the responsibility of the Land Management Team in the DPW-Natural Resources Branch. Until approximately 2000, most land management activities focused on forest management or maintenance of open areas and trails for military training. Forest management activities often followed traditional forest management practices of maximizing growth and yield of the most valuable forest products. In recent years forest management objectives have changed to give more emphasis to enhancing forested environments to benefit military training, wildlife habitat, and forest health. Since 2010, management of all landcover types has become the predominant theme to include not only forests, but shrublands, grasslands, invasive species, and significant plant communities/rare plants.

The Integrated Training Area Management (ITAM) Program within DPTMS-Range Branch is an Army-wide program that was originally created in response to the degradation of Army training lands. ITAM is primarily focused on vegetation management, trail maintenance, and other soil and water-related actions. The core part of ITAM's land management activities since 1997 has been the large tracts of open/semi-open areas primarily in Training Areas 12 and 13. ITAM also continues to work on maneuver corridors through forested areas and has the primary responsibility for invasive plant species management for species that impact military training.

In the Cantonment Area, Fort Drum Mountain Community Homes (FDMCH) is responsible for tree maintenance and the planning and management of all landscaping within their leased areas; however, removing trees is done in consultation with the Natural Resources Branch to ensure the value of the government's timber is retained. On non-leased areas in the Cantonment Area, DPW- Engineering Plans & Services Division is responsible for overall landscape planning and development around newly constructed facilities following the Installation Design Guide (Fort Drum 2017). Planting landscape trees and vegetation is usually accomplished through a contract mechanism. Maintenance of landscape trees and vegetation is conducted by DPW-Roads & Grounds when required. Any requests for the removal of trees and vegetation are done in consultation with the Natural Resources Branch.

The Directorate of Emergency Services (DES) Fire Chief serves as the Installation Wildland Fire Program Manager and is responsible for the Fort Drum Integrated Wildland Fire Management Plan (IWFMP 2023a) which sets forth and integrates the responsibilities and procedures needed to manage wildland fire on Fort Drum to maximize military training while protecting government property, natural resources, and adjoining properties. Fort Drum Fire Department personnel are first responders to fire incidents on the installation including wildland fires; Fort Drum also maintains mutual aid agreements with many surrounding communities for fire suppression. Natural Resources staff does not participate in extinguishing wildland fires; Natural Resources staff do assist in development of the IWFMP (Fort Drum 2023a) and provide weekly recommendations for fire danger ratings to the Fire Chief. The fire danger ratings are

determined through monitoring of the National Weather Service in Buffalo, New York and Burlington, Vermont fire weather web page, local weather patterns, and field observations of fuel moistures.

4.2.1 Land Resources Regulations & Guidance Documents

4.2.1.1 Federal Statutes & Regulations

Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884)

Provides for the identification and protection of threatened and endangered species of fish, wildlife, and plants and their critical habitats. All federal agencies (i.e. US Army and Fort Drum), in consultation with the USFWS (specified in Section 7 of the ESA), must ensure that any action authorized, funded or carried out is not likely to jeopardize the continued existence of an endangered or threatened species, or result in destruction or adverse modification of a critical habitat of a species. On Fort Drum, there are two listed species: the endangered Indiana Bat and the endangered Northern Long-eared Bat. Forest management and vegetation management (including the use of herbicides) are actions with associated conservation measures that are considered in the Biological Assessment (Fort Drum 2023b) and USFWS concurrence for those bat species. The most relevant conservation measure related to land resources is a time-of-year requirement to fell trees (> 3 in / 10 cm DBH) only between October 16 and April 15 to protect roosting bats during non-hibernation seasons.

Bald and Golden Eagle Protection Act of 1940, as amended, 16 USC 668 et. seq.

Provides for the protection of the Bald Eagle and the Golden Eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. Vegetation management restrictions (primarily forest management operations) are in place around one Bald Eagle nest in TA 19. No forest management operations are currently allowed within 330 ft (100 m) year-round. Actions are also restricted from 330-660 ft (100-200 m) during 01 January – 30 September. Time of year restrictions related to the Migratory Bird Treaty Act and Endangered Species Act will also benefit Bald Eagle conservation on Fort Drum.

Migratory Bird Treaty Act of 1918 (16 USC 703-712)

Protects migratory birds by prohibiting pursuing, hunting, taking, capturing, killing, and/or possessing (or attempting to do so) migratory birds (including eggs and nests) unless permitted by regulations. There is currently no permit to allow taking/killing migratory birds during land management activities. To minimize the taking/killing of migratory birds—including eggs, nestlings, and nesting adult birds—Fort Drum has instituted a land clearing window which allows vegetation clearing only between 01 August – 15 April to avoid most birds during the nesting season. This clearing window applies to undeveloped areas such as grassland areas in the Training Area and land clearing for construction; not for landscaped yards in the Cantonment Area.

Plant Protection Act (7 USC 7701-7786)

Consolidates all or part of ten plant health laws (including the former Plant Quarantine Act, Federal Pest Act, and Federal Noxious Weed Act) into one comprehensive law. Provides for the authority to regulate plants, plant products, certain biological control organisms, noxious weeds, and plant pests. Authorizes the control (i.e. management) of plants in accordance with Federal, state and local policies.

Sikes Act 16 USC 670 et seq.

The primary law regarding natural resource management policies and programs on military installations including the development of INRMPs, cooperation with the USFWS and state fish and game agencies, and ensuring professionally trained personnel are available and assigned to carry out natural resources management functions. To the extent practicable and appropriate, INRMPs must, among other things, provide for the management of lands and forests; wetland protection and enhancement; fish and wildlife protection and enhancement; sustainable public use of natural resources; and no net loss of the capability of the installation to support the military mission. The Sikes Act also stipulates that the sale of forest products and the leasing of lands for agriculture and grazing must be compatible with the installation's INRMP.

Authority to Harvest and Sell Timber and Lease Lands (Title 10 USC section 2665 & 2667)

Title 10 authorizes Army installations to harvest and sell timber and lease lands for agriculture and grazing.

Title 10 USC 2665, Sale of certain interest in land; logs allows the President, through the Department of the Army, to sell to any person or foreign government any forest products on land owned or leased by the Army. It provides that the Army will be reimbursed for all costs of production from the proceeds of the sale. This section also grants a 40-percent entitlement of net sale proceeds to the state or states in which the military installation is located. These entitlements will be used for public schools and roads. Section 2665 also established the DoD Forestry Reserve Account, which collects surplus funds from the sale of forest products. Installations of all the Services may apply for these funds, and section 2665 describes how the account balance may be used.

Title 10 USC 2667, Leases: Non-excess property of military departments allows the Secretary of Army to lease lands not needed for the immediate military mission. The terms of the lease must be advantageous to the US, promote the national defense, or be in the public interest. The Army retains monies received from Army agriculture and grazing leases and uses them to cover the administrative costs of outleasing and to finance multiple land use.

4.2.1.2 Executive Orders & MOUs

Executive Order 11987, May 24, 1977 - Exotic Organisms

Executive agencies shall, to the extent permitted by law, restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration; and, shall encourage the States, local governments, and

private citizens to prevent the introduction of exotic species into natural ecosystems of the United States.

Executive Order 13112, February 3, 1999 – Invasive Species; amended December 5, 2016 - Safeguarding the Nation from the Impacts of Invasive Species

Federal agencies are required to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

Executive Order 13186, January 10, 2001 – Responsibilities of Federal Agencies to Protect Migratory Birds

Federal agencies were to develop a Memorandum of Understanding with the USFWS to protect migratory birds by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. DoD was the second agency to establish an MOU with USFWS.

4.2.1.3 Department of Defense & Army Regulations and Policy

DoD Instruction 4715.03 Environmental Conservation Program (Incorporating Change 2, 31 Aug 2018)

Enclosure 3 - 3.b. & e. Biodiversity. Maintain or restore remaining native ecosystem types across their natural range and maintain ecological processes to the extent practicable. Invasive and noxious species will be identified, prioritized, monitored, and controlled whenever feasible.

Enclosure 3 - 4.a.: Installation lands shall be assessed for forestry suitability but any such use shall support the military mission, be addressed in the INRMP, and be consistent with long-term ecosystem-based management goals that place ecological sustainability objectives above revenue optimization goals. Forest products shall not be given away, abandoned, carelessly destroyed, used to offset contract costs, or traded for services, supplies, or products, or otherwise improperly removed without consideration of market value to be appraised by professional foresters. Forest products may be commercially harvested if such a harvest is consistent with the military mission, ecologically sustainable management and applicable regulations. Non-marketable forest products may be salvaged—forest products include, but are not limited to, standing timber/trees, downed trees, and pine straw. Environmental consequences of forest product removal must be considered with appropriate NEPA documentation and in compliance with all appropriate and applicable Federal, State, and local environmental regulations.

Enclosure 3 - 4.a.: Installation Lands shall be assessed for agricultural outlease suitability but any such use shall support the military mission, be addressed in the

INRMP, and be consistent with long-term ecosystem-based management goals that place ecological sustainability objectives above revenue optimization goals. Agricultural products shall not be given away, abandoned, carelessly destroyed, used to offset contract costs, or traded for services, supplies, or products, or otherwise improperly removed. Each agricultural outlease must require lessee adherence to a conservation plan that details the best management practices to sustain natural resources and protect Government interests under the lease .

Enclosure 3 - 4.a.(2) Forest products may be harvested to generate electricity, heat, steam, or for other uses only if such harvest is consistent with the military mission, the principles of ecologically sustainable management and the Sikes Act, and fair market value is paid.

DoD Financial Management Regulation 7000.14-R, Volume 11A Chapter 16 (Mar 1997)

This Department of Defense Financial Management Regulation (DoDFMR) provides policy, prescribes procedures, and assigns responsibility for the accounting, production, and sale of forest products. It also provides procedures for the reimbursement of program costs, the entitlement of states to share in the net proceeds derived from the selling of forest products, and the operation of the DoD Forestry Reserve Account

Army Regulation 200-1, Environmental Protection and Enhancement (13 Dec 2007)

This regulation implements federal, state, and local environmental laws and DoD policies for preserving, conserving, and restoring the environment.

4-3.d(3)(d) Minimize the impact of land uses on soil erosion and sedimentation when and where possible.

4-3.d(4)(a) Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with the mission and INRMP objectives

4-3.d(4)(c) Manage habitat to conserve and enhance existing flora and fauna consistent with the Army goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission.

4-3.d(7) Practice responsible stewardship of forested lands to support the mission.

4-3.d(8)(f) Sell no forest products nor outlease land for agricultural or grazing purposes unless the effects of the sale or lease are compatible with the INRMP

4-3.d(8)(m) Assure that agricultural and forest products are not given away, abandoned, carelessly destroyed, used to offset contract costs or traded for services, supplies, or products or otherwise improperly removed

4-3.d(10)(a) The Director of DPW is identified as the proponent for invasive species management.

4-3.d(10)(c) Mission activities must be conducted in a manner that precludes the introduction or spread of invasive species.

4-3.d(10)(d) Do not use invasive species in installation landscaping or land rehabilitation and management projects.

Army Regulation 405-80, Management of Title and Granting Use of Real Property (10 Oct 1997)

Army-controlled real property is defined as any interest in land, together with the improvements, structures and fixtures, under the control of the Army. Interests include leaseholds, easements, rights-of-way, water rights, air rights, standing timber, embedded gravel and stone, and underground water. As it pertains to the conservation reimbursable and fee collection programs, this regulation provides requirements for agriculture and grazing outleases, including the identification of potential available property, reports of availability (a list of installation lands available and suitable for agriculture and grazing outleases, also known as ROAs), management responsibilities, and the delegation of authority. The types of issued outgrants, or legal documents that grant the right to use Army real property, include leases, easements, licenses, and permits. According to AR 405-80, the Commanding General, US Army Corps of Engineers (USACE), and the USACE Director of Real Estate are delegated the authority to issue, execute, manage, renew, supplement, or revoke outgrants. They may re-delegate this authority as appropriate.

Army Regulation 405-90, Disposal of Real Property (8 Jun 2020)

This regulation sets forth authorities, responsibilities, policies, and procedures for the disposal of military and industrial real estate under the custody and control of the Army including standing timber. While installations are responsible for forestry management, the USACE District Real Estate Chief is responsible for selling timber except in instances where the installation can conduct sales within delegation limits.

Regulatory Guidance: Reimbursable Agricultural/Grazing and Forestry Programs (Aug 1999)

This guidance explains that reimbursable agricultural/grazing and forestry activities are opportunities for planning and managing the landscape to fit the needs of the mission. It provides explanation of responsibilities for implementation for Agricultural and Grazing Outleasing and Reimbursable Forestry activities, as well as identifying uses of generated revenue.

Army Installation Wildland Fire Program Implementation Guidance (15 Mar 2021)

This guidance requires all installations with unimproved grounds that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool will develop and implement an Integrated Wildland Fire Management Plan (IWFMP; Fort Drum 2023a) that is integrated with the INRMP, the installation's existing fire and emergency service program plan(s), the Integrated Cultural Resources Management Plan (ICRMP; Fort Drum 2020b), and the Range Complex Master Plan (RCMP). The purpose of the IWFMP (Fort Drum 2023a) is to reduce wildfire potential, effectively protect and enhance valuable natural resources, integrate applicable state and local permit and reporting requirements, and implement ecosystem management goals and objectives on Army installations. The guidance outlines the components of an IWFMP

(Fort Drum 2023a); describes program authority for fire management; and certification, training, and fitness standards for wildland fire management personnel.

Memorandum from the Principal Deputy Assistant Secretary of the Army (Installations and Environment), Army Forest Conservation Policy (Oct 2000)

This memorandum calls for all Army leaders to assure Army forests, grasslands, wetlands and deserts are managed as national assets, while fully implementing the principles of ecosystem management, which will also enhance the military mission.

4.2.1.4 NYS Laws, Regulations & Policies

NYS ECL Article 15, Protection of Water, and Article 24, Freshwater Wetlands.

Some land management activities require Article 15 and 24 permits (which are often granted jointly with Section 401 (water quality certifications) and Section 404 permits (USACE) if they are mutually requisite). The NYSDEC considers Article 15 permits based on impacts to streams which in New York are classified as either AA or A (used as a source of drinking water), B (used for swimming and recreation, but not drinking), or C and D (supports fisheries). Waters with classifications A, B, and C may have a standard of (T) indicating it may support a trout population or (TS) indicating it may support trout spawning. Article 15 permits are required for activities that have the potential to disturb streams classified from A through C, or lakes and ponds with an area of less than 10 ac (4 ha) connected to a stream. Article 24 permits are required for most ground or vegetation disturbing activities in and within 100 feet (30 m) of Regulated State Wetlands as identified on NYSDEC-provided maps with wetlands 12.5 ac (5 ha) and larger. Some Article 24 exemptions exist for some silvicultural and agricultural activities.

NYS Wildlife Action Plan (NYSDEC. 2015. Draft Final New York State Wildlife Action Plan. New York State Department of Environmental Conservation, Albany, NY. 102 pp.)

A guiding document related to fish and wildlife management and incorporated in the INRMP is the State Wildlife Action Plan (NYSDEC 2015) which is addressed in *Section 3.2.* The plan states: “Habitat management is fundamental to achieving the wildlife conservation goal. Most often managing habitats involves manipulation of vegetative cover, either by removing invasive species or controlling the natural process of succession.

4.2.1.5 Fort Drum Plans & Standard Operating Procedures

Fort Drum Forest Management Plan

Fort Drum is developing a forest management plan for all commercially available forests with goals and strategies for each of the five ecoregions present on the installation: *Eastern Ontario Plains Ecoregion*; *St. Lawrence Valley Ecoregion*; *Western Adirondack Transition Ecoregion*; *Indian River Transition Ecoregion*; and *Black River Valley Ecoregion*.

Fort Drum Regulation 420-6 Forest Product Sales (2020)

Fort Drum Regulation 420-6 Forest Product Sales sets forth policy and procedures for obtaining firewood and other forest products on Fort Drum.

MOU with Norfolk District Army Corps of Engineers

The Natural Resources Branch through the Fort Drum Conservation Reimbursable Program is required to market saleable timber through a contracting officer, which in this case is the Norfolk District USACE.

Biological Assessment (Fort Drum 2023b) and *USFWS Concurrence*

The Biological Assessment (Fort Drum 2023b) and USFWS 2024 Concurrence letter for the federally-endangered Indiana Bat and the federally-endangered Northern Long-eared Bat are applicable to land management activities.

Range Wetlands Management Plan (2011)

The Range-Wetlands Management Plan was developed to address complaints about beavers impacting the Training Area and the perceived loss of training lands due to wetlands and ecological succession. Appendix 2 of the Range Wetlands Management Plan provides an analysis of land conversion from open agricultural/range land to forest/shrubland for each subtraining area from 1941 to 2006.

Fort Drum Grassland Management Plan

Fort Drum is developing a Grassland Management Plan which includes the St. Lawrence Valley and Northern Sandplain grasslands.

Fort Drum Noxious and Invasive Plant Management Plan

This management plan describes the distribution of invasive species on Fort Drum, management options, and treatment locations.

Fort Drum Significant Community & Rare Plant Management Plan

Fort Drum is developing a management plan focused on significant ecological communities and state-listed plants.

4.2.2 Status of Land Resources

4.2.2.1 Forests

Forests cover approximately 57% of Fort Drum and provide for a variety of military training environments, diverse wildlife habitat, forest product production and many types of recreational opportunities. At least 62,186 ac (25,166 ha) of forests of various ages, species, composition, and structure are found across the installation with approximately 47,000 ac (19,000 ha) available for commercial and non-commercial forest management activities. Forest inventories are completed every 20 years—the latest forest inventory was completed in 2016.

As mentioned in *Section 2.3 Historic Land Use*, much of Fort Drum was agricultural land at the time of its acquisition by the federal government in 1940. By analyzing aerial photographs digitized in GIS, the conversion of open grassland/rangeland to forest/shrubland has been calculated over time comparing 1941 when Fort Drum was established to 1978 to 2006. In 1941, Fort Drum was approximately 25% forest/shrubland (primarily in the northeastern part of the installation) and 75% open grassland/rangeland; in 2006, approximately 85% of Fort Drum was forest/shrubland and only 15% consisted of open area. More detailed assessments by subtraining area can be found in the *Range Wetland Management Plan*. An example of the conversion through ecological succession of open grassland/rangeland to shrubland/forest over the past 65 years in TA3 can be seen as outlined in Table 4.10, although almost any training area shows a similar trend. See Appendix 9, Figures 6 and 7 for a comparison of historic vs. recent aerial photos of the grassland areas.

Table 4.10 Open grassland/rangeland in Training Area 3 in Appendix 3.2 Historic Analysis of Range Land by Training Area in the Range-Wetland Management Plan (2011).

SubTraining Area	Total Acreage	1941	1978	2006
TA3A	691	500	150	17
TA3B	344	283	178	80
TA3C	474	346	171	0
TA3D	775	604	436	56
TA3E	476	403	303	70
TOTAL	**2760**	**2136**	**1238**	**223**

Forests are defined as plant communities with at least 25% tree species cover. Forested sites are classified as having an “open canopy” if the percent of tree species cover is between 25-60%, or a “closed canopy” with greater than 60% tree species cover. Forests can be comprised of all deciduous trees, all conifer trees or a combination of both. Mixed forests have at least 25-75% co-dominance of both deciduous and coniferous species. Of the 62,186 ac (25,166 ha) of forests, 58,299 ac (23,593 ha) are classified as upland forests while 3,887 ac (1,573 ha) are wetland forests. See Table 4.11 and Appendix 9, Figure 3 for the different forest land cover types on Fort Drum.

There are many diverse forest types across the installation. The forest types in an area will change as soil conditions, topography and hydrology of the landscape change. These factors can dictate what type and what species of tree will thrive there. Since these factors are also part of what defines the five ecoregions found on Fort Drum,

changes in the dominant forest types are particularly noticeable as you transition from one ecoregion to the next (see INRMP *Section 2.5.3 Ecoregions*).

Approximately 1,028 ac (416 ha) on Fort Drum have been artificially reforested since 1919, mostly planting conifer species (e.g., Scotch Pine, Red Pine, Jack Pine, White Pine) to prevent soil erosion in the Eastern Lake Ontario Plains ecoregion. All other forests on Fort Drum are "natural."

The forest communities on Fort Drum can also be characterized by their stage of successional development. Forests are often referred to as either "early successional" or "late successional" depending on their age, size and species composition. Early successional forests are often characterized by dense stands of short-lived, shade intolerant tree species, such as; aspen (*Populus* spp*.)*, Gray Birch (*B. populifolia*), Balsam Poplar (*P. balsamifera*), Eastern Cottonwood (*P. deltoides*), White Ash (*Fraxinus americanus*) and Black Cherry (*Prunus serotina*). These tree species need a large amount of sunlight to grow and thrive. There may also be numerous shrub species found in early successional stands as well as a variety of forbs and grasses in the understory. Approximately 20% of Fort Drum's forest land is considered early successional.

Table 4.11 Approximate forested vegetative cover acreage based on 2006 digitizing efforts (last updated March 2011.

Upland Forests	**Acres**	**Hectares**
Closed canopy conifer	8,784	3,5441
Closed canopy deciduous	26,313	10,648
Closed canopy mixed	13,050	5,281
Open canopy conifer	901	364
Open canopy deciduous	7,089	2,868
Open canopy mixed	2,162	874
Total Upland Forests	**58,299**	**23,582**
Wetland Forests	**Acres**	**Hectares**
Closed canopy conifer	484	195
Closed canopy deciduous	1,082	437
Closed canopy mixed	607	245
Open canopy conifer	63	25
Open canopy deciduous	1,427	577
Open canopy mixed	224	90
Total Wetland Forests	**3,886**	**1,572**

As early successional forests mature into mid-to-late successional forests, trees with intermediate shade tolerance (White Pine (*Pinus strobus*) and Red Maple (*Acer rubrum*)) as well as trees that are very shade tolerant (Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), American Basswood (*Tilia americana*), Eastern Hemlock (*Tsuga canadensis*) and Yellow Birch (*Betula allegheniensis*)) begin to become established in the understory. The early successional species begin to reach biological maturity and start to die out of the stand and the shade tolerant tree species begin to dominate the stand. This transition of the dominate tree types moves the stand from early to mid/late successional forest stand development. Approximately 80% of Fort

Drum's forest land is considered to be in mid/late successional developmental stages. Although these forests can be found throughout the installation, the largest concentration of these mature forests are found in the Western Adirondack Transition and Eastern Ontario Ecoregions.

Early successional forest and shrubland habitats have been declining throughout the region (NYSDEC 2006). Land development is reducing habitat. Late successional mature forests are developing through ecological succession. Some shrublands are converted into agricultural fields, while the rate of farmland abandonment has slowed, further reducing the potential for early successional habitats to form. The decline of these habitat types has also been exacerbated by the lack of adequate land management in the form of sustainable forestry practices due to misconceptions that cutting down trees is, in general, a "bad thing." For example, NYS constitutional provisions prohibit management practices that would create and/or maintain early successional habitat (i.e., no logging, minimum basal area restrictions) in neighboring Adirondack Park. The loss of early successional forests have had negative impacts on the wildlife species that are dependent on this type of stand structure. In response, NYSDEC has adopted a Young Forest Initiative in 2015 to promote the growth of early successional woodlands in NYS Wildlife Management Areas

Likewise, mid/late successional forests are relatively abundant in the region (NYSDEC 2006) due to the presence of the 6 million acre matrix of public and private lands of the Adirondack Park. The current policy prohibiting logging and prescribed fires on more than 3.2 million acres of state-owned lands within the Adirondack Forest Preserve will only further the promotion of mid/late successional forests in the region (NYSDEC 2006).

4.2.2.2 Shrublands

Shrublands are classified as having at least 25% shrub species cover and less than 25% tree species cover. Shrublands comprise 13,382 ac (5,415 ha) or approximately 12% of Fort Drum. Upland shrubs comprise 9,559 ac (3,868 ha) while there are 3,824 ac (1,547 ha) of wetland shrublands.

The majority of the upland shrublands are composed of several dogwood species (particularly Gray Dogwood (*Cornus racemosa*), but also viburnums (*Viburnum* spp.), buckthorns (*Rhamnus* spp.), and honeysuckles (*Lonicera* spp.). These early successional shrublands typically succeed natural and human disturbances on the landscape.

Shrublands on Fort Drum have been increasing due to ecological succession with the largest patches of shrubland occurring around the periphery of large grassland areas. Current planning level surveys are being conducted to determine the increase of area dominated by these species.

4.2.2.3 Forblands

Forbs include all non-graminoid (i.e., non-grass), vascular species with morphology not adapted to float on water like pond lilies (*Nuphar* spp.). Forbland-dominated habitats are classified as having 51% or greater dominance of herbaceous vegetation with less than 25% tree or shrub cover. The communities dominated by forblands comprise 1,109 ac (449 ha) or 1% of Fort Drum. Forbland communities inhabit 987 ac (399 ha) of uplands

and 122 ac (49 ha) of wetlands. There are three distinct forbland communities across the installation—those that inhabit upland areas with sandy soils, those in upland areas with loamy clay soils, and those in wetlands.

Upland forb communities occurring in the St. Lawrence Valley ecoregion (e.g., Training Areas 3, 12, and 13 and the Cantonment Area) on loamy clay soils are usually dominated by Common Goldenrod (*Solidago canadensis*), asters (*Aster* spp.), Cow Vetch (*Vicia cracca*), and clovers (*Trifolium* spp.). These forbland communities have increased over the last decade mostly due to past management practices of prescribed fire killing off competing grasses and late season mowing which allows forbs to mature and spread their seed. The 2014-2017 vegetation classification surveys conducted in the St. Lawrence Valley ecoregion has shown that the past grassland communities are being displaced by forbs and shrubs.

4.2.2.4 Grasslands

From a functional perspective, grasslands and other open herbaceous-dominated cover types account for approximately 11,100 ac (4,492 ha) of Fort Drum training lands (Table 4.12). A variety of open areas fit the general description of grasslands, including old hayfields, sandplain grasslands, and beaver meadows. The vast majority of these open areas are remnants of the agricultural landscape that preceded the establishment of Fort Drum (see *Section 2.3 Historic Land Use* for more information). The two focal grassland areas of natural resources management concern are the St. Lawrence Valley Grasslands and Northern Sandplain Grasslands.

Table 4.12 Graminoid land cover acreage based on 2006 digitizing efforts (last updated March 2011).

Upland Graminoids	**Acres**	**Hectares**
Medium-tall sod temperate	559	226
Short bunch temperate	989	400
Medium-tall sod temperate with sparse trees	623	252
Short bunch temperate with sparse trees	1,821	737
Medium-tall sod temperate with sparse shrubs	5,673	2,295
Medium-tall bunch temperate/subpolar grassland	2,917	1,180
Wetland Graminoids	**Acres**	**Hectares**
Open grasslands	1,470	595
Grasslands with spare trees	239	96
Grasslands with sparse shrubs	1,188	480

A project by Natural Resources staff collected vegetation alliance data (typically dominant and co-dominant species) in non-forested areas in TA12 and TA13 in 2013-2014 with the eventual goal to continue across the installation. However, priorities shifted to invasive species management and the alliance effort was curtailed.

4.2.2.4.1 St. Lawrence Valley Grasslands

The area traditionally referred to as the “Fort Drum Grasslands” are approximately 3,500 ac (1,416 ha) of “old hayfields” in Training Areas 12B, 12C, and 12D; the western one-third of TA 13A; and smaller portions of TAs 11E and 13B. The grassland community

was dominated by Timothy (*Phleum pratense*), Orchard Grass (*Dactylis glomerata*), and Kentucky Bluegrass (*Poa pratensis*) and although these are not native grasses, the areas functioned as ideal nesting habitat for a number of grassland-breeding birds. The Fort Drum "grasslands" were identified as important breeding locations in NYS and the northeastern US for several bird species and this area had the highest concentrations of bird species of conservation concern anywhere on Fort Drum. These areas were also the largest contiguous patch of open maneuver space on Fort Drum, and were historically an important training asset especially for tracked vehicles.

Prior to the mid-1990s, no effort was made to maintain grasslands or other open, undeveloped space on Fort Drum. In 1997, Fort Drum's ITAM Program began using prescribed fire and mechanical methods to remove woody vegetation and shrubland to maintain open maneuver space in these open areas; this work remained a core part of ITAM's workload, with a goal of maintaining open space for military maneuvers and other training activity. Prescribed fire and late season mowing tended to favor forbs over grasses which met the goal of maintaining open areas, but not necessarily a Natural Resources goal of maintaining grasslands for birds. In 2013 ITAM abandoned prescribed fire as a management tool and began incorporating herbicide treatments into their management plans. In 2015, ITAM shifted its focus in these same large tracts of semi-open grassland to manage for patches of woody vegetation for concealment purposes.

The current status of the "grasslands" are more akin to emerging forblands/shrublands due to ecological succession. The TA 12 and 13 "grasslands" are almost entirely surrounded by woodland, including a strip that runs along much of the western boundary of TA12, and these woodland patches are encroaching into the fields; at the same time, existing shrub clumps within the fields are expanding. All but a very few fields have numerous shrubs growing throughout them, with Gray Dogwood (*Cornus racemosa*) being the dominant shrub species, and White Meadowsweet (*Spiraea alba*) occurring widely. What remains as "grass," is often dominated by a monoculture of *Phalaris*, an aggressive invasive species that does not offer the same structure preferred by nesting grassland birds. As mentioned in *4.2.2.3 Forblands*, recent (2014-2016) vegetation classification surveys conducted in the St. Lawrence Valley ecoregion has shown that the past grassland communities are being displaced by forbs and shrubs at a rapid pace in the past 10 years. Natural Resources staff have verified that acreages reported in Table 4.13 based on 2006 efforts are currently much smaller due to succession and the vigorous spread of shrub species as well as the increasing prevalence of forb species. Results from the 2016 survey of TA 12 are detailed in Table 4.14.

Table 4.13 Open grassland/rangeland in the "St. Lawrence Valley Grassland" in Training Area 12 and 13 based on GIS analysis of aerial photos in Appendix 3.2 Historic Analysis of Range Land by Training Area in the Range Wetland Management Plan (2011).

SubTraining Area	Total Acreage	1941	1978	2006
TA12A	1043	938 (90%)	672 (64%)	264 (25%)
TA12B	1170	1165 (100%)	1116 (95%)	1156 (99%)
TA12C	1338	1338 (100%)	1251 (93%)	1251 (93%)
TA12D	1200	904 (75%)	896 (75%)	784 (65%)
TA13A	3065	2264 (74%)	1799 (59%)	1319 (43%)
TA13B	673	544 (81%)	513 (76%)	326 (48%)
TOTAL	**8489**	**7153 (84%)**	**6247 (74%)**	**5100 (60%)**

Table 4.14 Results from a 2016 survey to document dominate vegetative cover in Training Area 12. Note: Almost half of grass in TA12C is Phalaris (~200 ac).

SubTraining Area	Total Acreage	Grass	Forbs	Shrub	Forest	Mowed	Open Water	Bare Ground
TA 12B	1170	104 (8.8%)	81 (6.9%)	301 (25.7%)	229 (19.5%)	445 (38.0%)	4 (0.3%)	6 (0.5%)
TA 12C	1338	486 (36.3%)	249 (18.6%)	358 (26.8%)	167 (12.4%)	59 (4.4%)	16 (1.2%)	3 (0.2%)
TA 12D	1200	64 (5.3%)	424 (35.3%)	279 (23.3%)	360 (30%)	25 (2%)	7 (.5%)	26 (2.1%)

Shrub encroachment has resulted in fields that are no longer suitable for grassland birds but provide excellent habitat for a growing suite of shrubland nesting birds. If no management is done to manage for open grasslands, nearly all of Fort Drum's open areas will convert to functional shrubland/woodland areas by 2027-2037.

4.2.2.4.2 Northern Sandplain Grasslands

The Northern Sandplain Grasslands occur in sandy soils (short bunch temperate) in the Eastern Lake Ontario ecoregion in Training Areas 4, 5, 6, 7, and 8. These grasslands have been designated a significant community by the New York Natural Heritage program and are described in their database as "successional northern sandplain grasslands". These grasslands are characterized by low vegetation consisting primarily of Common Hairgrass (*Deschampsia flexuosa*) and sedges (*Carex lucorum* and *C. rugosperma*). Patches of open sand may be colonized by the rare, disturbance-dependent sedges such as *Cyperus schweinitzii* and Houghton's Sedge (*Carex houghtoniana*) (Johnson 2003). Widely scattered trees may also be present in these areas.

This unique area has been impacted by a number of factors including erosion, development, ecological succession, and invasive species. The sandy soils in these grassland areas can be severely impacted by heavy military training and wind erosion. In the past Beachgrass (*Ammophila breviligulata*), Switchgrass (*Panicum virgatum*), Sheep Fescue (*Festuca ovina*), and Scotch Pine was planted to inhibit erosion from human disturbances. Portions of the Cantonment Area and all of Wheeler Sack Army Airfield and the Ammunition Supply Point are located in the historic sandplain areas and any new development in these areas will further decrease the amount of sandplains. Spotted Knapweed, an invasive species, has infiltrated many of these sites and displaced the typical native vegetation. Likewise, just like the rest of Fort Drum, ecological succession has led to the ingrowth of woody vegetation and decreased the amount of this rare grassland community.

After a management action occurred in 2014 to remove 340 acres of encroaching woody vegetation, there is currently approximately 150 acres of managed Northern Sandplain Grassland in Training Areas 7D and 7G.

4.2.2.5 New York State Significant Upland Communities

Seven significant communities have been documented on Fort Drum (NYNHP 2013), but only one is an upland community—the Northern Sandplains Grassland. (See *Section 4.2.2.4.2 Northern Sandplain Grasslands* for more information or *Section 4.1.2.6* for more information about the aquatic significant communities.) These communities are not afforded any special regulatory protection, but are considered important due to their uniqueness and typically contain rare flora and fauna.

4.2.2.6 New York State Endangered, Threatened and Rare Upland Plant Species

The status of state-listed Endangered, Threatened and Rare plants is challenging. The best available status information is from the New York Flora Atlas web site (http://newyork.plantatlas.usf.edu/default.aspx). Fort Drum has at least 15 state-listed plants but only six are upland species (Table 4.15).

New York State Natural Heritage conducted surveys on Fort Drum in 2012 for state-listed plant species, but this effort was more focused on verifying past records rather than finding new locations. New locations of rare plants continue to be documented and historic sites are re-visited, but not in a comprehensive manner.

Table 4.15 NYS endangered, threatened, and rare plants found in upland areas on Fort Drum Military Installation.

Common Name	Scientific Name	Global / State Status	Training Area
Northern Wild Comfrey	*Cynoglossum virginianum* var. *boreale*	G5 / S2 : State Endangered	19C, 19D
Northern Running-pine	*Diphasiastrum complanatum*	G5 / S1 : State Endangered	19C
Canada/Drummond's Rock-cress	*Boechera stricta*	G5 / S2 : State Threatened	4A, 4D, 5B, 5D, 6A, 7B, 7D, 8A, 8B
Houghton's Sedge	*Carex houghtoniana*	G5 / S2 : State Threatened	6A, 7D, 7G,
Stiff-leaf Goldenrod	*Solidago rigida* var. *rigida*	G5 / S2 : State Threatened	12A, 19B
Rock Elm	*Ulmus thomasii*	G5 / S2 : State Threatened	14D, 14F, 14G, 19C

See the *Fort Drum Significant Community & Rare Plant Management Plan* (in progress) for more information on plant species.

4.2.2.8 Invasive Plant Species

Invasive species can have negative impacts to the environment and military training. Fort Drum has documented 13 upland invasive species or groups of species (Table 4.16).

A survey for invasive species was originally conducted by the RTLA program in 2003. The data collected did not include all currently known invasive species. In 2009, more attribute data was collected to accurately represent the quantity of species, but the RTLA

effort ceased in 2010. The Natural Resources Branch began a more concerted effort in 2013 to monitor and manage invasive species and more than 2,500 locations have been documented, but that number does not generally include the most common and widespread invasive species (e.g., Spotted knapweed, Leafy spurge, Common buckthorn).

To facilitate a new land reclamation initiative, a systematic survey of buckthorn in the Cantonment Area was conducted in 2019-2020 to determine its presence/absence, but no other species were recorded nor was buckthorn surveyed outside of the Cantonment Area. Wild Parsnip populations have been surveyed and mapped along roadsides throughout the training areas in 2019-2020 to begin control efforts.

Table 4.16 Priority upland invasive plant species of concern for Fort Drum.

Common Name	Scientific Name	Training Area
Garlic Mustard	*Alliaria petiolate*	CA, 3B, 6A, 9C, 10A, 15A, 15B, 16C, 14A, 14E
Japanese Barberry	*Berberis thunbergii*	CA, 3A, 4A
Oriental Bittersweet	*Celastrus orbiculatus*	CA, 3A, 3C, 4A, 4B, 4D, 6A, 12D
Spotted Knapweed	*Centaurea stoebe ssp. Micranthos (maculosa)*	CA, THROUGHOUT TA
Black & Pale Swallowwort	*Cynanchum louiseae* and *C. rossicum*	CA, 3A, 3C, 4A, 4D, 5D, 6A, 7G, 8B, 10B, 11A, 11B, 12D, 13A, 13B, 14F, 15B, 15C, 15E, 16A, 17A, 17B
Leafy Spurge	*Euphorbia esula*	CA, THROUGHOUT TA
Purple or Himalayan Balsam	*Impatiens glandulifera*	7F
Honeysuckles	*Lonicera morrowii, L. tartarica,* and *L. x bella*	CA, 6A
Wild Parsnip	*Pastinaca sativa*	CA, THROUGHOUT TA
Japanese Knotweed	*Reynoutria japonica* var. *japonica*	CA, 3E, 5C, 6C, 12A, 12B, 14A, 14, 14E, 14G, 16C, 17B, 17C
Common & Glossy Buckthorn	*Rhamnus cathartica* and *R. frangula*	CA, THROUGHOUT TA
Black Locust	*Robinia pseudoacacia*	6A, 15A, 16C
False Spiraea	*Sorbaria sorbifolia*	CA, 16C

Beginning in 2021, the Natural Resources Branch began conducting a new systematic and comprehensive survey for invasive species based on 15 m grids to fully assess the invasive infestations for all known invasive species on Fort Drum as well as the possible presence of Giant Hogweed. New York Natural Heritage has conducted this survey primarily in upland areas.

See the *Fort Drum Noxious and Invasive Plant Management Plan* for more information.

4.2.3 Land Resources Management Principles and Methods

4.2.3.1 Manage and Resources to Support and Enhance Training

Any land management action proposed for the direct benefit of training takes priority for the Natural Resources Branch.

When mission requirements do not drive a land management action directly (e.g., wildlife habitat, forest health), training needs are always considered. Typically, the military mission will benefit from most timber harvest actions that reclaim overgrown or underutilized areas by making stands more accessible through creation of trail networks and thinning of dense forest stands. Vegetation management in non-forested areas (or grassland and/or shrubland areas) is accomplished through herbicides, mechanical methods, or a combination of the two.

4.2.3.2 Manage Land Resources to Benefit Wildlife, Especially Threatened and Endangered, Candidate Species and Species At-risk

Fish and wildlife biologists/managers must work closely with foresters/land managers to manage and/or enhance wildlife populations. Likewise, wildlife habitat activities must avoid any adverse effects to the training environment and coordination with the DPTMS training community is also part of the process. Maintaining and enhancing habitat is critical for sustaining robust and resilient populations for species of concern.

4.2.3.3 Manage Land Resources for Biodiversity and Sustainability

The quantity and diversity of Fort Drum's land resources brings many benefits as well as challenges for management. The wide range of types and conditions across the installation provides land managers the opportunity to manage the resource for many uses simultaneously. However, the challenge becomes finding the best opportunities to satisfy those goals.

Ensuring a sustainable environment for the military training mission is the primary consideration for all management activities. The goal is to not make a short-term decision to the detriment of long-term sustainability. Re-growing a forest stand is something that occurs over generations and not days or years.

It is the overall goal of Fort Drum's Natural Resources Branch to manage for diverse, healthy and sustainable resources to benefit all of the multiple uses that currently exist on Fort Drum.

When training or wildlife habitat creation/enhancement are not the driving force for forest management activities, upland forests can/will be managed based on forest improvement and production of forest products. These activities focus on the management of forested stands to provide a sustainable forest resource which emphasizes improved forest health, maintaining ecosystem integrity, improved forest growth, improvement/protection of water resources, and a sustainable flow of forest products in perpetuity. All management actions consider aquatic resources, water quality, wildlife, cultural resources, forest health, timber quality, aesthetics and other environmental concerns (See guidelines in Appendix 6.)

Succession is a natural process and these changes in the environment must be considered and potentially managed to reach the desired landscape conditions. In the absence of active management, climax forests will once again dominate Fort Drum; if open areas are desired, then active management must occur. Nothing on Fort Drum will remain open in perpetuity without continuous management activities.

Healthy, well-functioning natural communities tend to be diverse—they contain many different species within a balanced but dynamic web of life sustained by natural ecological processes. Maintaining biodiversity is not only important ecologically, but supports the military mission by: (1) aiding in environmental compliance and averting legal conflicts; (2) providing realistic training conditions for Soldiers to train as they expect to fight, and (3) assisting in maintaining quality of life for installation personnel and its neighbors. For this reason, we recognize the importance of maintaining the varied habitat types across the installations.

4.2.3.4 Survey and Eradicate Invasive Plant Species Utilizing Integrated Pest Management

Managers will aggressively survey and eradicate invasive species when found. There are numerous adverse effects of invasive species (Weldy 2008). Invasive species have directly impacted the military mission by degrading training ranges, encumbering realistic training conditions, hampering movements of Soldiers and vehicles, limiting training opportunities, increasing the cost of training land management, creating security and/or safety risks, and injuring Soldiers (Dalsimer 2002; Westbrook et al. 2005). Invasive species also cause ecological harm by dominating the understory and outcompeting native vegetation (e.g., swallow-wort, garlic mustard); reduces plant diversity by emitting allelopaths (e.g., Spotted Knapweed, Leafy Spurge); decreases quality of wildlife habitat (e.g., Purple Loosestrife, Common Reed); impacts outdoor recreation (e.g., Eurasian Watermilfoil); and affects human health (e.g., Giant Hogweed, Wild Parsnip).

4.2.3.5 Survey and Monitor Vegetative Communities

Forest inventory data is critical to ensure sustainable forest management. A forest inventory allows for establishment of a maximum allowable cut and a multi-year harvest plan to be determined based on the goals and objectives of any given area. The inventory gives land managers a “snap shot” of the forest conditions on the installation so that they can make informed management decisions to benefit military training, wildlife habitat, and forest product production. Fort Drum’s forest inventory system collects data on all forested stands. Stands less than 4 acres in size are not considered commercially productive for forest product production. An inventory of all commercial forest stands was completed in 2016. Starting in 2020, the stand inventory will be updated on a 20 year cycle (5% of the total inventory will be updated each year) and will include all forested stands regardless of size.

All other vegetated communities (grass and shrubs) will eventually be surveyed to capture dominant alliance type. Ideally this survey would be conducted every 10 years.

4.2.3.6 Manage for Land Resources for Recreation

Early successional forests and shrublands are important for many game species (e.g., White-tailed Deer, Snowshoe Hare, Ruffed Grouse, American Woodcock). Land managers will continue to create/enhance/maintain natural habitats to maintain robust populations to support recreational opportunities, such as hunting and bird watching.

4.2.4 Land Resource Management Strategies

4.2.4.1 Forest Management

Based on current forest inventory data and principles of sustainable forest management, Fort Drum can sustainably conduct forest management treatments on approximately 1,495 acres per year. This target management acreage is based on relative stand density, basal area/acre, and a 25-year treatment cycle (rotation age). There are currently approximately 27,000 acres of forest with a relative density exceeding 60%. Management of these stands is based on mission requirements, wildlife habitat requirements, forest pest control, invasive species control, and quality timber management.

4.2.4.1.1 Mid/Late Successional Forest Management for Military Training

Mature, mid/late successional forests often provide the most suitable conditions for military training scenarios in forested environments. Ideally, these areas would have large diameter trees, spaced widely apart for dismounted and mounted maneuverability, but still with overhead concealment; as well as little or no under-story vegetation for relatively unimpeded travel and bivouac opportunities. The training community has suggested a residual tree spacing of 4-8 meters (the range of spacing covers different types of training scenarios and equipment used). This spacing allows for maximum space between trees while minimizing sunlight reaching the forest floor which controls and/or reduces the amount of vegetation in the understory. This is the prescription followed in a forested stand that is being thinned for forest health purposes to promote maneuverability if desired as well as the prescription for mission-specific forest actions to create cross-country maneuver corridors through upland forest.

Forestry prescriptions also consider the type of forest for the intent of the harvest action. Certain tree species (e.g., aspen, black cherry, grey birch) cannot withstand repeated physical damage caused by military training. So for harvest actions specifically for military training, these trees would be targeted for removal during thinning, while trees with greater resistance to damage (e.g., maple, oak, pine) would be retained. This effectively increases the ability of the forest stand to sustain itself and recover from military training.

Silvicultural treatments are utilized to create areas suitable for various training scenarios across the installation by manipulating or altering forest type, tree spacing, tree size, canopy closure, age structure, and species composition

4.2.4.1.2 Mid/Late Successional Forest Management for Wildlife Management

Mid/Late successional forest types benefit numerous species of wildlife for all life stages. Many birds found on Fort Drum use woodlands or late successional forests to some extent. Two species of greatest interest are the Cerulean Warbler and Red-headed Woodpecker. The Cerulean Warbler is one of the least common nesting songbirds on Fort Drum and has been found in mature forests along the Indian River in Training Area 15. The Red-headed Woodpecker is another declining species, but the cluster of Red-headed Woodpecker territories on Fort Drum is among the largest known in the northeastern US and found in the oak savannas. With the exception of oak management

for woodpeckers (see *INRMP Section 4.2.4.1.5*), there are few prescriptions for wildlife management in mid/late successional forests.

Trees with cavities, snags, and downed logs and coarse woody debris are important wildlife habitat components in late successional forests. Aging and dead trees provide homes and food for many species including bats, woodpeckers, owls, salamanders, and insects. Snags are to be retained whenever possible/practicable.

- Long lived hardwood species > 12-15" DBH that have the potential to develop exfoliating bark or cavities will be left in areas that normally would be completely harvested (e.g., clearcuts, salvage operations). Targeted trees will be left in areas that experience large amounts of solar exposure (i.e. on the forest edge or within a forest opening or protruding above the canopy) to benefit bats and other wildlife.
- A minimum of 70 sq ft of residual basal area, all snags, and all live trees greater than 16 inches DBH that have noticeable cracks, crevices, or exfoliating bark must be retained around all perennial streams and open waterbodies (2 ac or greater in size) on Fort Drum. A perennial stream is defined as having flowing water year-round during a typical year.

There is also a desire to retain suitable live trees whenever possible/practicable.

- A percentage of suitable live trees (i.e., trees that have potential to develop into future snags) will be retained, for future snag recruitment and cavity development. Suitable trees will be long lived hardwoods >15 inches DBH and have the greatest potential to develop cavities or have exfoliating bark.
- In wetland areas 10 ac (4 ha) or larger with open water and shorelines greater than 30 m apart, 20 suitable trees will be left for every 50 ac (20 ha) harvested within 0.5 mi (0.8 km) of wetlands. Although this measure was originally developed to benefit cavity nesting waterfowl species (e.g., wood ducks and hooded mergansers); it can also benefit other wildlife. By retaining trees near wetlands that have the potential to develop into snags, future potential Indiana bat roosts may develop and be located near water sources and potential foraging areas.
- Mature "seed trees" will be left whenever possible/practicable in areas that normally would have been removed from the stand. This will allow specific mature trees to remain and provide food and/or cover components for certain wildlife, while also allowing the tree to function as a seed source for regeneration of other trees.

For most wildlife management, more emphasis is placed on early successional forest management.

4.2.4.1.3 Mid/Late Successional Forest Management for Forest Product Production

Mid/late successional forests have the potential to sustainably produce valuable forest products including sawtimber, firewood, pulpwood and biomass chips. Fort Drum foresters will focus on using uneven-aged management when appropriate to manage for forest products. This silvicultural technique will promote the growth of valuable

sawtimber species while maintaining a variety of age and size classes in the stand to maintain future sustainable harvests.

Even-aged management actions will still be required in some late successional forest stands due to past forest management actions, forest pest outbreaks, wind or ice damage, or military training actions that adversely influenced the species composition and stand structure. Some good examples of this can be found along FUSA Boulevard in Training areas 14 and 19. Even-aged management practices may be the best treatment to completely remove the existing trees and allow a new forest to grow into a productive stand once again.

4.2.4.1.4 Pine Plantation Management / Sirex Wood Wasp Management

In 2007 Fort Drum and the US Forest Service, Forest Health Protection staff in Durham, NH conducted a study associated with the invasive *Sirex* Wood Wasp (*Sirex noctilio*). *Sirex* preferentially chooses stressed and suppressed pine trees in stands with high basal area (i.e., dense), that are unthinned and have trees with small diameters. The presence of the wasp was confirmed in multiple pine plantations throughout Fort Drum and a study was designed to determine if the susceptibility of *Sirex* infestation could be decreased through silvicultural treatments (e.g., thinning). The study confirmed that thinning young pine stands removed the most susceptible trees (suppressed, damaged and/or diseased trees) and provided the opportunity for the remaining trees to increase growth and be healthier and less vulnerable to *Sirex* infestation (Dodds et al. 2014).

The results of this study are now applied to all forest management actions involving the management of pine plantations and dense natural stands of pine. This strategy of thinning to reduce susceptibility to insect infestation also falls directly in line with mission-related thinning requirements. This management effort does not eliminate the threat of *Sirex*, but it does greatly reduce the risk of tree mortality due to infestation.

4.2.4.1.5 Oak Savanna Forest Management

The oak savanna area in the Eastern Lake Ontario Plains Ecoregion in Training Areas 4, 5 and 7 is a unique forested area on Fort Drum. The area in Training Area 5, in particular, is composed of widely spaced red and white oaks and scattered eastern white and pitch pines. This area is frequently used for military training due to its sandy soils providing good drainage (i.e. no standing water) and easy digging, ideal tree spacing for maneuvers and bivouac areas, and close proximity to the Cantonment Area. Not only is this a unique habitat type, it is utilized by two bird species that are of management priority: Whip-poor-will and Red-headed Woodpecker. The pressing management issue in this forest type is the lack of regeneration—no seedlings/saplings (i.e. young trees) established in the understory to take the place of the larger overstory trees as they die out.

This lack of regeneration is most likely due to the ongoing military usage and frequent deer browse in the area. Because of heavy use and soil compaction from vehicular traffic, the existing vegetation is showing the detrimental effects of this long-term activity. Poorly formed trees and old scars on tree boles are widespread throughout the area.

Natural regeneration can usually be accomplished through silvicultural methods; in general, cutting trees in a forest opens up gaps in the canopy so sunlight can penetrate

to the forest floor and stimulate seed growth. Only in a few situations is tree planting required to reforest an area and due to the heavy military use in TA 5 and impact of deer browsing, this is a case where planting will be required. (Excluding training from using certain areas through the use of barricades or other means was considered and although natural regeneration was likely to occur, Natural Resources did not want to interfere with any training if other options were available.) In 2017, 2018, and 2019 bare-root red and white oak seedlings were obtained from the NYSDEC tree nursery in Saratoga, NY and/or from Jefferson County Soil & Water Conservation District in Watertown, NY. The seedlings were planted in areas where vehicle traffic was limited such as in existing tree/shrub islands to provide their best chance for survival. Red and white oaks are intermediate in shade tolerance, so in places where the tree canopy is excessively dense, poorly formed or dying trees may be cut to allow additional sunlight to reach the seedlings on the ground. Once planted, tree tubes were placed around the seedlings to protect them from deer browsing and make them more obvious and less likely to be run over by vehicles. The tubes also provide a greenhouse-like environment which promotes seedling growth and reduces stress from planting.

The seedling locations were recorded using GPS and then monitored annually to determine the success rate. Since 2017, there have been at least two major military exercises in and around the oak savanna habitat where the oak seedlings have been planted. Even though there was a heavy military presence of vehicles and personnel, seedlings in tree tubes were relatively undisturbed. As long as the tubes are maintained annually and not allowed to deteriorate (i.e. replacement of broken stakes/zip ties and/or uprighting fallen tubes), Soldiers will avoid the tubes. If this method of planting seedlings in tree tubes appears to be achieving the goal of establishing regeneration, then more bare-root stock will be planted in the coming years until the stand has enough recruitment to replace the overstory.

Oak savanna forests also provide important habitat for nesting Red-headed Woodpeckers (a species of Special Concern in NYS; see *Section 4.3.4.2.5*. for more information). A habitat assessment study was conducted with West Virginia University in 2012-2013 to determine key habitat characteristics that woodpeckers preferred in these oak savannahs. (Berl et al. 2015). Fort Drum foresters and biologists worked cooperatively to identify oak stands that were too dense and could be thinned using both small scale forest product sales (i.e., standing firewood lots) and large-scale commercial harvests. The goal of thinning was to attain a residual basal area of approximately 60-80 sq feet/ac. Oak species were favored over pine species as residual trees. Forest management actions occurred in 2014-2015. Woodpeckers were observed using the areas in 2015.

Thinning these areas also increases bivouac potential in these areas that Soldiers have already shown they like using. By utilizing new areas, maybe the impact on other areas with forest regeneration problems will be lessened.

4.2.4.1.6 Early Successional Forest Management

Early successional forests and shrublands are important for many game species (e.g., white-tailed deer, snowshoe hare, ruffed grouse, American woodcock) and species of greatest conservation need (e.g., American Woodcock, Black-billed Cuckoo, Blue-winged Warbler, Brown Thrasher, Canada Warbler, Golden-winged Warbler, Prairie Warbler, Willow Flycatcher).

Historically, natural disturbances from fires, wind, beavers, drought, insect outbreaks, and ice storms created a mosaic of forest structure and ages within the landscape. Periodic reversion of lands into young forests by Native Americans and early settlers also played an important role in shaping the structure of our forests. Early successional forests and the wildlife species that depended on them thrived.

In order to create and maintain habitat diversity natural disturbance events must occur and/or be simulated through forest management. Private, state and federal lands such as Fort Drum can be essential to maintain these early successional habitats in northern New York. The Natural Resources Branch on Fort Drum has succeeded in retaining and maintaining large stands of this critical forest habitat as part of its diverse forest resource. Currently on Fort Drum, approximately 20% of all forested stands are at various stages of what is considered early successional habitat.

Fort Drum land managers have completed multiple successful management activities targeting creation and maintenance of early successional forest habitat. Silvicultural strategies that have been used to regenerate early successional forest habitat include clearcuts, patch clearcuts, and seed tree harvests. Managers will continue these efforts to maintain a minimum of 11,800 acres (20% of the forest) in early successional forest habitat on Fort Drum. These efforts will focus on the St. Lawrence Valley and Eastern Ontario Plans Ecoregions where soil conditions and topography are most conducive to this type of management**.** Limited early successional work will be planned for the Western Adirondack Transition ecoregion due to challenges with topography and shallow soils.

4.2.4.1.7 Urban Forest Management

The Natural Resources Branch is ultimately responsible for all urban forestry concerns in the Cantonment Area. Natural Resources land managers also provide technical advice regarding landscaping, tree planting and tree care.

The first urban inventory in the Cantonment Area was conducted in 1998. Since then the urban landscape has changed drastically with development removing trees and small patches of forest as well as planting additional trees. In 2009, the Natural Resources Branch created and implemented a new Urban Tree Inventory (UTI) within the Cantonment Area to monitor the health and growth of trees in the urban landscape. Trees included in the UTI are those not included in the commercial forest inventory: single trees that have been planted; individual or small groups of trees that are remnants of natural forests; and small stands of naturally growing trees with a grass understory that is maintained by mowing to create a park-like area. The UTI is not conducted on lands within the housing areas that are leased by Fort Drum Mountain Community Homes. All trees in the UTI are mapped using GPS and tagged with a unique identification number. Data collected on each tree includes: species, size, crown width, overall tree condition and other observations that provide insight to the health of the tree. At the time of inspection, Fort Drum foresters also make recommendations on tree maintenance (i.e. needs pruning, mulching, watering). The UTI was created to be conducted on a 10-year inventory cycle (i.e. 2009, 2019, 2029), much like the Commercial Forest Inventory. However, no urban inventory data has been collected since 2014 due to staffing cuts in the Natural Resources Branch when the urban forester position was reassigned to the Compliance Branch. In the future, there may be an option

of completing the Urban Tree Inventory through a service contract or staffing adjustments.

The UTI was utilized to prioritize the planting of over 3,500 mature trees since 2010 as part of a massive reforestation effort to provide green space within the Cantonment Area where the demolition of old WWII buildings has occurred. These sites are being replanted with native tree species and will be off limits to mowing in an effort to re-establish natural vegetation and tree growth.

Another strategy to maintain and improve Fort Drum's urban landscape is to retain naturally- growing trees and forest stands whenever possible during new construction projects. If single trees are desired to be retained due to the size, species, or other factor, there should be buffer area of trees retained through the construction process. This tree buffer will increase the chances for the retained trees to survive the disturbance caused by construction activities. Often the chosen "leave trees" that have been retained quickly die because they are either run into by construction vehicles or their roots are compacted and/or damaged by construction activities.

When tree and shrub planting is required/desired native tree species that will thrive in USDA Plant Hardiness Zones 4a and 4b should always be selected. These are plants already adapted to the area and should require the least amount of maintenance. If non-native species are desired for ornamental purposes they must not be an invasive species. Because of the abundance of deer in the Cantonment Area, selected tree and vegetation landscape plantings should also be of species that are not preferred by deer in order to reduce damage to the plantings and overall cost. It is recommended that any plantings of hardwood species be of a size that the crown of the tree is above the reach of deer. Also, selecting plant species that are preferred by pollinators (e.g., bees, butterflies) would be beneficial to the natural environment as a whole.

The presence of the Indiana Bat, the listing of the Northern Long-eared Bat, and the establishment of the Bat Conservation Area (BCA) has prompted the need for a BCA-specific forest management plan. This plan must specifically address management for enhancement and sustainability of habitat requirements of Indiana and Northern Long-eared Bat and will be created in coordination with Fort Drum biologists to ensure no negative impacts to the species and its required habitat.

4.2.4.1.8 Hazard Tree Management

Nearly all trees pose some degree of hazard to people and/or infrastructure due to their vertical structure and massive weight. The Hazard Tree Management program attempts to manage the risk level associated with the interface between people/structures and the forest/landscape environment. The primary concern is in the Cantonment Area, where the greatest risk exists, but also in training areas when unsafe situations are observed that could negatively impact training and/or damage property. Hazard trees are identified when observed and brought to the attention of Natural Resources staff. There are currently no formal "windshield" surveys conducted annually for identification of hazard trees.

A Standard Operating Procedure (SOP) for handling hazard trees was developed in 2009 using guidance from US Forest Service Publication "Urban Tree Risk Management" (Pokorny et.al. 2003). This SOP lists several types of defects that will

affect the structural ability of a tree to maintain its upright position and attached branches. These defects are assessed and each given a probability of failure (low, moderate, high, or extremely high) that is documented on a "Hazard Tree Evaluation Form". A numbered rating system categorizes each tree for potential failure based on all the defects found and the degree of severity. Potential targets in the area were also identified and rated based on the potential to cause personal injury &/or property damage to buildings, vehicles, utilities or other infrastructure if the tree fails. The resulting numbers for "Probability of Failure" and "Probability of Target" are then added together to get to total "Risk Rating" for that particular tree.

Once this assessment has been completed the tree is assigned a number and scratched onto an aluminum tag attached to that particular tree. That number matches the one written on the evaluation form linking the 2 items (tree and hazard assessment) together forming an official record for the action. Cutting hazard trees or pruning (done when only the branches are the issue) is usually accomplished by DPW-Roads & Grounds or the Electrical Shop, if bucket truck capabilities are required. It will be contracted out if in-house resources are inadequate. Fort Drum Mountain Community Homes (FDMCH), or the Integrated Training Area Management (ITAM) Program may also be responsible for the removal depending on the location of the tree. Trees can only be cut down between October 15th and April 15th due to ESA restrictions. If an extremely high risk hazard tree is discovered outside this tree cutting window a biologist will document whether it is likely that an endangered species would be affected by this action. The tree will be then removed if necessary.

There have been three additional Hazard Tree protocol amendments developed since 2013 that apply to specific areas/situations: *Small Landscape Trees/Shrubs*, *LeRay Mansion Historical Area Trees/Shrubs*, and *Walking/Running Trails in Cantonment*.

4.2.4.1.9 Timber Stand Improvement

Fort Drum foresters use timber stand improvement (TSI) methods as a tool to help meet forest management objectives. TSI involves using mechanical or chemical treatments to control the growth of undesirable vegetation and in order to promote the establishment of desired tree species based on management objectives. In most situations, TSI treatments remove vegetation that has no commercial value but will ultimately promote the health and growth of the residual stand, increasing its value in the future. Some examples of TSI treatments include:

- Machine or hand thinning of dense pine saplings (<4" DBH) to reduce competition and increase growth or residual trees.
- Mechanical or chemical control of invasive species in forests stands, such as buckthorn and Oriental Bittersweet.
- Chemical control of American Beech sprouts that otherwise may quickly dominate the forest understory and negatively impact species diversity in the stand
- Chemical control of hardwood regeneration to promote the growth and establishment of Eastern White Pine.
- Annual mowing of understory vegetation to maintain open patches that are beneficial to wildlife.

4.2.4.1.10 Commercial Timber Harvests

Commercial timber harvests are often used to achieve the desired forest stand conditions for a variety of management objectives. Timber harvests involve the removal of standing trees from forested areas following a management prescription developed by Fort Drum's foresters. Trees that are removed from the forest stands are processed into various forest products to include; saw logs, firewood, roundwood pulp, and chips. Timber is most commonly harvested and removed by means of heavy equipment (i.e. wheeled skidders, tracked feller-bunchers, forwarders, etc.). These commercial harvests also support the local forest products industry by providing a source of wood products for the local sawmills, papermills, wood pellet mills and energy producing biomass plants.

Fort Drum foresters have primary responsibility for timber sale inspections and harvest contract administration. Inspections of sale areas are performed regularly to ensure that harvest operations are conducted in an orderly manner and in compliance with contract specifications. An end-of-year report is sent to IMCOM summarizing annual forestry activities. Post-harvest forest inventory and general harvest inspections are completed to ensure goals and objectives of each harvest have been met.

Small-scale timber harvests are also conducted through Fort Drum's firewood program. The firewood program was first established 1985 as a means to clean up dead and down material and to provide low cost timber stand improvement. In 2009, the program was updated and now includes offering small scale standing lots of trees for sale to the general public for firewood harvesting. Foresters designate the standing trees to be removed from within these lots by the purchaser. These standing firewood lot sales provide a low cost timber stand improvement (TSI) thinning in forested stands too small to support a large-scale commercial timber harvest operation, a low cost source of firewood for the local communities, and an effective habitat management tool for various wildlife species.

4.2.4.2 Shrubland Management

Shrubland management is not a high priority for Fort Drum land managers at this time. With approximately 9,500 ac (3,845 ha) of upland shrublands on the installation, there is no desire to create more shrubland area since areas of dense shrub vegetation are not beneficial for military training. In fact, land managers are often challenged by trying to stop shrub species from spreading into open grassland areas. Clearing shrublands to create more open grasslands or maneuver space may be an option; however this type of restoration work can be difficult and costly. Therefore Fort Drum's land managers have adopted a "Let It Grow" policy when it comes to the management of native shrublands. As these areas evolve into young forests, land managers will have more options for management to benefit training and wildlife habitat. Vegetation analysis surveys will still be conducted to determine the location and dominant species per Army data management recommendations. This data is essential to guide management decisions and recommendations for the sustainable future.

4.2.4.2.1 Shrubland Management for Military Training

Dense stands of shrublands are typically considered a hindrance when it comes to military training. The ITAM Program manages some of the installation's shrubland areas by controlling shrub growth in open areas to consist of 5-30% woody vegetation (this includes shrubs and small trees) in clusters spaced anywhere from 50-100 ft apart. Density and spacing of the woody vegetation clumps depends on the maneuver space desired for those areas (high or moderate maneuverability). These shrub clusters are used to provide concealment for training exercises. Management of the shrub communities are conducted through mechanical and chemical treatments.

4.2.4.2.2 Shrubland Management for Wildlife Habitat

Shrubland habitat can be just as beneficial to wildlife as early successional forests and functions in much the same way. Because natural succession is converting much of the open grassland areas to shrubland, little management is required to keep shrublands as part of Fort Drum's diverse natural environment. The Natural Resources Branch will focus on trying to limit the spread of shrubland communities into what remains of the Installation's open grasslands.

4.2.4.3 Grassland/Forbland Management

The Fort Drum Natural Resources staff recognizes the importance of the installation's grasslands/open space for maintaining a diverse landscape that can be beneficial to both wildlife and military training. It is the goal of the Natural Resources Branch to maintain and improve the condition of the existing open grassland areas including reducing the amount of forbs, woody stems and invasive plant. Survey efforts of these communities will continue to collect data across the landscape to make informed management decisions.

4.2.4.3.1 Grassland/Forbland Management for Military Training

Historically, Fort Drum's grasslands provided ideal training opportunities for unrestricted maneuver training. The ITAM program was responsible for the regular maintenance using mechanical treatments and prescribed fire to maintain open space for military maneuvers and other training activity. In recent years training priorities have changed and large tracts of open grassland/meadows are not as important for training scenarios. Now patches of woody vegetation are desired throughout the grassland area for concealment. The species composition of herbaceous vegetation (forbs versus grass) in these areas is of little concern for training purposes. The ITAM Program remains responsible for the management of these grassland/forbland areas for training. Mechanical and chemical treatments will be conducted to achieve the desired vegetation composition determined by the training community.

4.2.4.3.2 Grassland/Forbland Management for Wildlife Habitat

Because of the historical significance of Fort Drum grasslands and grassland bird communities in the region, and the Natural Resources Branch's doctrine to manage for sustainable and diverse ecosystems for the various flora and fauna that exist in the

region, at least some remnant grasslands are intended to be managed for grassland bird species for the foreseeable future.

Although nothing in this management scheme precludes military training we have selected areas considered low priority military training areas near the installation boundaries to avoid any potential conflict with training. The Natural Resources Branch's grassland management goal is to restore open areas to a condition where they are dominated by grasses and have few or no woody stems in order to provide habitat for grassland birds such as the Henslow's Sparrow and Sedge Wren in Training Areas 3 and 12 (St. Lawrence Valley Grasslands in the St. Lawrence Valley Ecoregion) and Upland Sandpiper and Vesper Sparrow in Training Area 7 (Northern Sandplain Grassland in the Eastern Ontario Plains Ecoregion).

Several factors must be incorporated into a grassland management plan regardless of the specific methods used to control woody vegetation to benefit grassland birds.

- The only fields on Fort Drum that are currently grass-dominated and continue to support nesting grassland birds are those that have been mowed relatively frequently, so any management plan for the long-term maintenance of these fields will require a program of repeated regular mowing, but not annually.
- Habitat management in the old hayfield grasslands should be guided by habitat requirements of Henslow's Sparrow, the species with the most restrictive habitat requirements of any of the grassland birds of interest on Fort Drum. Henslow's Sparrows require large fields at least 50 acres in size that have not been mowed or burned for at least two years and have a dense thatch layer. An alternative method is to partially mow a field annually, specifically by alternating strips that are mowed and not mowed across a field, and shifting the locations of mowed strips each year. This strategy results in a field that is completely mowed every 2-3 years, but retains sufficient standing dead grass for Henslow's Sparrows every year.
- Treatment plans must include the presence of several fields in excess of 50 acres that have not been mowed for 2-4 years. Preferably, the size of each field would be greater than 100 acres.
- Selected "grassland" fields will be either those that are already dominated by grasses or those fields dominated by forbs and other unfavorable plant species that can be relatively easy to convert. However, given the scarcity of such fields on Fort Drum, additional fields that have substantial amounts of woody vegetation will be cleared and restored to herbaceous-dominated fields. Initial conversion of these latter fields will be resource-intensive, but as the quality of the "grassland" fields improve, maintenance will become gradually less intensive.
- Ideally, all woody vegetation including trees will be removed from selected "grassland" fields. The removal of all woody vegetation will create the highest quality grassland bird habitat possible and remove seed sources that will complicate long-term management.
- Grassland restoration will be accomplished primarily by mowing of herbaceous fields to eliminate woody vegetation, supplemented when necessary by application of herbicides to eliminate hard-to-kill shrubs as well as invasive forbs, and seeding grasses when appropriate. Plowing and replanting with the

appropriate native grass seed mix may also be used in areas where forbs dominate graminoid species.

Fort Drum's land managers and biologists will continue to work together to ensure that any restoration work activities will have minimal impacts on existing bird populations.

- After establishment, at least half of all grassland bird habitat on Fort Drum should be left untreated each year to allow the possibility for sufficient grassland bird productivity. This percentage should be regularly evaluated and potentially increased depending on the amount of available habitat and the relative success of efforts to maintain extant grassland and recover areas where grassland quality is currently poor.
- When herbicides are necessary, spot treatments will be used to target either invasive species or woody stems. Timing of herbicide actions should also be delayed as late in the growing season as possible to minimize impacts to nesting birds and yet still effectively kill vegetation.
- Grassland management for the benefit of grassland birds has always presented a Catch-22 with regards to the Migratory Bird Treaty Act prohibiting the taking of migratory birds. Mowing, other vegetation removal and/or maintenance treatments required to enhance grassland bird habitat must take place during the growing season which is at the same time as the nesting season and will certainly take/kill migratory birds and/or their nestlings. However, without vegetation management occurring during the growing season, grassland habitat will be lost and there will be no further use by grassland birds. The USFWS does not issue permits for unintentional taking/killing of migratory birds, but this INRMP serves as our stated intention and rationale. To justify in-breeding season vegetation management with respect to MBTA, as long as the habitat management actions improve the quality and quantity of grassland bird nesting habitat, and such management leads to a net increase in the numbers, productivity, and/or survival of rare bird species, then the actions of Fort Drum will be justified.
- Avian surveys will continue to be conducted to determine the presence and location of grassland bird species of high conservation concern in order to alter mowing plans accordingly to avoid areas birds are using if possible. Monitoring presence and relative abundance of bird species before and after management will also be conducted to determine whether management is increasing grassland birds. See *Section 4.3.4.2 Bird Management* for more information.

Grassland Management Units:

- Training Area 3B: The 75-acre Bedlam Grassland Area has been mowed repeatedly during the growing season since 2019 to control Wild Parsnip. Once this control effort is complete the resulting field will likely be grass-dominated and maintained through mowing once every two to three years. If the field is still forb-dominated, it will be disked and planted in grass seed, then maintained as grass through regular mowing.
- Training Area 12D: The Coolidge Grassland Area consists of 3 sites of approximately 50 acres in size. To restore grass species as the major component at these sites, a combination of mechanical and herbicide

treatments was used to get rid of woody stems and forbs beginning in 2016. These areas were disked and re-seeded with a mix of native grass species. The resulting grassland was too dominated by a single grass species and had excessive amounts of clover, so additional plowing and seeding may be necessary to achieve the desired diversity of grasses. Once these fields are in the desired state, at a minimum, these areas will have a maintenance mowing prior to forb seed drop every 2-3 years to control regrowth of woody stems and forbs. In the future, a hay lease program could be implemented to help achieve the goal of annual mowing.

- Training Area 12C: The portion of the Chute Drop Zone south of Hunter Creek will be managed for grasslands. Beginning in 2021, woody vegetation will be cleared from shrubland and woodland, and then these areas will be disked and planted with grass seed. Forb-dominated fields will also be disked and planted with grass seed. Those areas within the Chute DZ that are currently grass dominated will be mowed once every three years, with approximately one-third of the area mowed in a given year. As additional areas are restored to grassland they will join this three-year mowing rotation to maintain the grassland community.
- Training Area 7D and 7G: Maintenance will be required in the Sandplains grassland restoration area to control sprouting and re-growth of woody vegetation on approximately 150 acres. This area was first treated in 2014 to remove all trees and woody stems. Land managers found that native sandplain grass species were still abundant in the understory, so no re-seeding of grass species was required. Mowing and herbicide treatments will be used annually over the next few years to control the re-growth of woody vegetation as well as any invasive species (spotted-knapweed) that may be present. Cut/stump treatments will be applied for suppression of woody stem sprouting. Spotted Knapweed control will consist of continued releases of biological control agents within the boundaries of these sandplain grassland patches. Periodic monitoring for introduced invasive species will be performed due to the increased amount of disturbance.

An emerging Grassland/Forbland-Wildlife Habitat Management component relates to pollinators, especially now that the Monarch butterfly was petitioned for listing (CBC 2014) and determined to be a candidate for listing under the ESA.

- Areas will continue to be assessed that may provide good pollinator habitat and documented. These sites should be relatively protected from disturbance primarily as a function of their size and/or location, versus creating “off limits” areas. At most “no mowing” signs will be placed around the perimeter of the area.
- Management for invasive species will continue on pollinator areas—if pesticides are necessary, their use will be minimized and targeted.
- To promote pollinator-friendly plant species, approximately 15-25 ac of non-contiguous areas that are currently mowed or classified as forbland, will be cultivated and a native northeast wildlflower seed mix will be used to promote pollinator use.

4.2.4.4 Significant Community/Rare Plant Management

No laws or regulations currently restrict training or other activities related to significant communities or rare plants. However, avoidance would be the primary strategy for the conservation of unique habitats if training or other activities were deemed a threat. Minimization of impacts to unique habitats and known rare plant populations can be accomplished through the NEPA process. Managers can facilitate coordination by viewing upcoming training events scheduled through the Range Facility Management Support System (RFMSS) and also review submitted RECs from military units. Using these tools, suggestions can be made to trainers regarding any potential impacts to unique and rare resources.

The greatest concerns involve the Northern Sandplain Grassland area in TA7 which is primarily due to development, invasive species, and ecological succession. Management of this area has already been discussed in INRMP Section *4.2.4.3.2 Grassland/Forbland Management for Wildlife Habitat.* Continued monitoring and managing of the resource will be required. Much of the Northern Sandplains Grassland is located near the NCO academy as well as a well-used training area typically used for navigation and maneuver exercises. Natural Resources staff do not foresee any incompatible use between military training and Northern Sandplain Grasslands.

4.2.4.5 Terrestrial Invasive Species Management

The overall strategy for invasive species management is to survey and monitor populations then (1) rapidly respond and eradicate newly discovered species and (2) suppress reproduction and control existing populations in specific areas with identified conservation values. (ITAM is responsible for invasive plant management that impacts mission readiness.) Because resources are limited, management must be prioritized.

(1) Early Detection/Rapid Response: Natural Resources staff (or DPW-Pest Control) should be rapidly responding to species newly discovered on the installation in order to eradicate before it becomes established. A component of this is also conducting annual surveys.

- Conduct surveys in a similar manner that has already begun with NYNHP on a 15m grid basis—priorities may be adjusted to focus high priority areas with conservation value rather than one entire TA at a time.
- Rapidly respond to new discoveries and eradicate as necessary (either Natural Resources Branch or Pest Control). (This would include Watch List species such as, Giant Hogweed, Japanese Stiltgrass, Porcelain Berry, or other species to be determined.)

(2) Regulated species: Invasive species that impact species managed by the Natural Resources Branch under federal/state regulations (e.g., ESA, CWA, MBTA, etc.)

- Buckthorn/Honeysuckle spp. in Bat Conservation Area and impacting long-term benefit of forest-dwelling federally-listed bats
- Oriental Bittersweet in Bat Conservation Area and impacting long-term benefit of forest-dwelling federally-listed bats
- Swallowwort spp. being toxic to Monarch Butterfly larvae which is now a candidate species for listing under the ESA.

- Japanese Knotweed overtaking the National Registered historic village site at in Lewisburg.

(3) Biodiversity -- It is acknowledged that invasive species decrease biodiversity---but this category focuses on certain species that become so dense that they create functional monocultures and preclude native flora and fauna. Where management occurs can be debated—starting with priority conservation areas, where spread is most likely to occur, roadsides, etc.

- Oriental Bittersweet – dense stands (forest impacts)
- Buckthorn spp. – dense stands (forest impacts)
- Swallowwort spp. – dense stands (forest, shrub, and grassland impacts)
- Japanese Knotweed – dense stands (riparian impacts)

(4) Priority Conservation Areas. These communities are not afforded any special regulatory protection, but are considered important due to their uniqueness of flora and/or fauna.

- Northern Sandplain Grassland
- Oak Savanna
- St. Lawrence Valley Grassland

(5) SocioEconomic benefit of Natural Resources – Forestry, Agriculture, Recreation, Aesthetics

- Oriental Bittersweet – forestry & forested areas in Cantonment Area (aesthetics)
- Buckthorn spp. – forestry (TSI)
- Swallowwort – forestry / recreation
- Buckthorn spp. – recreation
- Swallowwort spp. – recreation
- Japanese Knotweed – recreation

Some species will require mechanical or chemical treatments be conducted prior to seed development and drop. In these situations all efforts will be made to minimize impacts to nesting birds by utilizing spot treatments, adjusting droplet size, controlling drift and ensuring applicators are trained to look for and avoid direct applications to nesting birds. As with grassland management it is impossible to avoid all bird impacts while effectively treating and controlling the infestation. The no action alternative will also impact birds due to the loss of habitat. To be able to meet management goals for sustainability and eradication of invasive species, intelligently designed treatments will restore and enhance habitats and lead to a net increase in the numbers, productivity, and/or survival of rare bird species.

The method of control is designed specifically for each species and each location where it is found but generally follows Table 4.17.

Table 4.17 Management priorities and recommended control methods for invasive plants in uplands on Fort Drum.

Invasive Species	Priority	Pull	Cut/Mow	Herbicide	Biological
Wild Parsnip	High		X	X	
Black & Pale Swallowwort	High		X	X	
Japanese Knotweed	High			X	
Oriental Bittersweet	High		X	X	
Himalayan Balsam	Med	X			
Buckthorn spp.	Med		X	X	
False Spiraea	Med		X	X	
Japanese Barberry	Med			X	
Leafy Spurge	Low				X
Spotted Knapweed	Low	X			X
Scotch Pine	Low		X		
Garlic Mustard	Low	X			
Honeysuckle spp.	Low		X	X	
Black Locust	Low		X	X	

For more details on the treatment by site and species refer to the *Fort Drum Noxious and Invasive Plant Management Plan.* However, the primary focus of invasive plant species management are the following:

4.2.4.5.1 Wild Parsnip Management

Wild Parsnip is often found in disturbed sites and is common along roadways. However, Wild Parsnip is difficult to manage for a variety of reasons. Its life cycle as a biennial plant makes for difficult identification in the first year of growth. The basal rosette is difficult to spot unless it is out in the open; if growing amidst other vegetation it is easily missed. In the second year, a shoot and flower head is released upward making the plant easily identifiable during the flower period.

Management of this species consists of three stages: (1) identification and mapping of locations; (2) repetitive mowing during the growing season; and (3) chemical application of areas not managed by mowing. Parsnip-infested areas have been surveyed and mapped throughout the Cantonment and Training Areas. More than 600 infested areas in size from 1 sq ft to 25 ac (10 ha) have been identified during the 2020 growing season—the total infested area including all locations is approximately 100 ac (40 ha). Infestations mapped has grown by the end of the 2023 field season. Over 500 ac (202 ha) are now known throughout the western half of the installation. Approximately 10 ac of woody vegetation around roadside parsnip sites was removed in 2020 to facilitate mowing during the 2021 field season. Most areas with parsnip will be mowed every 10-14 days in order to chop off the flowering head and prevent further dispersal of seeds. This action will be conducted for the next 5-8 years in order to exhaust the seed bank of all parsnip seeds. Parsnip locations that are not accessible to mow will be chemically-treated. Any new parsnip locations identified will be mapped and added to the mowing/herbicide treatment regimen to prevent the spread of the plant. The goal is to treat 100% of known sites annually.

4.2.4.5.2 Swallowwort Management

Swallowwort is found in almost every training area on Fort Drum and in great abundance in some areas. Over 500 sites have been identified on the installation totaling approximately 25 ac (10 ha) with sites ranging from a few plants to patches over 2 ac (0.8 ha) in size.

Swallowwort is the first plant to be identified and treated during the growing season with the goal of 100% treatment of all known plants on the installation before the seed pods (similar to milkweed) mature and spread seed via the wind. Natural Resources staff have been treating swallowwort since 2018. Due to the lack of other effective options, chemical applications are used for the control of swallowwort.

Swallowwort does have a recently approved biological control agent, *Hypena opulenta*, a moth from Ukraine. While it has been approved for use in NYS, there is no viable mechanism to obtain the agent for release. When available, Fort Drum will attempt to obtain, release, and monitor the effectiveness of this biocontrol agent.

4.2.4.5.3 Japanese Knotweed Management

There are approximately 45 locations of Japanese Knotweed infestations totaling approximately 7 ac (2.8 ha). Only 6 locations are more than 0.4 ac (0.2 ha) in size and all of these areas have been routinely treated by the Natural Resources Branch since 2018 using mechanical and/or chemical treatments.

Larger, older stands are more difficult to eradicate, but suppression is still needed to limit its spread. The expanse and energy of the root system of long-established stands of Japanese Knotweed makes eradication almost impossible. Typically medium and large populations are cut using handheld brushsaws. All remnants will remain in place, or piled and burned. After approximately 5-6 weeks, any regrowth is sprayed with a systemic herbicide. This two-pronged management approach is designed to first cut the plant, which will then resprout and decrease the amount of energy in the root system. Follow-up applications of herbicides will increase the effectiveness of translocating the herbicide through the root system. In theory this will have will have a compounding effect on the growth and vigor of the plants the following year. Mowing is not a viable option—fragments and seeds can be spread to new locations if equipment is not cleaned thoroughly (which is very difficult).

Small knotweed patches that are detected early can be treated and potentially eradicated after a few years of treatment. Small patches are either cut and treated like the larger patches, or cut and then a concentrated herbicide is applied directly to the hollow stems of the plant. Stem injections are used whenever possible in order to limit the amount of herbicide used and potential non-target impacts.

Various types and formulations of chemicals have been used and will continue to be used in order to determine the most impactful to the species—triclopyr, imazapyr, diuron, and glyphosate have all been used and there has been no discernable difference in post-treatment growth.

4.2.4.5.4 Oriental Bittersweet Management

There are 300 sites encompassing approximately 130 ac (52 ha) of Oriental Bittersweet across the installation. Two sites are approximately 25 ac (10 ha) in size (in the Cantonment Area behind The Peak (The Commons) and TA 4A/4B) while the remaining average approximately 0.3 ac (0.1 ha). Most of these sites have been treated annually since 2018.

Management techniques vary based on the size and density of the infestation. Because smaller plants typically spread through the rhizome, systemic herbicides are needed for treatments. Triclopyr is typically used on Fort Drum as a foliar spray during the summer months—these applications are required repetitively over multiple years in order to limit the spread and growth of the plants.

Large diameter stems must be cut and stump-treated with herbicide to prevent regrowth. These large stems are the source of seeds that can be eaten by wildlife and transported wide distances to begin new infestations. The one extensive infestation in the Cantonment Area was mechanically cleared of all non-tree species and allowed to regrow in order to apply herbicide using a skidder-mounted, gas engine-powered 100 gal mist blower. While this treatment regime is complicated and extensive, it was necessary in order to accomplish widespread herbicide treatments.

4.2.4.5.5 Common Buckthorn Management

Management of Common Buckthorn in the Cantonment Area is being conducted as an integrated approach concerning the lack of forest regeneration for tree-dwelling federally-listed bat species, the overabundance of White-tailed Deer and culling operations, the prevalence of Black-legged Ticks and Lyme disease; and the lack of maneuverability through dense stands of buckthorn by Soldiers and recreationists.

Survey efforts were conducted in 2019-2020 using a 15 m grid arrangement to determine the presence/absence of buckthorn in the undeveloped areas throughout the Cantonment Area. This information was used to prioritize areas for future management.

Buckthorn management began in the BCA in the fall of 2019 with the eventual goal of reforestation/natural regeneration in the former buckthorn areas connecting remaining forested areas together in a contiguous block to support endangered bat habitat. Initial treatments consisted of clearing infested areas using a skid steer with a forestry cutting head. Buckthorn shrubs were cut and mulched down to ground level. Secondary treatments used mulching machines in order to grind residual debris and expose bare soil. These open areas will be mowed repeatedly in order to decrease buckthorn seed germination and potential stump sprouting. Areas inaccessible to a tracked skid steer were cut using a handheld brush saw and treated with concentrated herbicide immediately after cutting.

Numerous management options exist and can be deployed based on staffing, timing and other conditions of the sites being managed. Repetitive mowing can control newly sprouting buckthorn. Herbicides can be used as a broadcast spray over the entire site; directed foliar applications to individual or clumps of buckthorn; and/or an ecoblade cut/herbicide system mounted on the skid steer. All options will be considered based on terrain and resprouting of undesirable species.

4.3 Fish & Wildlife Resources

This section pertains to the management of fish and wildlife species including endangered species. The term “fish and wildlife” includes invertebrates.

Management of terrestrial habitats is discussed in *Section 4.2 Land Resources*. Management of fish and wildlife resources as they pertain to human conflicts and/or public health are addressed in *Section 4.4 Natural Resources & Human Conflict Management*. The management of fish and wildlife with regards to hunting, fishing, and trapping is addressed in Section *4.5 Outdoor Recreation& Outreach*.

4.3.1 Fish & Wildlife Resources Regulations & Guidance Documents

4.3.1.1 Federal Statutes & Regulations

Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884)

Provides for the identification and protection of threatened and endangered species of fish, wildlife, and plants and their critical habitats. All federal agencies (i.e. US Army and Fort Drum), in consultation with the USFWS (specified in Section 7 of the ESA), must ensure that any action authorized, funded or carried out is not likely to jeopardize the continued existence of an endangered or threatened species, or result in destruction or adverse modification of a critical habitat for a species. On Fort Drum, there are two listed species: the endangered Indiana bat and the endangered Northern Long-eared Bat. The following documents include an assessment of actions on Fort Drum and conservation measures with regards to both bats.

- Fort Drum. 2009. Biological Assessment for the Indiana Bat (*Myotis sodalis*) 2009-2011, Fort Drum, New York. 168 pp.
- USFWS. 2009. Biological Opinion on the Proposed Activities on the Fort Drum Military Installation (2009-2011) for the Federally-endangered Indiana Bat (*Myotis sodalis*) in the Towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County and the Town of Diana, Lewis County, New York. 108 pp.
- Fort Drum. 2011. Biological Assessment on the Proposed Activities on the Fort Drum Military Installation, Fort Drum, New York (2012-2014) for the Federally-endangered Indiana Bat (*Myotis sodalis*). 147 pp.
- USFWS. 2012. Biological Opinion on the Effect of Proposed Activities on the Fort Drum Military Installation (2012-2014) in the Towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County and the Town of Diana, Lewis County, New York, on the Federally-endangered Indiana Bat (*Myotis sodalis*). 83 pp.
- Fort Drum. 2014. Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum, New York (2015-2017) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*). 176 pp.
- USFWS. 2015. Biological Opinion on the Effect of Proposed Activities on the Fort Drum Military Installation (2015-2017) in the Towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County and the Town of Diane, Lewis County, New York on the Northern Long-eared Bat (*Myotis septentrionalis*). 61 pp.

- Fort Drum. 2017. Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum, New York (2018-2020) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*). 87 pp.
- Fort Drum. 2020a. Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum, New York (2021-2023) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*). 91 pp.
- Fort Drum. 2023b. Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum, New York (2024-2026) for the Indiana Bat (*Myotis sodalis*), Northern Long-eared Bat (*Myotis septentrionalis*), and Tricolored Bat (*Perimyotis subflavus*). 85 pp.

Migratory Bird Treaty Act of 1918 (16 USC 703-712)

Protects migratory birds by prohibiting pursuing, hunting, taking, capturing, killing, and/or possessing (or attempting to do so) migratory birds (including eggs and nests) unless permitted by regulations (e.g., salvage permit, depredation permit, etc. issued by the USFWS.)

Bald and Golden Eagle Protection Act of 1940, as amended, 16 USC 668 et. seq.

Provides for the protection of the Bald Eagle and the Golden Eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds.

Sikes Act 16 USC 670 et seq.

The primary law regarding natural resource management policies and programs on military installations including the development of INRMPs, cooperation with the USFWS and state fish and game agencies, and ensuring professionally trained personnel are available and assigned to carry out natural resources management functions. To the extent practicable and appropriate, INRMPs must provide for the adequate protection for fish and wildlife officially classified as threatened or endangered; sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources; fish and wildlife management; fish- and wildlife-oriented recreation; fish and wildlife habitat enhancements, improvements, or modifications; range rehabilitation where necessary for support of wildlife; and no net loss of the capability of the installation to support the military mission.

Engle Act (10 USC 2671)

Provides that resident wildlife on military installations belong to the State. Requires hunting, fishing and trapping on installations comply with state fish and game laws including obtaining appropriate state licenses for these activities. Special installation rules require state concurrence. Allows public access for hunting, fishing and trapping.

Fish and Wildlife Conservation Act (16 USC 2901)

Commonly known as the “Nongame Act,” provides financial and technical assistance to the states for the development, revision and implementation of conservation plans and programs for nongame fish and wildlife, and to encourage federal agencies to utilize

their statutory and administrative authority to conserve and to promote the conservation of nongame fish and wildlife and their habitats.

Fish and Wildlife Coordination Act (16 USC 661-667)

Elevates the protection of wildlife resources to the status of water resources protections, authorizes the completion of wildlife surveys on public lands, provides the framework for cooperation between Federal agencies and state and local governments for planning, and provides authority for organizations not included under the Sikes Act (e.g., US Army Corps of Engineers).

4.3.1.2 Executive Orders & MOUs

Executive Order 13186, January 10, 2001 – Responsibilities of Federal Agencies to Protect Migratory Birds

Instructs Federal agencies to develop a Memorandum of Understanding with the USFWS regarding migratory birds. The overall purpose is to protect migratory birds by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. DoD was the second agency to establish an MOU with USFWS. See MOUs below for more information.

Memorandum of Understanding between DoD and USFWS to Promote the Conservation of Migratory Birds, July 31, 2006, revised July 10, 2014

Clarifies shared and individual responsibilities for monitoring, managing, and conserving migratory birds. This MOU specifically pertains to all non-military readiness activities, including natural resources management, installation support functions, industrial activities, construction or demolition of facilities, and hazardous waste cleanup. Incidental take is authorized for military training and testing as stated in 50 CFR Part 21, the "Final Migratory Bird Rule". The MOU does not authorize the taking/killing of migratory birds. DoD issued guidance to implement the MOU on 2 April 2007 that included links to many migratory bird planning documents. (This MOU is currently expired, but is expected to be renewed in the near future. DoD provided guidance (Incidental Take of Migratory Birds Memorandum, Office of the Assistant Secretary of Defense, 6 February 2018) that military services should continue to minimize incidental taking/killing of migratory birds.)

Memorandum of Understanding between DoD and Pollinator Partnership – Request for Coordination October 23, 2014

Supports and affirms DoD's commitment to the White House Pollinator Initiative and establishes a framework for cooperative programs that promote the conservation and management of pollinators, their habitats and associated ecosystems. The Pollinator Partnership coordinates the North American Pollinator Protection Campaign, a unique, trinational collaboration working to promote awareness and scientific understanding of pollinators; to gather, organize and disseminate information about pollinators; to provide a forum to identify and discuss pollinator issues; and to promote projects, initiatives and activities that enhance pollinators and their habitats.

Executive Order 13112, February 3, 1999 – Invasive Species; amended *December 5, 2016 - Safeguarding the Nation from the Impacts of Invasive Species*

Federal agencies are required to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

4.3.1.3 Department of Defense and Army Regulations and Policy

DoD Instruction 4715.03 Environmental Conservation Program (Incorporating Change 2, 31 Aug 2018)

Enclosure 3 - 3. Biodiversity. Avoid single-species management and implement an ecosystem-based multiple species approach. Maintain viable populations of native species when practical. Manage and monitor resources over sufficiently long time periods to allow for adaptive management and assessment of changing ecosystem dynamics. Implement conservation and management efforts to further the conservation of State-listed species when such action is practicable and does not conflict with legal authority, military mission, or operational capabilities.

Army Regulation 200-1 (28 Aug 2007)

4-3.d(1)(r) Conduct Planning Level Surveys and data analysis as the foundation for effective planning and decision-making.

4-3.d(4) Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with the mission and INRMP objectives; manage flora and fauna consistent with accepted scientific principles and in accordance with applicable laws and regulations for the conservation of indigenous flora and fauna.

4-3.d(5) Integrate endangered species management and installation planning functions to ensure compliance. Conduct biological assessments for activities that may have an effect on listed species or critical habitat where they are present or may be present in the action area. Participate in the listing/delisting process, recovery plan development, and critical habitat designation where the species in question may impact installation military missions. Cooperate with State and local authorities in the management of designated Army species at risk and habitats with the goal of avoiding listings that could adversely affect military readiness. Participate in regional/habitat-wide efforts to conserve candidate and designated Army species at risk and habitats when it has the potential to benefit the Army.

4-3.d(6) Manage species at risk and habitats to prevent listing that could affect military readiness. Implement management plans for species at risk to include, but not limited to, survey, monitoring, habitat enhancement, and protection.

4-3.d(11) Implement conservation measures identified in the memorandum of understanding (MOU) between DOD and the USFWS pursuant to EO 13186 Migratory Birds. Obtain appropriate authorization from the USFWS before intentionally and directly taking any migratory bird species. Establish procedures to avoid the unintentional "take" of migratory birds, including nests and eggs.

4.3.1.4 New York State Laws and Regulations

In general, state laws, regulations, and policies related to fish and wildlife management activities—with the exception of hunting, trapping, and fishing regulations—do not apply to federal installations.

A guiding document related to fish and wildlife management and incorporated in the INRMP is the State Wildlife Action Plan (NYSDEC 2015) which is addressed in Section 3.2.

4.3.1.5 Fort Drum Regulations, Plans & Standard Operating Procedures

Fort Drum Regulation 420-3 Hunting, Fishing, & Other Outdoor Recreation

The regulation is concerned with recreational activities on Fort Drum in addition to NYS regulations. This regulation is updated annually.

Fort Drum Mammal Management Plan

This plan is in progress and will provide comprehensive information on the mammals on Fort Drum that are not addressed in the *Human-Wildlife Conflict Management Plan.* This plan is in progress.

Fort Drum Bird Management Plan

This plan provides comprehensive information on the installation's avifauna, including all efforts to monitor and manage birds. Specific chapters describe the legal justification for bird management on military lands; a complete history of all avian field work conducted on Fort Drum; detailed information on recent, ongoing, and potential future bird projects; summaries of the status and distribution of every species that has been documented on the installation; future data and research needs; management recommendations; and a description of outreach efforts.

Fort Drum Herptofaunal Management Plan

This plan provides the most up-to-date information on reptile and amphibian species found on Fort Drum and their distribution and management. This plan reviews herpetofaunal survey and assessment efforts conducted before 2011, as well as details on-going inventory and monitoring programs initiated since 2011.

Fort Drum Aquatic Species Management Plan

This management plan describes the distribution of fish and aquatic macroinvertebrate species on Fort Drum and their habitats, a history of Fort Drum aquatic surveys, results of fisheries and habitat surveys since 2008, and biotic indices based on benthic

macroinvertebrate communities. The plan outlines management recommendations to improve fish habitat, such as culvert and dam removals, in-stream pool construction, and riparian area buffering, as well as identifies knowledge gaps.

The Procedure for Monitoring Fort Drum's Flowing Waters Using Aquatic Macroinvertebrates

The protocol for aquatic invertebrate sampling and electrofishing at bioassessment sites is detailed in this document. It also includes formulae for calculating biological indices using sampled macroinvertebrates and outlines the methods for evaluating lotic habitats. Fisheries surveys from 2008 to 2014 generally followed the protocol in this document.

Fort Drum Human-Wildlife Conflict Management Plan

This plan addresses the primary wildlife species, including invasive species and forest pests, in real or perceived conflict with humans on Fort Drum and provides management methods to address those conflicts including education, physical deterrence, habitat manipulation, non-lethal, and/or lethal means.

4.3.2 Status of Fish & Wildlife Resources

Through various surveys, the occurrence of 49 mammals, 259 birds, 42 fish, 15 reptiles, and 22 amphibian species have been documented on Fort Drum. Invertebrates have not been adequately surveyed on Fort Drum to determine the number of species, although formal surveys for Odonates, some pollinators, sand wasps, and moths, and informal and opportunistic inventories for other insects have documented more than 1,300 taxa. All fish and wildlife species documented on Fort Drum are listed in Appendix 4. Special status species (endangered, threatened, special concern) are listed in Appendix 5.

The status of fish and wildlife resources on Fort Drum are organized by general taxonomic group (mammals, birds, reptiles and amphibians, fish, aquatic invertebrates, terrestrial invertebrates). Species or groups of species or guilds of species—whichever makes sense from a management perspective—are further assessed based on focal groups of management interest as identified by Natural Resources staff. These focal species or groups include but are not limited to current federal and state-listed species (Appendix 5), High Priority Species of Greatest Conservation Need (SGCN) in the State Wildlife Action Plan (NYSDEC 2015), and Army Species-at-Risk (SAR).

4.3.2.1 Mammals

Most mammalian planning level survey work focused on presence/absence data collection. The most extensive efforts were focused mainly on nuisance and game species which includes White-tailed Deer, Black Bear, Eastern Coyotes, Red & Gray Fox, and Beaver. Small mammal surveys were conducted in 1993 (RTLA project) and 2011. Most small mammal species that occur in this region of NYS were confirmed on the installation with the exception of 4 shrew species, which are typically difficult to confirm through traditional survey methods. Deer in the Cantonment Area and bats and are the most studied of all mammals on Fort Drum.

For information about survey methods and results, see the *Fort Drum Mammal Management Plan.*

4.3.2.1.1 Bats

Extensive bat surveys were conducted throughout the installation beginning in 2006 and all nine bat species known to be present in NYS have been documented on Fort Drum (Table 4.18). There are currently two federally-protected species of bats on the installation: Indiana Bat (federally-endangered) and Northern Long-eared Bat (federally-endangered). There is extensive and varied forested habitat throughout the installation suitable for roosting and foraging for all species of bats that occur; however, there is currently no known hibernaculum present.

Table 4.18 Bat species and status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	STATE AND FEDERAL STATUS	STATUS ON FORT DRUM
Indiana Bat (*Myotis sodalis*)	Federally-Endangered; State-Endangered; NYS High Priority Species of Greatest Conservation Need	Historic extensive maternity colony use—roosting and foraging—known within Cantonment Area, Training Areas 3 and 4, and areas off-post adjacent to Cantonment Area. Male use likely throughout much of the southern part of the Training Areas. No hibernacula are known on the installation. Populations have decreased due to WNS, and the current level of decline is unknown
Northern Long-eared Bat (*Myotis septentrionalis*)	Federally-Endangered; State-Endangered; NYS High Priority Species of Greatest Conservation Need	Historic maternity colony and male use-roosting and foraging-known throughout all of the installation. No hibernacula are known on the installation. Populations have decreased due to WNS, and the current level of decline is unknown
Little Brown Bat (*Myotis lucifugus)*	NYS High Priority Species of Greatest Conservation Need; Petitioned to be federally-listed (Kunz & Reichard 2010) and currently under review by USFWS to be determined in FY2024 (USFWS 2023).	Historic maternity colony and male use-roosting and foraging-known throughout all of the installation. Maternity colony of high focal attention is monitored annually within the LeRay Area. No hibernacula are known on the installation. Populations have decreased due to WNS; however, there seems to be some stabilization and small-scale recovery occurring in the monitored maternity colonies
Eastern Small-footed Bat (*Myotis leibii*)	NYS State Species of Special Concern and Species of Greatest Conservation Need	Not much is known about this species on Fort Drum. There is some limited historic use known in the northern rocky reaches of the Training Area. No hibernacula are known on the installation.
Tri-colored Bat (*Perimyotis subflavus)*	NYS High Priority Species of Greatest Conservation Need; Petitioned to be federally-listed (CBC & Defenders 2016) and proposed to be listed as endangered by USFWS (USFWS 2022)	Not much is known about this species on Fort Drum. There is some historic use known in the Cantonment and Training Areas. Not much is known about this species on Fort Drum.
Silver-haired Bat (*Lasionycteris noctivigans*)	NYS Species of Greatest Conservation Need	Historic maternity colony and male use-roosting and foraging-known on the installation; however, records are inadequate to make a true determination of abundance and distribution. This species is considered migratory, and no bats are known to overwinter on the installation. Although

COMMON NAME (SCIENTIFIC NAME)	STATE AND FEDERAL STATUS	STATUS ON FORT DRUM
		populations are being impacted by wind development, they seem stable on Fort Drum.
Big Brown Bat (*Eptesicus fuscus*)	Currently no special status	Historic extensive maternity colony and male use—roosting and foraging—known across all of the installation. No hibernacula are known on the installation. Populations seem stable on Fort Drum.
Hoary Bat (*Lasiurus cinereus*)	NYS Species of Greatest Conservation Need	Small numbers of this species have been captured across the installation; however, records are inadequate to make a true determination of distribution and abundance. This species is considered migratory, and no bats are known to overwinter on the installation. Although populations are being impacted by wind development, they seem stable on Fort Drum.
Eastern Red Bat (*Lasiurus borealis*)	NYS Species of Greatest Conservation Need	Historic extensive maternity and male use—roosting and foraging—known across the installation. This species is considered migratory, and no bats are known to overwinter on the installation. Although populations are being impacted by wind development, they seem stable on Fort Drum and are likely the most common "tree" bat on the property.

Many bat populations on Fort Drum and the eastern half of North America have been in rapid decline due to white-nose syndrome (WNS). WNS is a disease killing millions of cave-hibernating bats. WNS is named for a distinctive white fungus, *Pseudogymnoascus destructans*, appearing on the muzzles, wings, ears and tails of bats. First detected in February 2006 in Howes Cave in Schoharie Co., New York (Blehert et al. 2009), WNS has since spread throughout the eastern, southeastern, and midwestern US and Canada and has decimated many "cave" bats including: Indiana Bat, Northern Long-eared Bat, Eastern Small-footed Bat, Little Brown Bat, Tricolored Bat, and to a lesser extent, Big Brown Bat. Although variable among bat species, mortality rates at hibernacula of 40 to 100 percent have been reported within 2 years of an initial infection. More information about WNS can be found at (https://www.whitenosesyndrome.org).

Fort Drum has been involved in many other aspects of bat research and management, specifically those regarding WNS and its impacts to bats. Although WNS mortality is most prevalent and obvious at hibernacula, research at Fort Drum has documented how those impacts are manifested during the non-hibernation months. These impacts were first documented on Fort Drum in 2008, and subsequent research has led to information regarding landscape level changes in bat species abundance and distribution across Fort Drum's property. For example in 2007, biologists captured an average of 16.9 bats per net-survey site throughout the installation but by 2009, the rate had dropped to 4.6 bats per net-survey site. In 2015 (the latest mist-net survey effort), the capture rate had increased fairly significantly up to 9.8 bats per net-survey site. Differential species changes across years post- WNS can help explain these changes, where big brown and Eastern Red Bat increases in captures help offset significant declines in the myotid species (Table 4.19; Jachowski et al. 2014). The greatest declines have occurred among the previously most common species on the installation: the Little Brown and Northern Long-eared Bat (Table 4.19). Although there appeared to be some initial declines to big brown bats, it appears now that these bats are not as heavily impacted as previously thought. Additionally, the "tree" bats, i.e., Eastern Red, Hoary, and Silver-haired Bats

that migrate to the South rather than hibernate locally were also relatively unchanged, with potential increases in the Eastern Red Bat observed from 2007 to 2015. These trends were also mirrored by extensive acoustical monitoring performed on Fort Drum, where bat acoustic vocalizations were captured and analyzed (Jachowski et al. 2014).

Table 4.19 Results of installation-wide bat mistnet surveys on Fort Drum Military Installation during 2007-2015. (Sites in 2007-2010 were surveyed as a two night sampling effort in a distinct location; 30 sites in 2011 were surveyed as a two night sampling effort in a distinct location over two sampling periods-once in the early summer and once in the later summer- to determine temporal differences; 30 sites in 2015 were surveyed as a two night sampling effort in a distinct location over two sampling periods, five sites were surveyed for four consecutive nights in a distinct location and one site was surveyed for two nights in a distinct location during the second sampling period to determine temporal differences. For comparison purposes, two complete nights of sampling equals one site.)

	2007	**2008**	**2009**	**2010**	**2011**	**2015**
# Sites Surveyed	**81**	**41**	**85**	**86**	**60**	**71**
Big Brown Bat (*Eptesicus fuscus*)	574 (7.09)	215 (5.24)	311 (3.66)	488 (5.72)	364 (6.07)	516 (7.3)
Little Brown Bat (*Myotis lucifugus*)	440 (5.43)	104 (2.54)	35 (0.41)	51 (0.6)	14 (0.23)	75 (1.1)
Northern Myotis (*Myotis septentrionalis*)	260 (3.21)	37 (0.90)	5 (0.06)	5 (0.06)	1 (0.02)	0
Indiana Myotis(*Myotis sodalis*)	18	2	0	2	1	0
Small-footed Myotis (*Myotis leibii*)	0	0	0	2	0	0
Tri-colored Bat (*Perimyotis subflavus*)	4	0	1	1	0	0
Eastern Red Bat (*Lasiurus borealis*)	62 (0.77)	14 (0.34)	32 (0.38)	89 (1.05)	72 (1.2)	96 (1.4)
Hoary Bat (*Lasiurus cinereus*)	7	5	3	6	2	1
Silver-haired Bat (*Lasionycteris noctivigans*)	4	3	4	5	2	6
Total Bats Captured	**1369 (16.9)**	**380 (9.3)**	**391 (4.6)**	**647 (7.6)**	**456 (7.6)**	**694 (9.8)**

WNS research at maternity colonies of Little Brown Bats found in a bat house in the LeRay Historic District and others across the installation has also led to some insights into WNS during the non-hibernation season. Fort Drum and collaborators have documented: (1) that Little Brown Bats have some sort of resiliency to the effects of WNS and can survive multiple infection cycles over multiple years; (2) that infected females have survived up to 7 years post WNS infection; (3) that WNS exposed/infected females give birth and rear pups to dispersal from the colony; (4) that *P. destructans* remains present year round in the bat house and viable during the summer months to a small degree; (5) that bats may be able to pick up *P. destructans* from the bat house and carry it to hibernation sites; (6) that little brown colony sizes have fluctuated across years, with some coalescing and dispersing occurring on the landscape, and (7) there is currently some sort of small scale, short term, localized recovery occurring at multiple colonies across Fort Drum's landscape (Dobony et al. 2011, and Dobony and Johnson 2018). Fort Drum has worked with a number of cooperating agencies and universities researching WNS including: US Fish & Wildlife Service, NYSDEC, US Army Corps of Engineers, US Forest Service, and Virginia Tech University.

See the *Fort Drum Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum 2024-2026 for the Indiana Bat (Myotis sodalis), Northern Long-Eared Bat (Myotis septentrionalis), and Tricolored Bat (Perimyotis subflavus)* (Fort

Drum 2023b) for additional information regarding known spatial and temporal distribution of these species, potential impacts to the species by Fort Drum actions, and all conservation measures for the protection of the species. See the *Fort Drum Mammal Management Plan* for more information regarding the known status, spatial and temporal distribution for all bat species found on the installation.

4.3.2.2 Birds

Extensive survey work has documented the occurrence of 259 bird species, including residents, migrant breeders and wintering species, and several southern or western vagrants. Of these, breeding has been confirmed at least once for 148 species. Avian surveys have been sufficiently extensive that the breeding status of every species believed likely to nest on the installation has been well documented, although nesting has not been confirmed for a small number of Adirondack breeders for which nesting is possible but unlikely. As yet unrecorded on Fort Drum are several species that nest in northern New York but for which no nesting habitat occurs on the installation (e.g. Canada Jay), rarely winters in the region (e.g. Northern Hawk-Owl), or that probably migrate through, over, or near Fort Drum but are scarcely seen in the region away from Lake Ontario (e.g. Parasitic Jaeger). Surveys continue to pick up these and other regionally rare birds at a rate of 1-3 species most years, but none of these additions to the Fort Drum checklist constitute significant changes to the regular local avifauna. The Fort Drum Bird Management Plan includes detailed information on the status and distribution for every bird species that has been documented on the installation, as well as summaries of every bird survey and research project.

Although Fort Drum's avifauna is generally well known, a few groups of birds have not been the focus of surveys, and their distribution and seasonal occurrence are relatively poorly known. Freshwater marshes and ponds have not been thoroughly surveyed, and most information about nesting Pied-billed Grebe, Least Bittern, Common Gallinule, and other marsh birds comes from only a few locations. Anecdotal evidence suggests that Red-shouldered Hawks may be declining on Fort Drum, but a lack of any formal forest raptor surveys precludes any meaningful conclusions about abundance or trends for this species, nor for any other woodland hawk. Every owl species expected to occur on Fort Drum has been found on territory, but relative abundances and the overall distribution for Northern Saw-whet Owl, Eastern Screech-Owl, and Long-eared Owl are not known. Each of these groups includes species of high conservation concern and should be the focus for baseline planning level surveys.

4.3.2.2.1 Breeding Waterfowl and Waterbirds

There are 9 species of breeding waterfowl and waterbirds on Fort Drum, but only two are considered focal species (Table 4.20).

Fort Drum's wetlands provide extensive habitat for breeding and migrating ducks, and no specific actions are taken to increase waterfowl numbers. American Black Duck nesting is possible in wooded wetlands throughout the installation, but the precise number of nesting pairs is not known and thought to be low. A coordinated effort to document nesting black ducks could potentially document a larger nesting population than is currently known.

Table 4.20 Breeding waterfowl and waterbird status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
American Black Duck (*Anas rubripes*)	NYS High Priority Species of Greatest Conservation Need	Rare to uncommon breeder in wooded wetlands throughout Fort Drum-precise nesting numbers unknown but apparently has declined since 1990s.
Common Loon (*Gavia immer*)	State Species of Special Concern	2-5 nesting pairs in TA19, including Indian Pond, Indian and Mud Lakes, and occasionally 1-2 other water bodies.

The Common Loon nests primarily in the Adirondacks and along the St. Lawrence River, and the state's breeding distribution just enters the northeast corner of Fort Drum.

To assist in a regional effort to monitor breeding population trends and productivity, Fort Drum participates in the Annual Adirondack Loon Census coordinated by the Wildlife Conservation Society between 8:00 a.m. and 9:00 a.m. one Saturday in July. Additional visits are made to known and suspected nest sites to determine occupancy and productivity.

4.3.2.2.2 Freshwater Marsh Nesting Birds

Nine species of freshwater marsh birds nest on Fort Drum and four are considered focal species (Table 4.21).

Table 4.21 Freshwater marsh nesting bird status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Black Tern (*Chlidonias niger)*	State Endangered; NYS High Priority Species of Greatest Conservation Need	Observed infrequently at Matoon Marsh in TA 17B. Nesting suspected 2-3 times in 28 years but has never been confirmed.
American Bittern (Botarus lentiginosus)	State Species of Special Concern	Uncommon to locally common breeder—estimated 40-100 pair in wet grasslands, marshes, and other wet, open areas.
Least Bittern (*Ixobrychus exilis)*	State Threatened	Rare breeder—1-3 adults per year at Matoon marsh in TA 17B although detections sporadic; isolated records elsewhere.
Pied-billed Grebe (*Podilymbus podiceps)*	State Threatened	Local breeder—estimated 20-45 nesting pair annually; documented on 47 ponds and marshes including 21 sites 2020-2022.

Pied-billed Grebe is the most common High Priority Species of Greatest Conservation Need that occurs in Fort Drum's marshes, but precise abundance estimates for the installation are lacking. A baseline study surveying all marshes and suitable ponds will provide a census for the number of nesting pairs on Fort Drum. Such a survey would also help determine whether Least Bittern only occurs in the very few locations it has been documented or if it is in fact more widespread than is known. Matoon Marsh is the only site on Fort Drum that appears potentially suitable for Black Tern nesting, so a thorough survey would not likely document additional occurrences of this species.

Marsh habitat is generally not actively managed on Fort Drum. Large wet areas are not conducive to military training exercises, and are thus typically avoided by actively training units. Military vehicles sometimes pass through small, pocket wetlands in

grasslands or other open areas, which could crush American Bittern nests, but such impacts are probably limited, and no other wetland birds are likely to occur in such areas. Overall, marsh birds are probably not much affected by military training.

4.3.2.2.3 Raptors

There are 17 species of raptors on Fort Drum and 10 are considered focal species (Table 4.22).

Table 4.22 Raptor status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Bald Eagle (*Haliaeetus leucocephalus*)	Bald and Golden Eagle Protection Act	Uncommon but increasing year-round. Nesting confirmed in TA19 on Mud Lake in 2020 and 2022.
Golden Eagle (*Aquila chrysaetos*)	Bald and Golden Eagle Protection Act	Rare-but regular spring and fall migrant. Occasionally seen winter and summer but not suspected to nest.
Peregrine Falcon (*Falco peregrinus)*	State Endangered	Uncommon spring and fall migrant. Increasing as breeder regionally but no known nests on Fort Drum.
Short-eared Owl (*Asio flammeus)*	State Endangered / NYS High Priority Species of Greatest Conservation Need	Rare to uncommon migrant and winter resident. Highly erratic breeder, nesting on average one out of every 2-4 years on the installation in TAs 12 and 13; at least 3 pairs have nested during the same year.
Northern Harrier (*Circus cyaneus)*	State Threatened	Uncommon breeder—5-10 pairs per year in TA 12 and 13 grasslands; 5-15 pairs per year elsewhere. Uncommon to common in spring, fall, and winter.
Cooper's Hawk (*Accipiter cooperii)*	State Species of Special Concern	Uncommon breeder—apparently increasing; uncommon in spring, fall, and winter.
American Goshawk (*Accipiter atricapillus)*	State Species of Special Concern	1-3 pairs nest per year; rare to uncommon in spring, fall, and winter. May be more common than records suggest.
Osprey (*Pandion haliaetus)*	State Species of Special Concern	1-3 pairs nest; uncommon spring and fall migrant.
Red-shouldered Hawk (*Buteo lineatus)*	State Species of Special Concern	10-15 nesting pairs documented annually prior to 2003; precise abundance since 2003 uncertain but suspected to be 5-10 pairs annually.
Sharp-shinned Hawk (*Accipiter striatus)*	State Species of Special Concern	Uncommon breeder--possibly increasing; uncommon in spring, fall, and winter.

Golden Eagles only occur on Fort Drum as migrants, and Bald Eagles are increasingly common year-round. No Bald Eagle nest had been documented on Fort Drum until 2020 when a nest was confirmed in the northeastern portion of Fort Drum on Mud Lake.

Of the raptors known to breed on Fort Drum, the highest priorities for conservation are Short-eared Owl, Northern Harrier, American Goshawk, and Red-shouldered Hawk, and specific work for other nesting raptors is not anticipated at this time. Grassland bird monitoring adequately covers Short-eared Owl, but only captures a portion of the Northern Harriers that breed on Fort Drum. Anecdotal observations suggest that the harrier population is relatively stable, but an installation-wide survey is necessary to provide baseline data for the entire population.

Few American Goshawks are believed to nest on Fort Drum, but survey data are needed to confirm this. Anecdotal evidence suggests that Red-shouldered Hawks were more common prior to about 2003 than they have been since, but survey data are lacking.

Installation-wide hawk surveys focused on Northern Harrier, American Goshawk, and Red-shouldered Hawk would provide data for analysis of population trends, which would in turn provide a means to determine which species are most in need of conservation attention.

4.3.2.2.4 Nightjars

Two of the three nightjar species found in NYS are on Fort Drum (Table 4.23).The third, Chuck-will's-widow (*Antrostomus carolinensis*), has occurred on Fort Drum once but is a vagrant.

Table 4.23 Nightjar status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Eastern Whip-poor-will (*Caprimulgus vociferous*)	NYS High Priority Species of Greatest Conservation Need	Common breeder; common to abundant spring migrant; rarely observed fall migrant.
Common Nighthawk (*Chordeiles minor*)	NYS High Priority Species of Greatest Conservation Need	Breeding – uncommon to locally common breeder in sandy areas; uncommon spring migrant, uncommon to occasionally very common early fall migrant. Apparently stable population.

Past monitoring has consisted of single runs annually of six 10-stop point count routes, but results have fluctuated substantially between years, precluding reliable trend estimates. An analysis of variables that affect monitoring results will help Fort Drum biologists plan surveys in a way that will reduce bias related to methodology.

Common Nighthawks are unusually difficult to monitor because of their crepuscular habits and tendency for individuals to forage over large areas. The overall distribution on Fort Drum seems to be well known, as this species is frequently seen over sandy areas with openings and very rarely elsewhere. Abundance is poorly known, preventing any conclusions about likely population trends, although anecdotal observations suggest relatively stable numbers on the installation (as opposed to off-post where it has virtually disappeared). A graduate project to find and monitor nightjar nests in 2024 will provide much needed productivity data.

4.3.2.2.5 St. Lawrence Valley Grassland Nesting Birds

Nesting grassland birds are considered a focal group since this habitat type is on the decline throughout NYS (Table 4.24).

Current grassland bird monitoring goals are to track the occurrence and abundance of several species of conservation concern (American Bittern, Northern Harrier, Upland Sandpiper, Short-eared Owl, Sedge Wren, and Henslow's Sparrow) as well as overall bird abundance and diversity.

Table 4.24 St. Lawrence Valley grassland nesting bird status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Short-eared Owl (*Asio flammeus)*	State Endangered / NYS High Priority Species of Greatest Conservation Need	Rare to uncommon migrant and winter resident. Highly erratic breeder, nesting on average one out of every 2-5 years in TAs 12 and 13; up to 3 pairs have nested during the same year.
Henslow's Sparrow (*Ammodramus henslowii)*	State Threatened; NYS High Priority Species of Greatest Conservation Need	Rare breeder—on the verge of local extirpation. Since 2010 has declined from 8-12+ males/year to < 5 males/year, and for the first time none found 2020 and 2023 (one each 2021 and 2022).
Northern Harrier (*Circus cyaneus)*	State Threatened	Uncommon breeder—5-10 pairs per year in TA 12 and 13 grasslands; 5-15 pairs per year elsewhere. Uncommon to common in spring, fall, and winter.
Sedge Wren (*Cistothorus platensis)*	State Threatened; NYS High Priority Species of Greatest Conservation Need	Erratic breeder in grasslands—fewer than 5 territories some years, 20-40+ other years, but 5-15 most years.
Bobolink (*Dolichonyx oryzivorus*)	NYS High Priority Species of Greatest Conservation Need	Locally common breeder; disappearing from some fields because of succession; abundant spring and early fall migrant.
Eastern Meadowlark (*Sturnella* magna)	NYS High Priority Species of Greatest Conservation Need	Formerly fairly common breeder in old field grasslands in TAs 12 and 13, where now scarce most years. Apparently increasing in sandplain grasslands especially within the airfield fence. Uncommon spring and fall migrant.

4.3.2.2.6 Northern Sandplain Grassland Nesting Birds

Even more rare than birds that nest in "old hayfield' grasslands in NYS are those grassland nesting birds that utilize a unique community like Northern sandplains (Table 4.25).

Table 4.25 Northern Sandplain grassland nesting bird status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Upland Sandpiper (*Bartramia longicauda*)	State Threatened; NYS High Priority Species of Greatest Conservation Need	Formerly nested in old field grasslands in TAs 12 & 13 where largely absent since 2005. Estimated 6-10 pairs at airfield and TA7G where apparently increasing in response to grassland restoration. 1-5 additional pairs in TAs 5D & 8A and possibly Range 23.
Grasshopper Sparrow (*Ammodramus savannarum)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need	Locally common breeder on sandy grasslands near airfield; 30-50+ found per year, but apparently decreasing because of development in and around WSAAF and TA5.
Horned Lark (*Eremophila alpestris)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need	Formerly locally uncommon breeder in sandy grasslands near airfield, where now apparently scarce although precise numbesr unclear because of access limitations at airfield.
Vesper Sparrow (*Pooecetes gramineus)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need	Locally common breeder in sandy grasslands and openings, with 100+ territories. Possibly decreasing in airfield area—where largest number occur--because of development. Uncommon spring and fall migrant.

During 2015, just one year after the TA7 sandplain grassland restoration project began, a pair of Upland Sandpipers nested in this area for the first time in more than 14 years.

4.3.2.2.7 Early Successional Forest/Shrubland Nesting Birds

The Golden-winged Warbler is currently being considered for federal listing (Sewell 2010), and is thus the highest priority species for early successional bird monitoring. The goals of Golden-winged Warbler monitoring are to map occupied habitat throughout the Training Areas on a rotating basis, completing each cycle every four years, and track changes in the proportions of phenotypic Golden-winged Warblers, Blue-winged Warblers and hybrids over time. Golden-winged Warbler monitoring is complicated by two factors, one being the need to visually confirm the identity of every singing male because Blue-winged Warblers and hybrids cannot be separated by voice, with the result that surveys for this species are more time-intensive than for most other songbirds. The second factor is the short period between the end of migration when nearly all breeding males are on territory, around or slightly before 20 May, and the relatively early date when Golden-winged Warblers stop singing for the season, usually around 20 June. Given the ephemeral nature of Golden-winged Warbler habitat and the rapidly changing population dynamics between this species and Blue-winged Warbler, an up-to-date map of habitat actually occupied by Golden-winged Warblers will be very important if this species is federally listed. However, given current staffing levels, it will take approximately four field seasons for all of Fort Drum's accessible habitat to be adequately surveyed, by which time the earliest surveyed habitat will need to be revisited to see if it is still occupied and by which species. An ongoing graduate project comparing productivity and fledgling survival of Golden-winged Warblers, Blue-winged Warblers, and hybrids will provide additional data to evaluate the status of Fort Drum's Golden-winged Warbler population.

Table 4.26 Early successional forest/shrubland nesting bird status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Golden-winged Warbler (*Vermivora chrysoptera)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need; Petitioned to be federally-listed (Sewall 2010) and currently under review by USFWS to be determined in FY2026 (USFWS 2023)	Uncommon breeder—decreasing; rarely seen in migration.
Yellow-breasted Chat (*Icteria virens)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need	Rare in summer—5 records from June and July, including one of a presumed nesting pair; only one record since 2001, of a migrant in May.
Brown Thrasher (*Toxostoma rufum*)	NYS High Priority Species of Greatest Conservation Need	Common breeder—apparently stable; common spring and fall migrant.
Canada Warbler (*Cardellina canadensis*)	NYS High Priority Species of Greatest Conservation Need	Uncommon to locally common breeder; uncommon spring and fall migrant.
American Woodcock (*Scolopax minor*)	Game species	Common breeder—stable or possibly increasing.
Ruffed Grouse (*Bonasa umbellus*)	Game species	Widespread resident—numbers fluctuate but probably stable over long-term.

The point counts used for Golden-winged Warbler surveys capture presence and abundance for all bird species detected and will effectively monitor nearly the full suite of shrubland and early successional birds. Ruffed Grouse and American Woodcock will be the main exceptions, as they are not readily detectable during the time of day and year when surveys are best for most passerines, but these species will be monitored using other methods. Species that often use closed canopy successional forest (e.g. Canada Warbler) may not be adequately surveyed by the Golden-winged Warbler protocol, so that additional point counts may need to be allocated in this community.

Two game species, Ruffed Grouse and American Woodcock, use early successional habitats and have been the subject of monitoring efforts in the past. Ruffed Grouse monitoring was discontinued in the early 2000s because of low detection rates, but given the interest in grouse-hunting on Fort Drum and a perception that grouse numbers were very low in several recent years, it is worth developing a new grouse monitoring protocol that addresses past detectability problems. American Woodcock have been monitored on Fort Drum annually since the early 1990s, representing the longest continuous wildlife monitoring project conducted on the installation. Given the indicator status of woodcock for early successional habitats, woodcock monitoring will continue, but past data show a stable population so this survey will only be completed every other year instead of annually.

4.3.2.2.8 Mid/Late Successional Forest Nesting Birds

There are several species of nesting birds that utilize mid/late successional forests, but only two are focal species.

Monitoring goals for Red-headed Woodpecker are to estimate annual abundance and productivity in the core nesting area, and to survey peripheral habitat, especially where forest management has attempted to improve conditions for this species. Abundance estimates will be made based on visits to known occupied habitat in May and June, with productivity data collected in July and August when young are out of the nest. Managed stands will be checked once monthly between June and August.

Table 4.27 Mid/late successional forest/shrubland nesting bird status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Red-headed Woodpecker (*Melanerpes erythrocephal)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need	Ten to 15 pairs nested in TAs 5B,5D, 5E, and 6C per year 2008 to 2018, with apparent decline to 6-8 pairs 2020-2023. Formerly nested in TA 4, where none have been found since 2007.
Cerulean Warbler (*Dendroica cerulean)*	State Species of Special Concern	Rare breeder—3-7 territorial males found in 2-3 locations in TAs 13, 15, and 16 annually.

Every confirmed or probable Cerulean Warbler nesting record has come from one of about eight or nine maple stands in the center of Fort Drum, all in a relatively small area in TAs 13, 15, and 16. Typically, one or two stands will have several males for many consecutive years, while individuals appear and disappear in nearby stands, rarely occurring for two consecutive years. Many stands that appear similar to known occupied habitat elsewhere on Fort Drum have been searched repeatedly over many years without any Cerulean Warbler detections. There have been about four or five reports from other parts of the installation, but in two cases multiple efforts to relocate these

birds were unsuccessful, suggesting that the males that were seen were transients. Two historic cases were in locations that have been surveyed frequently since 1996 without any subsequent detections. Based on the history of observations and survey effort on Fort Drum, it is believed that the local population is very small, and while additional territories likely occur that have not been found, it is doubtful that a sizeable, undiscovered population exists on Fort Drum. However, there is no way to know how many might occur in the Impact Area, which is adjacent to the known distribution of Cerulean Warblers on Fort Drum. An ongoing graduate study using Automated Recording Units to sample suitable habitat through the nesting season will provide data to help determine whether some Cerulean Warblers are being missed because of low detectability on point counts.

The current Cerulean Warbler monitoring strategy is to check every stand where singing males have been documented in TAs 13, 15, and 16 at least once annually, and to also check several stands within the same area that appear suitable. Additional visits are made to each stand where no Cerulean Warblers were found on the first visit. When time allows, point counts followed by Cerulean Warbler song playback are conducted in stands that look suitable elsewhere on Fort Drum. Varying levels of annual survey effort from 1996 to 2020 have continued to find territorial Cerulean Warblers in 1-3 maple stands per year, all in TAs 13A, 15A,15C,15D, and/or 16A.

4.3.2.2.9 Migrating Birds

There are several species of birds that migrate through Fort Drum without nesting, but five are considered focal species.

Table 4.28 Migratory bird (i.e., not nesting) status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Bay-breasted Warbler (*Setophaga castanea*)	NYS High Priority Species of Greatest Conservation Need	Present – uncommon in spring & fall migrant.
Cape May Warbler (*Setophaga tigrina*)	NYS High Priority Species of Greatest Conservation Need	Present – uncommon spring and fall migrant.
Olive-sided Flycatcher (*Contopus cooperi*)	NYS High Priority Species of Greatest Conservation Need	Present – occasional in spring and fall; spring migrants occur into June; 2-5 individuals detected most years.
Rusty Blackbird (*Euphagus carolinus*)	NYS High Priority Species of Greatest Conservation Need	Present – uncommon to common in spring and fall; occasional flocks 100-400 observed, usually during fall.
Semipalmated Sandpiper (*Calidris pusilla*)	NYS High Priority Species of Greatest Conservation Need	Irregular spring and fall migrant—most detections of individuals flying over Fort Drum.

Since 2008 bird surveys conducted during migration have substantially filled in a knowledge gap about Fort Drum's avifauna, and the status of most regularly-occurring songbird migrants is now fairly well known. Documentation for migration of some other taxa, especially shorebirds, is less complete, but there is generally less habitat for these birds and they probably do not regularly use habitat on the installation, although they may fly over Fort Drum. For most regularly-occurring species there seems to be abundant stopover habitat on Fort Drum, and no need to manage for any particular species. Surveys conducted during all seasons will likely continue to document new

species to Fort Drum, although most will be migrants that spend little time on the installation.

4.3.2.3 Reptiles & Amphibians

Previous surveys dating 2005 and 2007 focused on species presence/absence although a broad range of locations were surveyed. A more intensive and comprehensive planning level surveys occurred from 2011-2016 to assess amphibian and reptile species assemblages.

To date, 14 reptile species have been documented on Fort Drum including two new species unknown before (Spotted and Musk Turtles) and 22 amphibian species with detection of one previously undocumented species (Cope's gray treefrog). Terrestrial and semi-aquatic herpetofauna are surveyed and monitored in their more distinct habitats including uplands adjacent to riparian and wetland areas, large open water resources, grasslands, and other species-specific habitats.

4.3.2.3.1 Turtles

There are six species of turtles on Fort Drum—two are very common (Painted Turtle and Snapping Turtle) and found throughout the installation; the Wood Turtle is found infrequently and in localized populations; and three are rare and/or difficult to find (Spotted Turtle, Blanding's Turtle, and Musk Turtle). The four latter species are considered focal species (Table 4.29).

All three aquatic turtles—Blanding's, Spotted, and Musk—may be more common than realized without more intensive survey efforts because of their highly aquatic habits, cryptic nature, and difficulty of accessing their habitats to conduct surveys. Due to their habits and habitats, they are less likely to be impacted by Fort Drum training activities; however, land management and maintenance activities will need to be carefully considered in areas known to have these species.

The Wood Turtle is known to occur on Fort Drum, and surveys from 2016-2020 have provided spatial and temporal information primarily in the southern section of Fort Drum along the Black Creek and West Branch of Black Creek. However, more surveys are required to fully determine the extent of the population. According to NYSDEC Herp Atlas records (https://dec.ny.gov/nature/animals-fish-plants/amphibians-reptiles/herp-atlas-project), Wood Turtles are distributed throughout the basin, and we anticipate finding more across the installation as surveys continue. Efforts thus far have shown that both male and female Wood Turtles spend much of their time concentrated around the stream and the immediate scrub/shrub wetlands, and adjacent upland field and forests. Additional surveys will continue over the next 2-3 years in other areas of Fort Drum to fully determine temporal and spatial use. More information can be found in the *Fort Drum Herptofaunal Management Plan.*

Table 4.29 Turtle status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Spotted Turtle (*Clemmys guttata)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need; Petitioned to be federally-listed (CBC 2012) and currently under review by USFWS to be determined in FY2024 (USFWS 2023)	Two individuals were first detected in April 2012 along northeastern boundary of Fort Drum in TA19C. Beginning 2019, 7 Spotted Turtles were fitted with radio transmitters in Mud Lake and tracked through the field season. In 2020, 16 Spotted Turtles had PIT tags inserted and will be used in a Mark-Recapture population estimate survey during spring 2021. According to NYS Herptile Atlas (NYSDEC 2007), Spotted Turtles have been observed in only four blocks in the Basin including two from the east Lake Ontario plains region (Jefferson Co.) and two from the St. Lawrence Valley/Adirondack transitional region (Lewis Co. - St. Lawrence Co. border).
Blanding's Turtle (*Emydoidea blandingii*)	State Threatened Species; NYS High Priority Species of Greatest Conservation Need; Petitioned to be federally-listed (CBC 2012) and currently under review by USFWS to be determined in FY2024 (USFWS 2023)	One individual found off of Figert Rd in TA14 in 1995 and one found 200 m outside of Fort Drum on the Indian River adjacent to TA12C in 2011. According to NYS Herptile Atlas (NYSDEC 2007), St. Lawrence Valley (primarily Jefferson and St. Lawrence counties) is one of two strongholds for this species in NYS--populations are known to exist along the north and northeastern borders of Fort Drum.
Eastern Musk Turtle (*Sternotherus odoratus*)	NYS High Priority Species of Greatest Conservation Need	One individual found on the southern boundary in TA14A in 2013 and a second found on the eastern side at the extreme southern end of TA19D near the Range 50 road.
Wood Turtle (*Clemmys insculpta)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need; Petitioned to be federally-listed (CBC 2012) and currently under review by USFWS to be determined in FY2024 (USFWS 2023)	At least 17 individuals have been found across the installation, primarily concentrated along the Black Creek and West Branch of Branch Creek. However, detailed surveys determining the full spatial and temporal distribution are lacking. To date, Wood Turtles have been found in varying velocity stream sections and adjacent scrub/shrub wetlands and upland field and forests.

4.3.2.3.2 Snakes

There are 17 species of snakes in NYS and at least 9 occur on Fort Drum. No snakes have any special legal status designations, nor are any focal species. No snakes on Fort Drum are venomous.

However, Snake Fungal Disease (SFD) is an emerging disease in certain populations of wild snakes in the eastern and midwestern US including NYS and have been increasing since 2006 (Lorch et al. 2016). The fungus *Ophidiomyces* (formerly *Chrysosporium*) *ophiodiicola* is consistently associated with SFD, however, definitive evidence that *O. ophiodiicola* causes SFD is inconclusive. As its name implies, SFD is only known to afflict snakes. SFD has been documented in three species that occur on Fort Drum including the Northern Water Snake (*Nerodia sipedon*), Black Rat Snake (*Pantherophis obsoletus* species complex), and Milk Snake (*Lampropeltis triangulum*). The most

consistent clinical signs of SFD include scabs or crusty scales, subcutaneous nodules, premature separation of the outermost layer of the skin (stratum corneum) from the underlying skin (or abnormal molting), white opaque cloudiness of the eyes (not associated with molting), or localized thickening or crusting of the skin (hyperkeratosis). Skin ulcers, swelling of the face, and nodules in the deeper tissues of the head have also been documented. While mortality has been associated with some cases of SFD, population-level impacts of the disease are not widely known and are difficult to assess due to the cryptic and solitary nature of snakes, and a general lack of long-term monitoring data. In New Hampshire, clinical signs consistent with SFD were associated with a 50 percent decline of an imperiled population of timber rattlesnakes from 2006 to 2007. Monitoring of snakes for SFD may be prudent based on Fort Drum's experience with White-nose Syndrome impacting the previous common species of Little Brown Bats and Northern Long-eared Bats. Beginning in summer of 2015 five separate snake survey routes (transects) were established of 8-10 miles in length to assess the presence of SFD on Fort Drum. These routes are conducted at least 5 times per year and all snakes encountered are given a visual inspection for SFD. To date no signs of SFD have been detected on Fort Drum. Beginning summer of 2021 a new survey will be conducted across most CONUS military installations, including Fort Drum, to assess presence and prevalence of this snake chytrid fungus.

4.3.2.3.3 Salamanders

There are 18 species of salamanders in NYS and 11 occur on Fort Drum. Only three species on Fort Drum are considered for any sort of special legal status by NYS (Table 4.30).

Table 4.30 Salamander status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Jefferson Salamander (*Ambystoma jeffersonianum)*	State Species of Special Concern	Relatively common throughout the installation.
Blue-spotted Salamander (*Ambystoma laterale)*	State Species of Special Concern; NYS High Priority Species of Greatest Conservation Need	Relatively common throughout the installation's mature forests.
Four-toed Salamander (*Hemidactylium scutatum)*	NYS High Priority Species of Greatest Conservation Need	Relatively common throughout the installation's small stream systems.

Both the Jefferson Salamander and Blue-spotted Salamander are common on Fort Drum, but there is confusion due to the potential to hybridize. Understanding the genetics of these species would be beneficial and no genetic study has been conducted in the region to date. Blue-Spotted salamanders occur frequently in the vernal pool type wetlands of mature forests more associated with the eastern side of Fort Drum. It is interesting to note that towards the west and center of Fort Drum, Blue-spotted Salamanders display characteristics more commonly associated with Jefferson Salamanders (hybrids, Jefferson-Blue-Spotted complex), whereas in the north and eastern areas of Fort Drum individuals display characteristics (color pattern and size) more like true Blue-spotted Salamanders. Jefferson Salamanders are rarely found in the eastern and northern forested areas of Fort Drum. Despite the hybridization issue, both

species use seasonally flooded areas (i.e., vernal pools) for reproduction and development. These areas have not been sufficiently surveyed or characterized to date.

4.3.2.3.4 Anurans (Frogs & Toads)

There are 14 species of frogs and toads in NYS and 11 occur on Fort Drum. No frog or toad on the installation has any special status designation, but amphibians globally have been impacted by numerous environmental conditions. Hence, monitoring of anurans is conducted on Fort Drum annually using breeding call surveys in accordance with North American Amphibian Monitoring Protocols (NAAMP). This survey method is used throughout the US including NYSDEC. Four separate routes on Fort Drum have been established and surveys are conducted beginning in early spring and at least two additional times throughout the growing season to encompass the different breeding periods of all species. Each route has ten separate 6-minute listening stops at least 0.5 miles apart. Ideally, these surveys are conducted 4 times per year beginning immediately after ice-out when water temperatures are approximately 40ºF.

Current amphibian surveys focus on five different types of common wetlands distributed throughout each of the five separate ecoregions constituting Fort Drum. These wetland habitats include open-emergent marsh type wetlands, seasonally-flooded closed-canopied forested wetlands, seasonally-flooded open-canopied wetlands, shrub/scrub-riparian (palustrine) wetlands, and open-emergent semi-permanent wetlands. In addition of inventorying species within these separate wetlands, habitat assessments were also conducted evaluating physical components and characteristics of each wetland.

Diseases are one of the most important factors of amphibian declines. The lethal amphibian skin disease (chytridiomycosis) caused by the chytrid fungus *Batrachochytrium dendobatidis (Bd)*. *Bd* was first described in 1998 (Berger et al. 1998) and is known for its devastating impact on amphibian species elsewhere in the world; in fact, approximately 20% of the world's amphibian species may now be facing extinction, and *Bd* is thought to be a major contributor to these global declines (Daszak et al. 1999). Fort Drum sampled for Bd in 2013 as part of a DoD Legacy project--28 frogs and toads of 10 species were sampled from 14 randomly selected wetland areas. Each animal was carefully rinsed and then swabbed along its ventral portions and then released unharmed at its site of capture. The swabs were sealed in sterile containers and sent to Wildlife Disease Laboratories at the San Diego Zoo Institute for Conservation Research for analysis. Of 19 samples that could be analyzed, 13 frogs tested positive for *Bd*. Although *Bd* was present on Fort Drum, it was below the lethal limit for frogs in other locations. This is similar to results found near in Adirondack Park where Bd was found to be geographically widespread and prevalent in amphibians, particularly salamanders, in relatively protected areas (Robinson et al. 2018). To date, no amphibian die-offs associated with *Bd* have been observed on Fort Drum or anywhere else in New York State. The reason why *Bd* is present yet not lethal may be due to reasons still unknown and research continues.

Another emerging disease issue is ranaviruses (Daszak et al. 1999). Ranaviruses are DNA-based viruses of the genus *Ranavirus*. Ranavirus can effect anurans, as well as salamanders and turtles. Amphibian ranaviruses are probably present in every US state. Globally, ranavirus diseases in amphibians have been diagnosed in North and South America, Europe, Asia, and Australia. Field signs of a ranaviral epizootic include sudden or explosive onset of illness in amphibians in a wetland, often with hundreds or

thousands of sick and dead amphibians found in a 1–5 day period. Overall mortality rates in juvenile frogs and salamanders in a wetland can exceed 90%. Affected individuals usually present with subtle to severe hemorrhages in the ventral skin, especially at the base of the hind limbs and around the vent opening. Hemorrhages may be present from tip of chin to tip of tail ventrally and may be pinpoint or irregular patches. Other clinical signs include lethargy, swimming erratically, weakly, or on their sides, and mild to severe fluid accumulation under the skin (in lymphatic sacs) of the abdomen and proximal hind limbs. There are also internal signs. Turtles with ranavirus infection show weakness, swollen eyelids, discharge from the nose and mouth, and the tongue and palate may show dull white or thick yellow plaques. At dissection, these plaques also may be found in the pharynx and esophagus. Occasionally, turtles may show ulcers on the bottom of their feet. Like ranaviral infections in tadpoles and salamanders, infection in Box Turtles spreads throughout the body affecting many organs including blood vessels. Additional research is needed to better understand this disease. Fort Drum will continue to monitor populations and would greatly benefit as a study site for research conducted by other entities.

4.3.2.4 Fish

There are 42 species of fish documented and verified on Fort Drum. This current species list may differ from previous lists because it now excludes questionable records with unverified specimens. No fish on the installation has any special status designation, but all fish can be used to monitor the health of aquatic resources and many are important for recreation.

The first known report from a Fort Drum fisheries survey was completed by NYSDEC in 1987 (Gordon 1987). Several fisheries surveys have been conducted by various entities since then and comprehensive surveys by Fort Drum staff have occurred from 2009 – 2016. Baseline fish survey data has not been collected in Matoon Creek, Hawkins Creek, Deerlick Creek, Cool Creek, and in several Indian River tributaries, nor in several small tributaries and wetlands. State surveys completed in stream reaches downstream from Fort Drum suggest that additional fish species such as the Spotfin Shiner (*Cyprinella spiloptera*), Rosyface Shiner (*Notropis rubellus*), Logperch (*Percina caprodes*) and Spottail Shiner (*Notropis hudsonius*) may occur on the installation.

There are two SGCN fish species present on Fort Drum: Blacknose Shiner (*Notropis heterolepis*) and Iowa Darter (*Etheostoma exile*).

Blacknose Shiners are only known to occur in the Sawyer Creek Watershed. Over two years, 2013 (n=12) and 2014 (n=1), it was sampled from two of three locations within the watershed. Its limited distribution on Fort Drum makes its population vulnerable to disturbance. Siltation from forestry and agricultural activities has been identified by the state as the primary threat to this species (NYSDEC 2015).

The Iowa Darter is a New York SGCN because of its decline in the Alleghany Watershed to undetectable levels and unknown trends in its distribution and populations across the rest of the state. Two streams in Fort Drum have populations of Iowa Darters. The first sampled Iowa Darter was in the West Creek watershed in 2016. One individual was caught from this creek in a minnow trap and none have been caught there since. A robust population of Iowa Darters was sampled in 2018 in two adjacent reaches of Matoon Creek using backpack electrofishing and minnow traps. Further targeted surveys to identify Iowa Darter distribution within West Creek are warranted. The larger

population in Matoon Creek should be monitored for changes in distribution or abundance.

Fort Drum has self-sustaining ("wild") populations of Brook Trout (*Salvelinus fontinalis*) in the Pleasant Creek and Trout Brook watersheds. In New York, wild Brook Trout populations that are genetically distinct from stocked strains are designated as Species of Greatest Conservation Need (SGCN; NYSDEC 2015). Wild Brook Trout populations on Fort Drum have not been genetically analyzed so it is not known if they are SGCN populations. Self-sustaining populations of Brook Trout are, however, considered indicator species of ecosystem health (USEPA 2008, Grabarkiewicz and Davis 2008). Sedimentation, low dissolved oxygen, high temperatures, and competition with non-native species are among the greatest threats to Brook Trout (Raleigh 1982).

Largemouth Bass (*Micropterus salmoides*) and Brown Bullhead (*Ameiurus nebulosus)* were selected in 2011 as the top two indicator species for contaminants because they are widespread across the installation, they are popular with anglers, and they represent two trophic levels in the aquatic food web. Pumpkinseed Sunfish (*Lepomis gibbosus)* are a tertiary species for contaminants testing for waterbodies where populations of Largemouth Bass or Brown Bullheads are insufficient or lacking (e.g., Quarry Pond). Pumpkinseeds are the widest spread native game fish species on Fort Drum. Contaminants testing is explained in more detail in *Section 4.1.4.5 Contaminants* and in *the Fort Drum Aquatic Species Management Plan.*

4.3.2.5 Aquatic Invertebrates

Since 2008 surveys of aquatic macroinvertebrates have occurred annually as a proxy for water quality measurements. These surveys identified 40 genera of mayfly, 23 genera of stonefly, and 53 genera of caddisfly. Virtually all macroinvertebrates were identified to genus from larval specimens, and very few to the species level. During 2012 New York Natural Heritage surveyed Training Area 6 near the Black River for the state-listed Tomah Mayfly, in the process identifying an additional genus of stonefly and five genera of caddisfly, and also identifying several members of each order to the species level.

4.3.2.6 Terrestrial Invertebrates

Assembling a complete list of Fort Drum's insect fauna would take an army of entomologists many years, so future formal insect surveys will focus on species of conservation concern known or suspected to occur on the installation, or functional groups of particular importance (e.g. pollinators).

All 56 butterfly species that have been observed on Fort Drum were identified during the course of informal inventory work between or after surveys for other taxa, although a small number of formal surveys have been conducted. During 2012, the New York Natural Heritage Program searched for several rare butterfly species, primarily focusing on Mottled Duskywing and Olympia Marble, but secondarily on Bog Elfin, Edward's Hairstreak, Frosted Elfin, Gorgone Checkerspot, Hoary Comma, Jutta Arctic, Karner Blue, Persius Duskywing, and Silvery Blue. Natural Heritage found none of these species, including Silvery Blue which is well documented on Fort Drum, and noted a lack of habitat and/or food plants for Mottled Duskywing and Olympia Marble. A few species likely remain to be found, but butterflies are probably the most thoroughly documented group of insects on Fort Drum.

Table 4.31 Terrestrial invertebrate status on Fort Drum.

COMMON NAME (SCIENTIFIC NAME)	LEGAL STATUS	STATUS ON FORT DRUM
Northern Amber Bumble Bee (*Bombus borealis*)	NYS High Priority Species of Greatest Conservation Need	Many observations in old hayfield habitat throughout Fort Drum—apparently common.
Lemon Cuckoo Bumble Bee (*Bombus citrinus*)	USFWS Priority At-Risk Species	One record in TA5D in 2015 and four records in Cantonment Area in 2019—current status unknown.
Yellow Bumble Bee (*Bombus fervidus*)	NYS High Priority Species of Greatest Conservation Need	One record from TA10B in 2009—current status unknown.
American Bumble Bee (*Bombus pensylvanicus*)	Petitioned to be federally-listed (CBC 2021).	In historic range, but no records on Fort Drum—status unknown.
Yellow-Banded Bumble Bee (*Bombus terricola*)	NYS High Priority Species of Greatest Conservation Need	One record from TA13A in 2015 and three individuals recorded in TA17A in 2019—status unknown.
Monarch Butterfly (*Danaus plexippus*)	Petitioned to be federally-listed (CBC 2014) and currently under review by USFWS to be determined in FY2024 (USFWS 2023)	Formerly common but uncommon to scarce since 2010, more common during fall migration.
Tomah Mayfly (*Siphlonisca aerodromia)*	State Endangered; NYS High Priority Species of Greatest Conservation Need	Larvae collected in Black River adjacent to Fort Drum—status on Fort Drum unclear. Possibly present in the West Branch of Black Creek between Hwy 3A and Warren Swamp.
Nine-spotted Lady Beetle (*Coccinella novemnotata)*	NYS High Priority Species of Greatest Conservation Need	Released on Wellesley Island in 2016. Documented several times on Fort Drum—the first time in TA5D in June 2016 and most recently in TA11A in July 2020.
Three-banded Lady Beetle (*Coccinella trifasciata)*	NYS High Priority Species of Greatest Conservation Need	Widespread records throughout Fort Drum, especially western TAs.

The Monarch Butterfly was petitioned for listing (CBC 2014) and determined to be a candidate for listing under the ESA in 2020. One of the causes often blamed for Monarch Butterfly declines is a substantial reduction in the occurrence of its host plant—milkweed—due to herbicide use and agricultural practices. However, Milkweed is extremely common and widespread on Fort Drum, and the low densities of Monarchs on Fort Drum likely have resulted from population-level effects rather than anything that is occurring on Fort Drum itself. Surveys documenting the presence and abundance of adult butterflies and host plants will be conducted throughout Fort Drum.

The only formal moth surveys conducted on Fort Drum were part of the 2012 New York Natural Heritage Program inventory. These moth surveys were targeted to several habitats that seemed most likely to produce rare species, including the sand barrens in TAs 7D, 7G, 8B, and 5D; a seasonally wet clearing with exposed limestone bedrock in TA15C, and woodlands and fields in TA6A near the Black River. Natural Heritage documented 267 moth species on Fort Drum including several rare species, most notably the Faded Gray Geometer, which had not been found in New York State for about 100 years. Natural Heritage also surveyed a fen in TA 19 for the state-listed Bog Buckmoth, finding none, but did not conduct sufficient replicates to be confident that no buckmoths were present at this site. Fort Drum Biologists have identified an additional

29 species of moth during the course of other field work. Many moth species certainly occur that have not yet been recorded, and additional moth trapping would likely add many species to the Fort Drum list.

A limited bee survey was conducted by Colorado State University in 2017; Fort Drum was a study site for the Empire State Native Pollinator Survey in 2018 and 2020; and more extensive surveys of pollinators was conducted by the New York Natural Heritage Program in 2019 and 2021 following the Empire State Native Pollinator Survey protocol with focal taxa including bumble bees, mining bees, leafcutter bees, oil bees, saproxylic hover flies, bee flies, flower long-horned beetles, hairy flower scarabs, flower moths, and sphinx moths.

Given the great interest in pollinator declines nationally and the possibility of future federal action on pollinator conservation, it would benefit Fort Drum to know more about pollinator diversity on Fort Drum. Given the recent records of Three-banded Lady Beetle on Fort Drum and the possibility that other rare lady beetle species occur, lady beetles would be a high priority for coleopteran surveys. In addition to targeted surveys, additional informal inventory work will continue to add species to the known list of insects that occur on Fort Drum.

A 1996-97 study of sand wasps (Kurczewski 1998) that documented 109 species of mostly sand-nesting wasp is the only formal survey of Hymenoptera that has been conducted on Fort Drum. Informal Hymenopteran inventories during the course of other field work has documented an additional 88 species, including 42 species of bee and an additional 32 stinging wasps, and several additional families for which specific or even generic identification is very difficult. Many hundreds of species certainly occur that have not yet been documented, including ants, of which only seven species have been identified, and very diverse wasp families such as Ichneumonidae and Braconidae, for which identification is extremely challenging.

Two volunteers conducted Odonate surveys throughout Fort Drum during the summers of 2007-2009 for the New York State Odonate Atlas, documenting 20 species of damselfly and 24 species of dragonfly. During 2012 New York Natural Heritage searched for rare Odonates, focusing on Ebony Boghaunter, riverine clubtails, and several species of emerald and darner that rely on bogs and fens. Natural Heritage only found one rare odonate, Spatterdock Darner, in TA19. Fort Drum biologists have documented an additional 25 species of dragonfly during informal surveys conducted during the course of other field work, including Arrowhead Spiketail, a species listed by New York State as of Greatest Conservation Need. Surveys thus far have likely documented most or all of the common odonates on Fort Drum, but several species of uncommon to rare dragonflies likely occur but have not yet been observed.

Except for tiger beetles, which have been the focus of ongoing surveys, there has been no effort to systematically survey Fort Drum's Coleoptera fauna. Eight species of tiger beetle have been documented on Fort Drum, and additional surveys are planned to search for several more that are possible based on published range maps. Informal surveys have identified an additional 125 beetle species, but relative to their overall diversity and importance, Coleoptera is the least well known insect order on Fort Drum.

4.3.3 Fish & Wildlife Resources Management Principles and Methods

4.3.3.1 Surveys are Critical to be Proactive Managers

Planning level surveys are vital to determine a species presence/absence and general distribution on the installation in order to establish base-line information to determine if there is a change over time or impact from an activity.

Table 4.32 Status of planning level surveys for wildlife species. Species groups are based on organisms identified in the NYSDEC State Wildlife Action Plan (2016) and DoD Species at Risk (2016).

GROUPS	# KNOWN SPECIES	% COMPLETE	PLS STATUS
Mammals	49	92	All species thought to occur in this region of New York are documented except 4 shrew spp.
Birds	255	98	Status of all regularly-occurring species known. Continue to periodically add new species although rate has slowed down to less than one per year.
Reptiles	14	75	All reptile species predicted to be within this region of NYS are accounted for on Fort Drum. Distribution and population sizes for Wood, Spotted, Musk, and Blanding's Turtle are currently being assessed
Amphibians	22	75	All amphibian species predicted to be within or on the periphery of this region of NYS are accounted for on Fort Drum. Status and distribution of Blue-spotted salamanders and Four-toed salamanders are poorly understood at this time.
Fish	42	75	Many waterbodies on Fort Drum have been surveyed at least once, but not necessarily extensively.
Crustaceans (Crayfish, Amphipods, & Isopods)	10	90	An installation wide crayfish survey was completed in 2010.
Aquatic Molluscs (Bivalves & Snails)	20	10	A comprehensive mussel survey was completed in 2009. Most data from aquatic invertebrate surveys identifies snails to family or genus level.
Terrestrial Molluscs (Snails & Slugs)	3	0	
Arachnida – Araneae (Spiders)	36	5	No formal surveys have been conducted.
Insects – Coleoptera (Beetles)	136	1	Tiger beetles only group systematically surveyed.
Insects – Ephemeroptera (Mayflies)	40	20	Primarily identified to genus level. Larval surveys have been done only in summer months.
Insects – Hymenoptera (Bees & Ants)	197	2	Sand wasps only group systematically surveyed.
Insects – Lepidoptera (Butterflies & Moths)	352	20	Approximately 75-90% of butterfly species that likely occur have been identified; moth inventory < 20% complete.
Insects – Odonata (Dragonflies & Damselflies)	74	75	All common species likely have been detected; unknown number of rare species likely occur but no documentation.
Insects – Plecoptera (Stoneflies)	24	20	Primarily identified to genus level. Larval surveys have been done only in summer months.
Insects – Trichoptera (Caddisflies)	58	20	Primarily identified to genus level. Larval surveys have been done only in summer months.

4.3.3.2 De-conflict Training Missions/Garrison Operations and Species Impacts

Managers will be engaged in all aspects of mission and garrison planning activities to provide options to meet regulatory requirements to enable actions to be conducted as effectively and efficiently as possible.

In accordance with legal requirements under the Endangered Species Act, conservation measures have been implemented for the protection and benefit of the Indiana and Northern Long-eared Bat on Fort Drum; however, these requirements also benefit most species of bats found on the installation. Two significant conservation measures are: (1) the establishment of a 2200 acre Bat Conservation Area situated mostly in the Cantonment Area, and (2) the establishment of a tree clearing restriction period from April 16 – October 15 when bats are likely to roost in trees and raise young.

To minimize the taking/killing of migratory birds—including eggs, nestlings, and nesting adult birds—Fort Drum has instituted a land clearing window which allows vegetation clearing only between 01 August – 15 April to avoid most birds during the nesting season. This clearing window applies to undeveloped areas such as grassland areas in the Training Area and land clearing for construction; not for landscaped yards in the Cantonment Area. Certain exemptions exist depending on the situation and actions will be evaluated on a case-by-case basis. See Appendix 7 for bird conservation measures and more information on exemptions.

4.3.3.3 Monitoring Indicator Species and Species At-risk to Provide Feedback for Adaptive Management

Another part of proactive management is to know when there is a problem as soon as possible and this can be done by monitoring certain species or groups of species over time. Monitoring should be performed for species considered at-risk to ensure species do not become federally-listed. The more information obtained and management conducted now, the better positioned the Army and the Resource is in the future if or when species become listed or petitioned for listing. Other species to monitor are those that are considered indicators of ecosystem integrity and/or health. Other monitoring efforts may focus on wildlife health for known diseases impacting wildlife species in other areas.

Table 4.33 Taxonomic groups monitored on Fort Drum.

GROUPS	MONITORING RATIONALE
Bats	Two ESA listed species, the endangered Indiana bat and the threatened Northern Long-eared bat/At risk species due to infection with white nose syndrome
Small Mammals	Lyme disease prevalence
Common Loon	Ecosystem indicator in Partnership with WCS
Breeding Waterfowl	Ecosystem indicator in Partnership with NYSDEC
Bald and Golden Eagles	At risk species
Hawks	At risk species
Nightjars	At risk species, assess land management actions to create habitat
St. Lawrence Grassland Birds	At risk species, assess land management actions to create habitat
Northern Sandplain Grassland Birds	At risk species, assess land management actions to create habitat
Cerulean Warbler	At risk species

GROUPS (continued)	MONITORING RATIONALE
Red-headed Woodpecker	At risk species, assess land management actions to create habitat
Golden-winged Warbler	At risk species/potential ESA-listed species, asses land management actions to create habitat
Early Successional Woodland/Shrubland Birds	At risk species; assess land management actions to create habitat
Frogs/Toads	Decline of regional species; Ecosystem indicators
Snakes	Emerging snake fungal disease in New York
Brook Trout	Ecosystem indicator
Largemouth Bass, Brown Bullhead, Pumpkinseed	Wide-spread species used to monitor pollution, recreational/economic value
Aquatic Macroinvertebrates	Ecosystem indicators
Monarch Butterfly	At risk species, Federal Candidate (2020)
Bumblebees	At risk species/ecosystem indicator, potential ESA-listed species
Ticks	Increasing in abundance, primary carrier of the Lyme Disease bacteria, carrier of other life-threatening emerging diseases

4.3.3.4 Manage Holistically to Support Biodiversity

Managing for “biodiversity” or ecosystem management are buzzwords for looking at the “big picture” which is the overall management strategy of managing holistically. Almost all management actions will benefit some species and adversely affect others; for instance forest management that removes early successional species from a stand to promote the growth of maple and oak will inevitably lead to a loss of bird species that require early successional forest. However, the area will subsequently be colonized by species that require more mature forest. The overall impact across the landscape for any given management decision is probably negligible, but many such actions taken over a large area and many years can have a substantial cumulative impact on populations across the installation. We cannot have tunnel vision and manage for only one species or group of species across the entire landscape and need to consider the impacts of one management decision on all the species in the entire area.

4.3.3.5 Survey and Eradicate Invasive Invertebrate Species Utilizing Integrated Pest Management

Managers will aggressively survey and eradicate invasive species when found. Numerous species of invasive insects can threaten the forested environment. Any large outbreaks can directly impact maneuverability and jeopardize Soldier safety due to falling dead and dying trees.

4.3.3.6 Manage Naturally

“No” management is an option that must always be considered and is sometimes the best course of action and let “Nature take its course.” This is particularly true in the case of individual animals.

For example, utilizing natural cavities in standing snags is the preferred management strategy over the use of artificial nest boxes. Another example is not utilizing food plots. Food plots typically consist of a planted field of corn, oats, or other agricultural or cover crop grown to provide food and cover for wildlife. The preferred option on Fort Drum is to utilize forest management practices to provide abundant natural food and cover without the costs associated with planted food plots.

4.3.4 Fish & Wildlife Resources Management Strategies

4.3.4.1 Mammal Management

4.3.4.1.1 Bat Management

Currently management is maintaining the habitat we have and avoid any take of bats while they are potentially inhabiting the installation (approximately 15 April – 15 October).

See the Fort Drum 2023 *Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum (2024-2026) for the Indiana Bat (Myotis sodalis), Northern Long-Eared Bat (Myotis septentrionalis), and Tricolored bat (Perimyotis subflavus)* (Fort Drum 2023b) for additional information regarding known spatial and temporal distribution of these species, potential impacts to the species by Fort Drum actions, current and ongoing management actions, and all conservation measures for the protection of the species. See the *Fort Drum Mammal Management Plan* (in progress) for more information regarding the known spatial and temporal distribution and applicable management actions for all bat species found on the installation.

Fort Drum plans to monitor bats for the foreseeable future following multiple strategies. Because there are now relatively few bats on the landscape (outside of big brown and eastern red bats), mistnet surveys are not the most efficient or effective means of surveying for the presence/absence of all bats in a specific location. These types of surveys are still important to conduct to try and capture bats to assess general body condition and attach radio-transmitters to obtain roosting and foraging temporal and spatial changes. However, it is likely they will now only be conducted every 5 years. Most work is now, and will be focused, on using acoustical surveys to detect bats on the landscape. Efforts are ongoing for determining the potential biases in using this methodology and also for determining the most efficient and effective monitoring strategy across the landscape to document spatial and temporal use by all species of bats on Fort Drum. Efforts will continue to monitor little brown bat maternity colonies across the landscape to document effects of WNS.

Within the next five years, Fort Drum Natural Resources Branch biologists and foresters will be developing new, and augmenting existing, habitat management strategies for bat species across the installation, with emphasis placed on benefits to both of the federally-listed species. These strategies should help meet existing requirements and posture Fort Drum well in the event that any additional bat species receive federal protection. Known or newly found roost trees will be protected for both species in accordance with conservation measures and recommendations within existing Biological Assessments and Opinions.

4.3.4.2 Bird Management

A lot of bird management is maintaining the habitat we have and avoiding any taking/killing of migratory birds while they are potentially nesting on the installation (approximately 15 April – 1 August). Some habitat is de facto protected with minimal impacts (e.g., water and marsh birds); some habitat is abundant (e.g., mid/late

successional forests); whereas other habitats require management to exist (e.g., sandplains, grasslands and early successional forests).

4.3.4.2.1 Nightjar Management

A Whip-poor-will study conducted by a graduate student at the University of Massachusetts, Amherst during 2015 and 2016 found that whip-poor-wills on Fort Drum preferred forested sites with intermediate basal area and an open understory (Spiller 2019). Based on these results, silvicultural recommendations included using shelterwood or group selection systems to create suitable Whip-poor-will habitat was forwarded to Fort Drum's Forest Management Program.

The most likely method for determining population health of Common Nighthawks would be to monitor nests for survival and productivity, which would be a time-intensive project so not one that could feasibly be conducted by in-house resources. A nighthawk nest success study is one of the top research priorities related to migratory birds, and will be conducted concurrently with experimental surveys to determine whether there is a way to accurately count nighthawks.

4.3.4.2.2 St. Lawrence Valley Grassland Nesting Bird Management

Monitoring results will provide information on the overall status of grassland bird populations, the locations of the highest quality patches of occupied grassland bird habitat, and the effects of various land management activities on grassland birds. Additionally, the nesting locations for species of high conservation concern will be provided to NEPA so that training exercises can be guided away from them whenever possible.

ITAM management for much of this area is to allow shrubs to grow in patches and mow broad swaths of vegetation between these patches, which over time will result in the conversion of many grassland areas to shrublands. The effect of this management on birds will be to concentrate most grassland birds in a few locations and contribute to further declines in the abundance of Henslow's Sparrow and other grassland bird species, but will also lead to increases in shrubland birds, possibly including Golden-winged and Blue-winged Warblers. As grassland birds become restricted to progressively smaller and fewer areas, the potential impact of training exercises on rare grassland birds will increase.

Although ITAM management will generally reduce the amount of open grassland present in Training Areas 12 and 13, a few patches of grassland will be maintained. Natural Resources Branch will actively manage 488 acres of grassland bird habitat in TA 12C as well as a few smaller patches in TA3 and perhaps elsewhere. . See *Section 4.2.4.3 Grassland/Forbland Management* for thorough descriptions of grassland management and goals, and *the Fort Drum Bird Management Plan* for more details on annual bird monitoring.

4.3.4.2.3 Northern Sandplain Grassland Nesting Bird Management

In response to declines in sandplain grassland area and quality, during 2014 Natural Resources Branch cleared approximately 300 acres of woodlands for a grassland

restoration project in TAs 7D and 7G. The main focus of current sandplain grassland monitoring is to track the response of grassland birds to this and similar management actions. The TA7D and 7G field will be monitored annually to determine the occurrence and abundance of birds that rely on these grasslands, focusing especially on Upland Sandpiper, as this species has the strictest habitat requirements of any species that regularly uses this community. Should management be conducted in other sandplain grassland patches, pre and post treatment sampling will be conducted to determine the response of sandplain grassland birds. More general monitoring will also help identify potential areas for future management should the possibility arise.

During 2015, just one year after the TA7 sandplain grassland restoration project began, a pair of Upland Sandpipers nested in this area for the first time in more than 14 years. The quick response by Upland Sandpipers to this habitat management project shows the potential benefit to grassland birds that can accrue from management actions. Additional work must be done to control woody sprouting before this management effort can be deemed fully successful, but there continues to be a sufficiently healthy sandplain grassland bird population on Fort Drum that newly created habitat patches can be quickly colonized.

4.3.4.2.4 Early Successional Forest/Shrubland Nesting Bird Management

In addition to Golden-winged Warbler surveys, additional surveys will document the response of shrubland birds to forest management aimed at creating or maintaining early successional habitats. Examples of such management include patch clearcuts in TAs 7 and 14 for Ruffed Grouse, and heavily thinned forest in TAs 3 and 4 for Golden-winged Warbler (see *Section 4.2.4.1.6 Early Successional Forest Management* for more information). Monitoring will focus on determining use by bird species that are the targets of these management actions, when applicable, as well as documenting the overall community of birds that uses these managed areas following treatment.

4.3.4.2.5 Red-headed Woodpecker Management

The majority of the Red-headed Woodpecker habitat on Fort Drum occurs just east of Wheeler-Sack Army Airfield, and long-term plans for airfield expansion could lead to the loss of most currently extant woodpecker habitat on the installation. To mitigate this potential habitat loss, the Natural Resources Branch is using timber sales and firewood sales to expand the area of potential habitat on Fort Drum (*Section 4.2.4 Land Resource Management Strategies*). These managed areas will be monitored annually to determine whether Red-headed Woodpeckers colonize them, and whether such colonization leads to increases in the total population.

4.3.4.2.6 Cerulean Warbler Management

Long-term management for mature deciduous forest should benefit Cerulean Warblers in the future. In the meantime, management consists of ensuring that currently occupied habitat is protected to the extent feasible, and that at minimum several stands of mature maple forest with tall, large-diameter trees remain in the central Training Areas.

4.3.4.2.7 Bald & Golden Eagle Management

Bald Eagles were documented nesting on the installation for the first time in the early summer of 2020 in TA 19. This nest was ultimately successful, and the eagle pair raised at least 1 young that fledged from the nest. Preliminary eagle conservation management actions were developed in coordination/consultation with the USFWS and NYSDEC and implemented starting in late summer/early fall of 2020. The primary concern from both a military training and conservation perspective was the location of the nest which was in close proximity to the main administrative flight route for military aircraft in the northeastern portion of Fort Drum. In coordination with DPTMS, WSAAF, and numerous aviation personnel, it was determined that the administrative flight route could be modified with no adverse training impacts, and it was subsequently moved 0.25 miles to the west of the nest. This both reduced disturbance to the nest and reduced any potential wildlife-aircraft strike hazard. Other conservation actions were developed following information outlined within the USFWS Bald Eagle Management Guidelines (USFWS 2007) and the NYSDEC Bald Eagle Conservation Plan (NYSDEC 2016). Buffers were placed around the nest to minimize or eliminate disturbance concerns from fixed and rotary winged aircraft, military training, forest management operations, and recreation. Appendix 9, Figure 8 has the type, size, and timing when the buffer restriction is active. Educational and regulatory signage was also placed outside of the nesting location to help minimize disturbance. If all the agreed upon conservation actions are followed, the USFWS determined that no regulatory permit and follow-on requirements would be needed. Monitoring will take place during the nesting season (01 January- 30 September), and if the nest location changes over time, or it is found that the conservation actions are not suitable for mitigating disturbance, then additional actions may be required.

4.3.4.3 Reptile & Amphibian Management

4.3.4.3.1 Wood Turtle Management

Wood Turtle numbers have been dramatically declining for many years in NYS due to loss of habitat, depredation, and illegal harvest for the pet-trade. Wood Turtles take approximately 14-18 years to reach maturity, females typically lay eight or fewer eggs per year, and many females may not mate every year (Gibbs et al 2007). . It has been estimated predators raiding new turtle nests account for over 60% of turtle eggs being destroyed (Buhlmann and Osborn 2011). Due to these factors, Wood Turtle populations are very susceptible to environmental stressors.

In 2013, four artificial nesting mounds were constructed near selected streams. These mounds are basically sandy berms approximately 20 feet long, 4 feet wide at the base, and a 3 feet high and topped with an anti-predator cage designed to allow turtles to pass through the bottom, but restrict access to predators such as Raccoons, Black Bears, Coyotes, fox, and corvids (ravens and crows). Sides of nesting structures are sloped to a degree which discourages nesting other than within the anti-predator cage. These structures have been used with good success in other locations in US and Canada (Buhlmann and Osborn 2011).

Surveys for Wood Turtles began in 2016, and then an intensive Wood Turtle telemetry project was initiated in 2017. The goal of the project was to search all likely Wood Turtle

habitats on Fort Drum and determine presence, probable absence, and spatial and temporal use. All Wood Turtles encountered were photographed, assigned a unique mark, and many were affixed with radio transmitters. Telemetry data of their movements was recorded, and information has been collected on hibernacula, foraging, and important habitat and nesting areas primarily along the Black Creek and West Branch of Black Creek in the southern part of Fort Drum.

Surveys have shown that Wood Turtles are the most terrestrial of all turtles found on Fort Drum. Indeed, other than for hibernation, Wood Turtles are often more likely found in adjacent uplands than in the water. In early spring as they emerged from hibernation, most Wood Turtles moved directly into nearby upland areas to bask, forage, and breed. Although most of the time turtles were found in "natural" areas, some were found spending time in gravel/dirt parking areas and crossing/utilizing gravel/dirt roads. During hot spells, most turtles moved back into the streams, or burrowed under forest/field leaves/detritus for thermal regulation. This behavior was also seen as temperatures started to get cold. Given what we are observing, mowing, training (foot and wheeled vehicle traffic), or other disturbances within close proximity to important stream sections may negatively affect this species, and this will be an important consideration moving forward.

Because it is a species that is being considered for future federal listing, more information is necessary to fully understand the spatial and temporal distribution across Fort Drum's landscape. Survey efforts are ongoing and will continue over the next 2-3 years into 2022-2023, leading to a better understanding of important areas and habitat associations, potential BMPs, and appropriate conservation actions for the species. This information will ultimately help Fort Drum manage for this species, especially if it is found to be warranted for federal protection.

4.3.4.4 Fish Management

Most of the focus related to fish management is improvement of fish habitat that is mentioned in various sections of *4.1.4 Aquatic Resources Management Strategies.* Surveying and monitoring fish assemblages will continue to evaluate habitat enhancement projects as well as part of the Long-Term Monitoring efforts mentioned in Section *4.1.4.8 Monitor to Improve Water Quality*.

4.3.4.5 Invertebrate Management

Besides continued baseline surveys to understand what currently exists on Fort Drum, there will be some focus on habitat management for pollinators as mentioned in Section 4*.2.4.3.2 Grassland/Forbland Management for Wildlife Habitat*.

Given the conservation attention that pollinators are receiving and potential future listings, as well as the likely role that chemical pesticides play in their declines, Fort Drum should reevaluate the use of pesticides with the goal in reducing use or emphasize methods of targeted use to the extent possible.

4.4 Human & Wildlife Conflict Management

Human conflicts, either real or perceived, includes human life, health and safety; property damage (vehicles, aircraft, utilities/infrastructure/facilities, grounds and landscaping, agriculture and gardens, and pets); ecological damage (forests and protected species); social distress (nuisance/undesirable and fear); and military training. For more information, see the *Fort Drum Human-Wildlife Conflict Management Plan*.

This section pertains to animals that are involved with human conflict situations in the natural environment and/or species that are considered "wildlife." Household "pests" such as fleas, termites, and mice that are the solely the responsibility of DPW – Operations & Maintenance Division – Pest Control Program are not included in this section. Invasive plant species are addressed in Sections *4.1.4.10 Aquatic Invasive Species Management* and *4.2.4.5 Terrestrial Invasive Species Management* of this INRMP and the *Fort Drum Noxious and Invasive Plant Management Plan*.

Besides the Natural Resources Branch, human conflict situations are handled by a variety of entities on Fort Drum:

- DPW – Operations & Maintenance Division – Pest Control Program focuses mostly on invertebrates (e.g., bees, fleas, cockroaches, ants) and some vertebrates (e.g., mice, pigeons, woodchucks) that cause conflicts occur in and/or around human-occupied dwellings. The DPW-Pest Management Coordinator oversees the updating of the Integrated Pest Management Plan (IPMP; Fort Drum 2016); coordinates all chemical pesticide use on the installation, is the primary contact to pick-up road-killed animals, and conducts pest control activities. The Pest Control Program is staffed by two federal employees with additional support by seasonal contractors.
- Fort Drum Mountain Community Homes (FDMCH) maintains their own pest control management for residential housing areas for individual pest situations for vertebrates (e.g., skunk, woodchuck, raccoon, or starling) and invertebrate species. FDMCH abides by the principles of the Fort Drum IPMP.
- DES- Conservation Law Enforcement Officer Section responds to nuisance wildlife (e.g., bears) in the Training Area and reports of suspicious wildlife or stray domestic animals in the Cantonment Area.
- DPTMS-WSAAF personnel manage nuisance vertebrate pests on Wheeler-Sack Army Airfield (see *Section 4.4.4.12 Wildlife-Aircraft Strike Hazard Management*).
- MEDCOM-Preventive Medicine is responsible for surveillance and control of pests impacting foodstuffs and vector-borne or vertebrate pest-related zoonotic disease surveillance and management. MEDCOM coordinates and reports pesticide usage to the Fort Drum Pest Management Coordinator.

4.4.1 Human Conflict Regulations & Guidance Documents

4.4.1.1 Federal Statutes & Regulations

Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884)

Provides for the identification and protection of threatened and endangered species of fish, wildlife, and plants and their critical habitats. The policy of Congress is that federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the Act's purposes. All federal agencies including Fort Drum, in consultation with the USFWS (specified in Section 7 of the Act), must insure that any action authorized, funded or carried out by the agency (agency action) is not likely to jeopardize the continued existence of an endangered or threatened species, or result in destruction or adverse modification of a critical habitat of a species. On Fort Drum, there are two federally-listed species: the endangered Indiana Bat (*Myotis sodalis*) and the endangered Northern Long-eared Bat (*Myotis septentrionalis*). Vertebrate pest control activities are considered in the Biological Assessment (Fort Drum 2023b) and USFWS concurrence for those bat species.

Bald and Golden Eagle Protection Act of 1940, as amended, 16 USC 668 et. seq.

Provides for the protection of the Bald Eagle and the Golden Eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. Actions have been implemented to avoid any human-wildlife conflict encounters with nesting Bald Eagles and rotary wing aircraft in TA 19.

Migratory Bird Treaty Act of 1918 (16 USC 703-712)

Implements various treaties and conventions between the US and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, pursuing, hunting, taking, capturing, killing, and/or possessing (or attempting to do so) migratory birds (including eggs and nests) are prohibited unless permitted by regulations issued by the USFWS. Fort Drum operates under several permits and depredation orders:

- Depredation Permit (primarily for activities on Wheeler-Sack Army Airfield but also for handling nests)
- Depredation Order for Blackbirds, Cowbirds, Crows, Grackles, and Magpies (Regulation 21.43)
- Control Order for Resident Canada Geese at Airports and Military Airfields (Regulation 21.49)
- Depredation Order for Resident Canada Geese Nests and Eggs (Regulation 21.50) and Egg Oiling Permit

Animal Damage Control Act of 1931, (7 USC 426 - 426d)

Allows USDA-APHIS-Wildlife Services to conduct a program with respect to injurious animal species and take any action deemed necessary. APHIS has been utilized on Fort Drum to assist the management of beaver, but they could also be used for BASH management. The Animal Damage Control Act also pertains to DoD to prevent the

inadvertent introduction of Brown Tree Snakes (*Boiga irregularis*) from Guam to Hawaii in aircraft and vessels transporting personnel or cargo.

Engle Act of 1958 (10 USC 2671)

Provides that resident wildlife on military installations belong to the State. Requires hunting, fishing and trapping on installations comply with state fish and game laws including obtaining appropriate state licenses for these activities. Special installation rules require state concurrence. Allows public access for hunting, fishing and trapping. The first option when a game species is involved with human-wildlife conflicts is to manage it through state hunting and trapping regulations.

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

The FIFRA and its implementing regulations (Public Law 110-426) requires the registration, classification, and regulation of all pesticides used in the US; likewise, all pesticides, whether for commercial or private use, must be applied in accordance with product labeling and containers must be properly disposed of. The US EPA is responsible the implementation and enforcement of FIFRA. Federal agencies shall also use Integrated Pest Management techniques in carrying out pest management activities and shall promote Integrated Pest Management through procurement and regulatory policies, and other activities. Integrated Pest Management is a sustainable approach to managing pests by combining biological, behavioral, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

Plant Protection Act (7 USC 7701-7786)

Consolidates all or part of ten plant health laws (including the former Plant Quarantine Act, Federal Pest Act, and Federal Noxious Weed Act) into one comprehensive law. Provides for the authority to regulate plants, plant products, certain biological control organisms, noxious weeds, and plant pests including forest pests.

Airborne Hunting Act (16 USC 742j-l)

Added to the Fish and Wildlife Act of 1956 that prohibits shooting or attempting to shoot, harassing, capturing or killing any bird, fish, or other animal from aircraft except for certain specified reasons. Under exception [16 USC 742j-l, (b)(1)], state and federal agencies are allowed to protect or aid in the protection of land, water, wildlife, livestock, domesticated animals, human life, or crops using aircraft.

Federal Food, Drug, and Cosmetic Act (21 USC 360)

This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration (FDA).

Controlled Substances Act of 1970 (21 USC 821 et seq.)

This law requires an individual or agency to have a special registration number from the Drug Enforcement Agency (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994 (21 USC 301)

The AMDUCA and its implementing regulations (21 CFR 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in damage management programs.

4.4.1.2 Executive Orders & MOUs

Executive Order 11987, May 24, 1977 - Exotic Organisms

Executive agencies shall, to the extent permitted by law, restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration; and, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the US.

Executive Order 13112, February 3, 1999 – Invasive Species; amended December 5, 2016 - Safeguarding the Nation from the Impacts of Invasive Species

Federal agencies are required to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

4.4.1.3 Department of Defense & Army Regulations and Policy

DoD Instruction 4150.07 DoD Pest Management Program (29 May 2008)

Enclosure 4 – 7.6 The Military Services (e.g., Army) shall detect and respond rapidly to control populations of invasive species; monitor invasive species populations accurately and reliably; and conduct research on invasive species, develop technologies to prevent introduction, and provide the latest IPM techniques for their control.

Enclosure 4 – 7.13 The Military Services (e.g., Army) shall implement vertebrate pest management programs, including wildlife aircraft strike hazard reduction programs, to prevent vertebrate pest interference with operations, destruction of real property, and adverse impacts on health and morale; and cooperate with Federal, State, and local agencies that have implemented animal damage control programs on adjacent public and private lands. To manage feral animal problems, use Army Regulation 40-905.

DoD Instruction 4715.03 Environmental Conservation Program (Incorporating Change 2, 31 Aug 2018)

Enclosure 3 - 3.e. Biodiversity. Invasive and noxious species and feral animals will be identified, prioritized, monitored, and controlled whenever feasible.

Army Regulation 40-905 (29 Aug 2006) Veterinary Health Services

Dogs, cats, and other privately owned or stray animals will not be permitted to run at large on military reservations. Stray (or feral) animals are considered DOD-owned animals until it is euthanized, adopted, or released to civil authorities. The installation commander ensures that free-roaming domestic animals are collected as often as necessary for confinement. Stray animals will be confined for a minimum of 3 working days (more if required by local or state regulations) to provide owners sufficient time to reclaim the animals. After this time, the animal(s) may be euthanized or disposed of according to local regulations.

Army Regulation 200-1 (28 Aug 2007) Environmental Protection & Enhancement

Pest management is defined as the prevention and control of animal and insect disease vectors and other pests that may adversely affect the DOD mission or military operations; the health and well-being of people; or structures, materiel, or property.

4-3.d(4) Promote biodiversity and ecosystem sustainability on Army lands and waters consistent with the mission and INRMP objectives; manage flora and fauna consistent with accepted scientific principles and in accordance with applicable laws and regulations for the conservation of indigenous flora and fauna.

4-3.d(10) DPW is the proponent for noxious weeds and invasive species management. The most effective and environmentally sound approach for controlling invasive species will be utilized.

4-3.d(11) Obtain appropriate authorization from the USFWS before intentionally and directly taking any migratory bird species. Establish procedures to avoid the unintentional “take” of migratory birds, including nests and eggs.

5–1. Integrated pest management (IPM) strategies will be utilized to protect real property and the health of soldiers, civilians, and family members from pests.

5–3.a Pests that pose a threat to the health and safety of the installation population will be monitored and controlled.

4.4.1.4 NYS Laws & Regulations

In general, state laws, regulations, and policies related to fish and wildlife management activities—with the exception of hunting, trapping, and fishing regulations—do not apply to federal installations. Despite Federal agencies maintaining sovereignty, DoD voluntarily complies with the substantive portions of State pesticide and pest management laws and regulations when such compliance does not adversely impact DoD missions (DoDI 4150.7).

Fort Drum operates under various permits issued by NYSDEC related to human-wildlife conflict management:

- NYSDEC permits for addressing nuisance beavers and dam removal have varied over the years; however, currently, Fort Drum obtains an Article 11-Nuisance Beaver Permit and a General Permit–Breaching/Removal of Beaver Dams to allow removal of beaver dams, cleaning culverts plugged by beaver, installing

beaver pond levelers, or destroying beaver. These two permits work in conjunction and preclude the need to obtain site specific permits.

- Deer Management Assistance Program (DMAP) permits have been issued to Fort Drum to issue to hunters to take antlerless deer in the Cantonment Area since 1999.
- Deer Management Permits (DMPs or "doe tags") have been issued through licensing agents to hunters to take antlerless deer throughout Fort Drum (Wildlife Management Unit 6H) since 2002.
- Deer Damage Permits have been issued to Fort Drum to issue to agents (i.e., APHIS-Wildlife Services) to cull deer in WSAAF since 2017 and the Cantonment Area since 2018.
- An Airport Depredation Permit is issued to take migratory birds at Wheeler-Sack Army Airfield in conjunction with the USFWS Depredation Permit.
- Fort Drum is a subpermittee on the NYSDEC banding permit to band Canada Geese during capture and translocation efforts.

4.4.1.5 Fort Drum Plans & Standard Operating Procedures

Fort Drum Human-Wildlife Conflict Management Plan

This plan is a long-term planning document designed to guide the management of wildlife on Fort Drum Military Installation as it relates to real or perceived human conflicts. The various conflict situations are addressed in Section 2 and include: human life, health and safety; property damage (vehicles, aircraft, utilities/infrastructure/facilities, grounds and landscaping, agriculture and gardens, and pets); ecological damage (forests and protected species); social distress (nuisance/undesirable and fear); and military training. Section 3 of the plan addresses conflicts within geographic areas (Wheeler-Sack Army Airfield and Central Vehicle Washrack); Section 4 addresses species or groups of species that are listed in Tables 4.34-4.38.

Integrated Pest Management Plan for Fort Drum, NY (IPMP; Fort Drum 2016)

The IPMP describes past and anticipated pests, defines responsibilities for pest management on Fort Drum, and outlines resources necessary for surveillance and control of these pests including any administrative, safety or environmental requirements. Federal Agencies are mandated by Public Law (Section 136r-l of title 7, United States Code) to use Integrated Pest Management (IPM). The IPMP Is concerned mostly with the control of potential disease vectors (e.g., mosquitoes, ticks, fleas, and rodents); stored product pests (e.g., weevils and rodents); structural pests (e.g., termites and carpenter ants); general household and nuisance pests (e.g., cockroaches, blackflies, ants, filth flies, spiders, wasps, etc.); some vertebrates pests (e.g., pigeons, skunks, raccoons); and some plants (e.g., weeds and invasive species).

Wheeler-Sack Army Airfield Wildlife Hazard Management Plan (Fort Drum 2019)

This is the installation "BASH" plan (or Wildlife-Aircraft Strike Hazard Management Plan). It encompasses all wildlife hazards and their management in regards to airfield operations. The purpose of this plan is to minimize the potential of a wildlife strike to aircraft utilizing WSAAF.

Range-Wetlands Management Plan (2011)

The Range-Wetlands Management Plan was originally developed to address complaints about Beavers impacting the Training Area and the perceived loss of training lands due to wetlands and ecological succession. This also serves as a culvert management plan which began to be implemented in 2018.

Guide to Safe and Humane Handling of Bats on Fort Drum

The standard operating procedure ensures personnel can safely remove bats from buildings.

4.4.2 Human Conflict Resources Status

Various species and/or groups of species that create real or perceived human conflicts on Fort Drum are listed below. Species are included in broad taxonomic groups (mammals, birds, reptiles, fish, invertebrates) with a brief note of the general conflict and their status on Fort Drum (Common; Rare; in New York State, but not Fort Drum; not in New York State). Although some species will most likely never occur on Fort Drum, they are still addressed because of public questions and concerns. More information on the conflicts and the wildlife species can be found in the *Fort Drum Human-Wildlife Conflict Management Plan*.

There are 49 mammals documented on Fort Drum; 24 species (including 3 squirrels—Gray Squirrel, Red Squirrel, and Eastern Chipmunk—and all 9 bat species) are considered sources of human conflict. Five additional species (feral swine, cougar, feral cat, feral dog, gray wolf) not considered wildlife or not found on Fort Drum are also listed in this section and the *Fort Drum Human-Wildlife Conflict Management Plan*.

Table 4.34 Type and Frequency of Human-Wildlife Conflicts by Species (Mammals).

Species	Human-Wildlife Conflicts	Status on FD
White-tailed Deer	• Life/Health/Safety – Vehicle Collisions • Life/Health/Safety – Aircraft Collisions • Life/Health/Safety – Disease Transmission (part of the tick life cycle transmitting Lyme disease) • Property Damage – Vehicles • Property Damage – Aircraft Collisions • Property Damage – Grounds & Landscaping • Property Damage – Agriculture & Gardens • Ecological Damage – Forest Resources • Ecological Resources – Protected, Rare, Threatened & Endangered Species	Common
Moose	• Life/Health/Safety – Vehicle Collisions • Property Damage – Vehicle Collisions	Rare
Feral Swine	• Ecological Resources – Forests • Ecological Resources – Protected, Rare, Threatened & Endangered Species	In NYS, but not FD

Species	Human-Wildlife Conflicts	Status on FD
Black Bear	• Life/Health/Safety – Encounters • Property Damage – Buildings • Property Damage – Agriculture/Gardens (i.e., apiaries) • Nuisance/Undesirable • Fear	Common
Cougar	• Fear	Not in NYS
Bobcat	• Impact to Pets (predation or disease transmission) • Fear	Uncommon
Domestic / Feral Cat	• Human/Health/Safety – diseases • Property Damage - Impact to Pets (disease transmission) • Ecological Damage – predation of protected wildlife	Common
Gray Wolf	• Fear	Not in NYS
Coyote	• Life/Health/Safety – Encounters • Life/Health/Safety – Aircraft Collisions • Property Damage – Aircraft Collisions • Property Damage – Impact to Pets (predation or disease transmission) • Fear	Common
Red/Gray Fox	• Property Damage - Impact to Pets (disease transmission) • Nuisance • Fear	Common
Domestic / Feral Dog	• Life/Health/Safety – Encounters • Impact to Pets (predation or disease transmission) • Ecological Damage – predation of protected wildlife • Fear	Uncommon
Raccoon	• Life/Health/Safety – Rabies Vector • Nuisance/Undesirable • Ecological Damage – predation of protected wildlife	Common
Striped Skunk	• Life/Health/Safety – Rabies Vector • Nuisance/Undesirable • Fear	Common
Beaver	• Property Damage – Roads / Trails / Trees	Common
Porcupine	• Property Damage – Plywood Structures / Houses-Garages / Targetry • Property Damage – Landscaping • Nuisance/Undesirable • Ecological Resources - Trees	Common
Woodchuck	• Property Damage – Infrastructure / Electrical Supply • Property Damage – Landscaping	Common
Squirrels	• Life/Health/Safety – Lyme Disease Vector • Property Damage – Grounds / Electrical Supply • Nuisance/Undesirable	Common
Bats	• Life/Health/Safety – Rabies Vector • Nuisance/Undesirable • Fear	Common

There are 252 birds documented on Fort Drum; only 13 species and one group (Woodpeckers) are listed in the *Fort Drum Human-Wildlife Conflict Management Plan*;

one additional species that has not been documented on Fort Drum (mute swan) is also included.

Table 4.35 Type and Frequency of Human-Wildlife Conflicts by Species (Birds).

Species	Human-Wildlife Conflicts	Status on FD
Wild Turkey	• Life/Health/Safety – Aircraft Collisions • Property Damage – Aircraft • Property Damage – Vehicles • Nuisance/Undesirable	Common year-round
Canada Goose	• Life/Health/Safety – Aircraft Collisions • Property Damage – Aircraft • Nuisance/Undesirable	Common spring-fall
Mute Swan	• Life/Health/Safety – Aircraft Collisions • Property Damage – Aircraft • Nuisance/Undesirable • Ecological Resources – Fish & Wildlife	In NYS, but not FD.
Ring-billed Gull	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions • Nuisance/Undesirable	Common spring-fall
Turkey Vulture	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions	Common spring-fall
Snowy Owl	• Life/Health/Safety – Aircraft Collision • Property Damage - Aircraft Collisions	Uncommon; winter only
Woodpeckers	• Property Damage – Grounds / Electrical Supply • Nuisance	Common year-round
American Kestrel	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions • Nuisance	Common spring-fall
Pigeon	• Life/Health/Safety – Aircraft Collisions • Life/Health/Safety - Histoplasmosis • Property Damage - Aircraft Collisions • Nuisance/Undesirable	Common year-round
American Crow	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions • Nuisance/Undesirable	Common year-round
Common Raven	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions • Nuisance/Undesirable	Common year-round
Horned Lark	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions	Common spring-fall
American Robin	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions • Nuisance/Undesirable	
European Starling	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions • Nuisance/Undesirable • Ecological Damage – competition with cavity-nesting birds	Common year-round
Snow Bunting	• Life/Health/Safety – Aircraft Collisions • Property Damage - Aircraft Collisions	Common; winter only

Only one turtle and all eight documented species of snakes on Fort Drum are included in the *Fort Drum Human-Wildlife Conflict Management Plan*.

Table 4.36 Type and Frequency of Human-Wildlife Conflicts by Species (Reptiles).

Species	Human-Wildlife Conflicts	Status on FD
Snapping Turtle	• Fear	Common
Snakes	• Fear	Common

There is no species mentioned related to fish, but two general groups—baitfish and aquaria fish—are included in the *Fort Drum Human-Wildlife Conflict Management Plan*.

Table 4.37 Type and Frequency of Human-Wildlife Conflicts by Species (Fish).

Species	Human-Wildlife Conflicts	Status on FD
Baitfish	• Ecological Damage – Predation/ Competition/Hybridization/Disease (fish)	Common
Aquaria Fish	• Ecological Damage – Predation/ Competition/Hybridization/Disease (fish)	Uncommon

There is an unknown number of invertebrates on Fort Drum. Some of the common species that cause conflicts--bees, hornets and wasps, and mosquitoes—are not the responsibility of the Natural Resources Branch and are not considered in the *Fort Drum Human-Wildlife Conflict Management Plan*. Control measures for bees, wasps, and hornets around human occupied dwellings are primarily conducted by DPW-Pest Control. Surveillance of mosquitoes as well as some control measures for mosquitoes are conducted by MEDCOM-Preventive Medicine or local health departments. There are no scorpions or medically important spiders that cause conflicts. Although Natural Resources personnel have been involved with issues related to bees, the main focus is on ticks and forest pests.

Table 4.38. Type and Frequency of Human-Wildlife Conflicts by Species (Invertebrates).

Species	Human-Wildlife Conflicts	Status on FD
Ticks	• Life/Health/Safety – disease • Impact to Pets – disease	Common
Spongy Moth (European Gypsy Moth)	• Ecological Damage – Forests • Life/Health/Safety – allergies	Common
Sirex Wood Wasp	• Ecological Damage – Forests	Common
Emerald Ash Borer	• Ecological Damage – Forests	In Jefferson Co., but not FD

4.4.3 Human Conflict Management Principles & Methods

Management guidelines follow an arc of involvement with an effort for humans and wildlife to coexist with no intervention except maybe outreach, to changing behaviors of the wildlife or humans to mitigate the conflict, to exclusion or habitat management, to non-lethal or lethal removal of the animal. Often an integrated approach can be taken to utilize more than one method at a time for a given situation.

4.4.3.1 "Do Nothing"/Outreach & Education are Always the First Options

The core element in all human conflict situations is communication and education. This is done by natural resources staff with the public experiencing a real or perceived conflict. For some species or groups of species, education is the only management technique to utilize. In fact, about half the species or groups of species listed in *Section 4.4.2* are managed exclusively through education and/or a change in human behavior. Often it involves talking to people one-on-one or in small groups to alleviate fears and address concerns. Education also occurs at outreach events or public displays; through press releases, publications, signs and other graphics, or the internet.

Oftentimes no management or interaction is necessary and the best alternative is to let "Nature take its course." This is a perpetual management strategy and accomplished one person at a time—and repeatedly especially with an ever-changing population at a military installation.

Education = Change in Human Attitude / No Management Option. In many cases, the real or perceived issue can be overcome by educating the people involved. The wildlife species of concern is simply doing what comes natural and is not causing any harm. By understanding the biology and behavior of the animal, the issue can be perceived differently and alleviated.

Education = Change in Human Behavior. Education of the people involved in a conflict to change a certain behavior may address the specific conflict that is occurring. Typically wildlife species involved in conflict situations are opportunistic and adaptable—all wildlife are seeking food, water, shelter, and space. Focusing on one of these basic needs (e.g., food) and modifying a human behavior will often alleviate the conflict. Increasing awareness of a situation can also alleviate a potential conflict such as wearing appropriate clothing to minimize exposure to ticks or poison ivy. Examples include:

- Secure or remove garbage and wait until the day of trash pick-up to bring outside.
- Pick up dropped fruit on the ground
- Remove bird feeders and suet in the spring and summer; clean up food around bird feeders at other times of the year.
- Don't overfeed birds at a bird feeder that can attract other animals.
- Feed pets indoors or don't allow pet food to stay outside.
- Don't feed wildlife.

Table 4.39 Educational Resource Options to Minimize Human-Wildlife Conflicts.

Species	Education Examples
White-tailed Deer	• Press release informing drivers to be cautious when driving, especially in the fall.
Moose	• Press release informing drivers to be cautious when driving, especially in the fall.
Black Bear	• Safety Briefing & Information Paper for Soldiers in the Training Area
Cougar	• Communication only
Bobcat	• Communication only

Species	Education Examples
Feral/Domestic Cat	• *Don't Let Your Cats Go AWOL* brochure developed by American Bird Conservancy & DoD Legacy Program
Gray Wolf	• *Canids of Fort Drum* brochure
Coyote	• *Canids of Fort Drum* brochure
Red/Gray Fox	• *Canids of Fort Drum* brochure
Feral/Domestic Dog	• Communication only
Raccoon	• Safety Briefing & Information Paper for Soldiers in the Training Area
Striped Skunk	• Communication only
Bats	• *Bats of Fort Drum* brochure
All Birds	• At WSAAF, Bird Hazard Warning System is utilized by airfield personnel to exchange of information with aircrews concerning the existence and location of wildlife that pose a hazard to flight safety.
Snapping Turtle	• *Turtles of Fort Drum* brochure
Snakes	• *Snakes of Fort Drum* brochure • Safety Briefing & Information Paper for Soldiers in the Training Area • Outreach events exhibiting live snakes and answering questions.
Ticks	• Signage on trails, playgrounds, and other areas in the Cantonment Area alerting users to presence of ticks and precautions to take • *Tick-borne Disease* pocket cards (Army Publication GTA-08-05-056) • Press release in *Mountaineer*

4.4.3.2 Long-term Management is the Preferred Option Over Short-term Management

From a management perspective, selecting an option that will achieve a long-term solution with little or no additional involvement is the preferred option rather than short-term solutions that will continue into perpetuity. That said, long-term solutions are least likely to occur because they usually require greater initial effort and resources.

Behavioral/Biological Modification of the Animal. An action is taken that will modify the behavior or the biology of the animal in some way. Similar to changing human behavior, behavioral modification is a perpetual management strategy that is accomplished one animal at a time and can be a very intensive method. It is an effective method if only one application is required to modify many individuals at one time, or if there is a single individual that can be modified quickly. If the animal becomes habituated to the application, then other methods must be employed. Biological modification is concerned with affecting some aspect of its biology by promoting a predator or competitor, and/or interrupting some aspect of its life cycle.

- Use visual repellents such as scarecrows or lights
- Use auditory repellents (e.g., distress calls) or simply create noise (e.g., yelling, noisemakers, propane cannons, crackershells fired from a shotgun).
- Haze (i.e. chase away with dogs, remote control cars and planes, vehicles, etc.).

Table 4.40 Examples of Techniques to Modify the Behavior/Biology of Problem Wildlife.

Species	Behavioral/Biological Modification Examples
White-tailed Deer	• Promote (or at least not discourage) predators to increase predation of deer.
Black Bear	• Firing shotguns with rubber buckshot by DES- Conservation Law Enforcement Officer at specific nuisance bears. • Use of Bear Spray with capsaicin or other taste aversion techniques or repellents at specific facilities/equipment. • Electric fencing around apiaries
Birds (general)	• Crackershells, propane cannons, distress calls, approaching with a vehicle and other hazing techniques at WSAAF by DPTMS-Base Operations personnel per WSAAF SOP.
Pigeon	• A falconer fly a raptor in an area as a natural predator; and/or install perches to promote perching by naturally-occurring raptors.
American Crow	• If crows begin to congregate in winter roosts and become a nuisance, using distress calls and other hazing techniques similar to the ones employed in the City of Watertown.
Ticks	• Inoculate small mammals to Lyme disease through broadcast application of vaccine-laced bait. • Use bait stations to attract small mammals and/or white-tailed deer in order to apply an acaricide to kill/repel ticks from infecting host animals. • Encourage harvest of white-tailed deer during the regulated hunting season to reduce host of adult ticks and subsequent incidence of Lyme disease. • Promote (or at least not discourage) predators of small mammals and deer.

Physical Deterrence/Exclusion/Habitat Modification. Instead of a human behavior changing, a physical change is required to eliminate a species' access to food, water, and/or shelter. This is often the best alternative for the long-term solution of a problem, but also requires greater costs in the initial stages of the effort. Examples include:

- Use fencing to cover gardens and plants.
- Put fencing around specific trees to deter beavers from gnawing.
- Get rid of piles of brush, logs, junk, etc., away from your house or other buildings that would attract animals as a source of cover.
- Don't place firewood next to your house that would attract animals as a source of cover.
- Use chimney covers and soffit vents to prevent birds from nesting or bats entering a structure.
- Completely fence or wall-in areas under decks or porches to reduce a place of shelter.
- Seal entry holes that lead into the house.
- Use landscaping plants that do not attract problem animals.
- Bury fencing or other barrier to keep out burrowing animals (e.g., from undermining electrical transformers).

Table 4.41 Examples of Deterrents and Modifications to Minimize Human-Wildlife Conflicts.

Species	Physical Deterrence/Exclusion/Habitat Modification Examples
White-tailed Deer	• Mesh placed around seedlings and/or specific trees to prevent browsing damage • Fencing place around community gardens or other plants to be protected.
Beaver	• Wire mesh/fencing placed around specific trees to prevent chewing damage and/or loss of trees in park or landscape situations • Breaching dams, clearing culverts, and/or installing beaver tubes or water-control devices in areas of repeated problem beaver activity and flooding. Actual work is primarily done by DPW-Roads & Grounds.
Porcupine	• Shielding of cables and rubber hoses to prevent chewing damage to targets and vehicles. • Repellents on/around plywood structures
Woodchuck	• Subterranean shields/fencing around transformers to prevent digging and damage to the utilities
Bats	• Exclusion from LeRay Mansion and other structures • Construction of bat houses near LeRay Mansion to serve as alternate roost sites. • Utilizing appropriate construction techniques to preclude bats from being attracted to a building to begin with.
All Birds	• Reducing the diversity of habitats within the airfield perimeter; removing sources of standing water; removing dead trees and other natural perches.
Wild Turkey	• Removing forested habitat within the WSAAF perimeter and ravines outside the perimeter leading to WSAAF to reduce food and cover for turkeys in and around the airfield.
Canada Goose	• Centralize the stormwater runoff system in the Cantonment Area to reduce the number of stormwater retention ponds and available goose nesting habitat.
Ring-billed Gull	• Advocate for proper solid waste disposal, especially near WSAAF, to reduce gulls in the area.
Pigeon	• Modify coverings over access control points to remove exposed beams and rafters to prevent pigeons from nesting. • Add Nixalite to ASP bunkers to reduce the surface area where pigeons can nest. • Add alternative roosting sites at the ASP to draw pigeons away from the bunker doors where they are currently creating a nuisance/health issue.
American Crow	• Advocate for proper solid waste disposal, especially near WSAAF, to reduce crows in the area.
Common Raven	• Modify range facilities and remove exposed beams and rafters to prevent ravens from nesting.
European Starling	• Advise Mountain Community Homes to install devices on the clothes dryer vents on their residential properties to prevent starlings from nesting.
Ticks	• Creating a buffer area (i.e. mowed grassy area) between places where humans walk/recreate (e.g., trails and playgrounds) and natural habitat. • Remove or modify small mammal habitat such as rock walls or stands of invasive plant species to reduce the number of host organisms.

4.4.3.3 Lethal Management is the Last Option

If behavioral modification and/or deterrence/exclusion efforts are ineffective, then it may be necessary to live trap and relocate animals or use lethal control methods. Although lethal control is considered a last option, it is recognized that lethal control may be the only option and will be employed when necessary.

Non-lethal removal. A wildlife species (e.g., Woodchucks, Raccoons, squirrels, etc.) should only be trapped if other means are not feasible such as deterrence or exclusion (e.g. eliminating potential food/nesting sources, plugging openings into buildings, etc.). The intensity of the action is dependent on the species and situation. It can be as simple as removing a single bat on a low ceiling of an office or having to call the Paint/Sign shop to bring an extension ladder to remove a bat from the high ceiling of the swimming pool area; or putting a branch into a dumpster for a Raccoon to climb out to live trapping a dozen Woodchucks across the Cantonment Area.

If a wildlife species must be live-trapped and show no signs of ill health, they should be released within the Cantonment Area or Training Areas 3 or 4. Under no circumstances should animals be released anywhere except Fort Drum or be given to any individual unless the animal is hurt or orphaned and then it should only be given directly to a NYSDEC licensed wildlife rehabilitator.

Table 4.42 Examples of Non-lethal Techniques to Remove Problem Wildlife.

Species	Non-lethal Removal Examples
Red/Gray Fox	• Live-trap in box trap (often around Child Development Centers) and release in Training Area unless health is suspect and then euthanized.
Raccoon	• Live-trap in box trap and release in Training Area unless health is suspect and then euthanized. • For Raccoon trapped in dumpsters, place a board or branch in the dumpster so they can climb out on their own.
Striped Skunk	• Live-trap in box trap and release in Training Area unless health is suspect and then euthanized.
Woodchuck	• Live-trap in box trap and release in Training Area unless health is suspect and then euthanized.
Bats	• Removing a bat by hand from an occupied dwelling and releasing it.
Canada Goose	• Corral geese in the Cantonment Area during their flightless molting period and relocate as many geese as possible to Matoon Marsh in Training Area 17.
Snowy Owl	• USDA-APHIS-WS would be contracted to live trap and remove Snowy Owls from WSAAF in the winter months if there was a risk of bird strikes.
Snapping Turtles	• Turtles are captured by hand and removed from beaches, roads, or other areas where people are expressing concern. Turtles are released immediately next to the nearest water source.
Snakes	• Snakes are captured by hand and removed from areas where people are expressing concern if there is no other alternative for the protection of the snake.

Lethal removal of animals. Lethal removal is done in in accordance to US and New York State laws and regulations. Trapping, shooting, and hunting are all means of lethal removal. Lethal control methods and euthanasia shall be in accordance with the most current Animal Welfare guidelines (http://awic.nal.usda.gov). A wildlife species (e.g., Woodchucks, Raccoons, squirrels, etc.) should only be lethally removed if:

- Other means are not feasible such as deterrence or exclusion (e.g. eliminating potential food/nesting sources, plugging openings into buildings, etc.) or ineffectual;
- Human life, health and safety is in jeopardy (e.g., at Wheeler-Sack Army Airfield or there is a potential rabies exposure);
- The animal is obviously in ill health;
- There is no alternative for relocation either physically (no other available space (e.g., beavers) or legally (e.g., no movement of rabies vectors); or,
- Population control is a management strategy (e.g., White-tailed Deer, Canada Geese).

Acceptable means of lethal removal depend on the species and situation:

Regulated Hunting & Trapping. One of the first alternatives and potentially most cost effective means to manage conflict situations involving game and furbearer species, is to utilize NYSDEC-licensed hunters and trappers to take wildlife during the regulated seasons. See Section *4.4 Outdoor Recreation* for more information about access and promotion of hunting and trapping opportunities. However, typically this is only effective to reduce the number of surplus animals and not necessarily a means to reduce population levels to a required minimum level.

Shooting. Shooting is one of the most common means of lethal removal. Shooting is done by DPTMS Base Ops personnel at Wheeler-Sack Army Airfield for any birds that are not discouraged by any of the behavioral modification means outlined in strategy #4 above and pose an imminent threat to human health and safety. DES-Conservation Law Enforcement Officers can use lethal means to kill an animal, although this is usually done only for an injured animal. DPW Pest Control can use air rifles for pigeons. USDA-APHIS-Wildlife Services and discharge firearms of all types for wildlife conflict purposes. At this time, Natural Resources personnel are limited to using crossbows for deer, but have not been authorized to discharge a firearm during the normal course of their duties. NYSDEC could be contacted and their biologists can utilize firearms as a normal course of their duties if shooting was necessary in the case if mute swans or feral swine were encountered on Fort Drum.

Trapping. Trapping with conibear traps for beaver is the most common means of lethal control concerning trapping. Beaver trapping in conflict situations is conducted primarily by USDA-APHIS-Wildlife Services.

CO2. Some animals live-trapped in box traps or otherwise captured may be killed using a CO2 chamber. An SOP concerning the operation of the euthanasia chamber has been developed and can be found in the *Human-Wildlife Conflict Management Plan*.

Poisons for Vertebrates. The use of poisons carries potential risks to other wildlife and humans. Toxins will generally not be considered except in very specific circumstances when impact to non-target organisms and humans can be minimized. This includes

potential direct exposure to non-target animals as well as secondary exposure to animals, including humans, who may consume the flesh of poisoned animals. On Fort Drum, only the use of Avitrol for pigeon control and Giant Destroyer for Woodchuck control is allowed.

Insecticides for Invertebrates. Only pesticides registered by the USEPA and NYS may be applied and only in accordance with their label.

Table 4.43 Examples of Lethal Removal Techniques for Problem Wildlife.

Wildlife	Lethal Removal Examples
Any Mammal	• If any individual animal is acting aggressive or exhibiting odd behaviors around humans when rabies or another transmissible disease is suspected, the animal should be killed and disposed of. If the animal was in contact with a human or pet, then Vet Services and/or the Jefferson Co Health Dept. should be contacted.
White-tailed Deer	• Encourage harvest during the regulated hunting season to reduce incidence of deer-vehicle collisions; reduce impact to forests and tree regeneration and impact to landscaping; and reduce hosts of adult ticks and subsequent incidence of Lyme disease. • Killed within the WSAAF perimeter by USDA-APHIS-Wildlife Services personnel or authorized DPTMS-Base Operations personnel per WSAAF SOP. Reported to NYSDEC.
Feral Swine	• Coordinate with NYSDEC and probably contract with USDA-APHIS-Wildlife Services for trapping and shooting efforts.
Black Bear	• Encourage harvest during the regulated hunting season.
Domestic/Feral Cat	• Live-trap in box trap and held at least 3 days. Owners will be contacted if the cat has tags or microchips; lost animals can be claimed. Feral cats or unclaimed cats will be euthanized in a CO2 chamber.
Domestic/Feral Dog	• Typically captured with a noose pole by DES or PW-Pest Control and held by Veterinary Services for at least 3 days. Dogs could be killed on the spot by DES if a threat to human health/safety.
Beaver	• Encourage harvest during the regulated trapping season. • USDA-APHIS-Wildlife Services personnel will trap beavers outside the regulated trapping season or in areas that are inaccessible to recreational trappers. This is primarily a complaint-driven program. • CSX Railroad employs a trapper for nuisance problems along the CSX railroad tracks that run through Fort Drum.
All Birds	• Any bird (or other species) considered a threat to human life/health/safety at WSAAF, may be lethally removed after other non-lethal methods have first been attempted or there are no other options.
Mute Swan	• Fort Drum has a zero tolerance policy for Mute Swans anywhere on the installation and will eradicate any should they appear.
Pigeons	• Pigeons could be lethally removed from the ASP with the use of an air rifle on a regular basis. • Pigeons can be legally poisoned in NYS using Avitrol
Ticks	• Apply an acaricide (permethrin or fipronil) to kill ticks. The only pesticide currently registered for use by USEPA and NYS is Select TCS Tick Control Systems (active ingredient is fipronil).

4.4.3.4 An Integrated Approach is usually the Best Option

In some cases, a number of methods must be employed to minimize a conflict with a certain species and/or in a specific area. Integrated Pest Management is (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques. IPM is recognized as an important option in both the DoD Instruction 4150.07 (29 May 2008) and Army Regulation 200-1 (28 Aug 2007).

Table 4.44 Examples of Integrated Techniques to Minimize Human-Wildlife Conflicts.

Wildlife/Area	Integrated Examples
Wildlife at Wheeler-Sack Army Airfield	• **Education = Change in Human Behavior:** use of bird warning system to alert pilots of potential danger from bird strikes • **Behavioral Modification**: Crackershells, propane cannons, distress calls, approaching with a vehicle and other hazing techniques at WSAAF by DPTMS-Base Operations personnel per WSAAF SOP. • **Physical Deterrence/Exclusion/Habitat Modification**: Reducing the amount of woody vegetation for food and cover within the airfield perimeter; removing sources of standing water; removing dead trees and other natural perches. • **Lethal Removal:** Any bird (or other species) considered a threat to human life/health/safety at WSAAF, may be lethally removed after other non-lethal methods have first been attempted.
Ticks in Cantonment Area	• **Education = Change in Human Behavior:** Signage on trails, playgrounds, and other areas in the Cantonment Area alerting users to presence of ticks and precautions to take; *Tick-borne Disease* pocket cards (Army Publication GTA-08-05-056) • **Physical Deterrence/Exclusion/Habitat Modification**: Creating a buffer area (i.e. mowed grassy area) between places where humans walk/recreate (e.g., trails and playgrounds) and natural habitat. • **Physical Deterrence/Exclusion/Habitat Modification**: Creating Remove or modify small mammal habitat such as rock walls or stands of invasive plant species to reduce the number of host organisms. • **Biological Modification**: Inoculate small mammals to Lyme disease through broadcast application of vaccine-laced bait. • **Biological Modification**: Apply acaricide to small mammals and/or white-tailed deer through the use of bait stations. • **Biological Modification**: Encourage harvest of white-tailed deer during the regulated hunting season to reduce host of adult ticks and subsequent incidence of Lyme disease. • **Biological Modification**: Promote (or at least not discourage) predators of small mammals and deer. • **Lethal Removal of Ticks**: Apply an acaricide (permethrin or fipronil) to the landscape to kill ticks. The only one currently registered for use by USEPA and NYS is Select TCS Tick Control Systems (active ingredient is fipronil).

4.4.3.5 Management Options Not Considered

Sterilization. At this time, sterilization has not been shown to be an effective means of managing wildlife populations such as those found on Fort Drum.

Trapping/Shooting by Volunteers. At this time, a volunteer trapping or shooting program outside of the regular trapping/hunting seasons is not being considered. A volunteer program for beaver trapping was once utilized since the 1990s, but it was discontinued after the 2017-2018 season.

Electrically Operated Devices. Per DoDI 4150.7 (29 May 2008) Enclosure 4.10.1, electromagnetic exclusion or control devices, ultrasonic repellent or control devices, and outdoor devices for electrocuting flying insects are not approved for use on DoD installations.

Paints and Coatings Containing Pesticides and Other Biocides. Per DoDI 4150.7 (29 May 2008) Enclosure 4.10.2, paints containing insecticides are not approved for use on DoD property. This guidance applies to interior and exterior pesticide-containing paints intended for application to structural surfaces, such as walls, ceilings, and siding.

Preventive or Scheduled Pesticide Treatments. Per DoDI 4150.7 (29 May 2008) Enclosure 4.10.3, regularly scheduled, periodic pesticide applications are not approved for DoD property except in situations where the IPM plan clearly documents that no other technology or approach is available to protect personnel or property of high value.

4.4.4 Human-Wildlife Conflict Management Strategies

The strategies in this section are focal species and/or focal areas where Natural Resources staff work to minimize human-wildlife conflicts on Fort Drum through active management. This does not include species that are managed only through education or infrequently. For more information on the conflicts and wildlife species listed in *Section 4.4.4*, see the *Fort Drum Human-Wildlife Conflict Management Plan*.

4.4.4.1 Birds & Mammals at Wheeler-Sack Army Airfield

Because of the potential for a catastrophic event and the loss of life and/or property damage related to wildlife-aircraft collision, wildlife conflicts are taken very seriously at all airports and airfields including Wheeler-Sack Army Airfield.

The two documents that are most relevant to wildlife conflicts at WSAAF are the Wheeler-Sack Wildlife Hazard Management Plan (WHMP; Fort Drum 2019) which is written by the DPTMS Aviation Division and part of the airfield safety and accident prevention program; and the Wildlife Hazard Assessment for Wheeler-Sack Army Airfield, Fort Drum, NY (Fort Drum 2023c) written and updated annually by the DPW-Natural Resources Branch. The WSAAF WHMP (Fort Drum 2019): (1) designates responsibilities to Airfield Safety Committee (AFSC) members and supporting units; (2) develops procedures for identifying, reporting, and disseminating information about hazardous wildlife activity including altering or discontinuing flying operation if required; (3) develops active/passive techniques to disperse wildlife from the airfield and decrease airfield attractiveness to wildlife including land management to alter environmental conditions and/or reducing attractants in and around the airfield; and (4) designates responsibilities and procedures to initiate or terminate Bird/Wildlife Watch Conditions (BWC). The purpose of the Wildlife Hazard Assessment (Fort Drum 2023c) is to highlight potential wildlife hazards and offer solutions to minimize the potential of a wildlife-aircraft collision. A synopsis of both documents are in Section *3.1 Wheeler-Sack Army Airfield* in

the Human-Wildlife Conflict Management Plan; see Sections *2.1.3 Life/Health/Safety-Aircraft Collisions* and *2.2.2 Property Damage-Aircraft* for more information about wildlife-aircraft conflicts.

With an integrated approach necessary for effective airfield management, communication is critical. To assist with communication, there are two standing committees.

The Airfield Safety Committee (AFSC) meets quarterly and is chaired by the Airfield Manager. The AFSC is designed to promote mishap prevention and operational standardization through discussion and resolution of issues pertinent to the Fort Drum aviation community.

The Wildlife Hazard Management Working group meets at least once a year between in late April-early May to discuss anticipated budget and operational requirements for WHM operations including, but not limited to vegetation removal, area maintenance, mowing plans, ravine management, etc.

Table 4.45. Recorded wildlife strikes, remains of wildlife found at WSAAF with no reported strike, and the number of birds and mammals depredated (i.e., lethally removed) in 2001-2023 ([c] = includes one coyote strike; [b] = includes one beaver live trapped and released; [p] = includes one porcupine live trapped and released).

Year	Aircraft – Wildlife Strikes	# Wildlife Involved in Strikes	Animal Remains Found (No Reported Strike)	Birds Depredated	Mammals Depredated
2001	1	1	9	0	0
2002	5	6	4	39	0
2003	2	4	3	0	0
2004	8	9	2	0	0
2005	3[c]	4	1	1	0
2006	4	7	8	54	0
2007	1	1	0	19	1
2008	4	13	0	61	1
2009	2	2	0	57	6
2010	1	9	4	21	2
2011	2	2	2	18	4
2012	1	1	1	52	1
2013	0	0	0	13	1
2014	2	2	1	27	3
2015	3	4	1	6	3
2016	1	1	0	0	0
2017	1	1	1	0	19
2018	1	1	1	0	15
2019	3	3	2[b]	0	44
2020	0	0	2	7	30
2021	1	1	9[p]	2	3
2022	**0**	**0**	2	2	3
2023	**1**	**1**	**3**	**5**	**28**
TOTAL	**47**	**73**	**56**	**384**	**164**
AVG/year	**2.0**	**3.2**	**2.4**	**16.7**	**7.1**

Both DPTMS and DPW personnel have responsibilities for day-to-day activities that affect wildlife hazard situations at WSAAF.

WSAAF Base Operations personnel that are part of the Wildlife Detection and Dispersal Team (WDDT) conduct daily surveillance for wildlife and active wildlife management on WSAAF. The WDDT are a roving airport patrol that disperses wildlife when potentially hazardous situations arise by using non-lethal and lethal control techniques in accordance with the WSAAF WHMP (Fort Drum 2019) and federal and state depredation permits.

DPW-Operations and Maintenance Division personnel are responsible for correcting and maintaining physical conditions that increase BASH potential (e.g., mowing grass, maintaining the perimeter fence).

DPW-Natural Resources Branch: (1) acquires all necessary state and federal permits for harassment/depredation of nuisance wildlife; (2) identifies the remains of all dead wildlife and ensures proper disposal of remains pursuant to permits; and (3) functions in an advisory capacity on wildlife biology and behavior, habitat requirements or modifications, or management schemes to make informed decisions and minimize aircraft-wildlife strikes.

DPW-Natural Resources also contracts with USDA-APHIS-Wildlife Services for various wildlife conflict situations which includes targeted responses at WSAAF such as shooting White-tailed Deer and trapping Woodchucks.

Table 4.46 Primary wildlife species depredated on WSAAF, involved in air strikes, and/or found dead at WSAAF from 2001-2023. (* Depredated geese only includes those taken by Base Ops personnel and does not include any geese taken by Natural Resources personnel in the Cantonment Area; animals found dead are assumed to have been impacted by an aircraft—it may have been a strike that the pilot didn't realize or an animal may have been killed by the physical force of the aircraft passing by—they are not counted as a strike, but they are indicative of wildlife in the airfield environment.

Species	Section in Human-Wildlife Conflict Mgmt Plan	# Depredated	# Strikes	# Total Birds in Strikes	# Found on Tarmac	Total # Animals in WSAAF Incidents
Ring-billed Gull	4.2.4	270	4	5	16	291
American Crow	4.2.10	75	0	0	2	77
White-tailed Deer	4.1.1	67	0	0	0	67
Woodchuck	4.1.16	48	0	0	0	48
Horned Lark	4.2.12	0	15	21	4	25
Snow Bunting	4.2.15	0	2	17	2	19
Canada Goose	4.2.2	12*	1	3	0	15
American Kestrel	4.2.8	0	6	6	6	12
Coyote	4.1.9	17	1	1	1	19
Wild Turkey	4.2.1	10	0	0	0	10

All wildlife species that have been involved with aircraft strikes, depredated on WSAAF, or found dead at WSAAF have been recorded since 2001 (Table 4.45). Despite the proximity of undeveloped areas surrounding WSAAF as well as the inherent habitat within the airfield perimeter, Fort Drum generally does not experience a high number of wildlife-aircraft strikes relative to other airfields in the US. Ring-billed Gulls and American Crows make up 75% of all bird-related incidents at WSAAF.

The goal at any airfield is to have no wildlife-aircraft strikes. Although it is impossible to guarantee there will never be a wildlife-aircraft strike, there are several actions that can be taken to minimize the possibility of a strike.

Education/Human Behavior

- The Bird/Wildlife Watch Warning System is one of the most critical wildlife hazard management procedures as it is an immediate exchange of information between ground agencies and aircrews concerning the existence and location of wildlife that pose a hazard to flight safety.
- The Airfield Safety Manager creates a wildlife hazard bulletin board (electronically and/or in WSAAF Base Operations flight planning room) and develops an airfield wildlife activity map tailored to local wildlife hazards.
- Vigilance of solid waste facilities—ensuring the proper disposal of waste and maintenance of dumpsters--in the vicinity of WSAAF is probably one of the easiest issues to overlook, but critical to discourage the presence of Ring-billed Gulls and American Crows—the top two species depredated at WSAAF (Table 4.46). Dumpsters behind AAFES/Burger King and the Dining Facility (DFAC) are all approximately within a mile from the center point of WSAAF runways. (The dumpster at the Central Vehicle Washrack nearest WSAAF was removed.)
- Maintaining discipline around the gates to ensure they are open only for vehicles/personnel to pass and then closed immediately to reduce the chances of wildlife (e.g., deer) from easily entering is critical.

Behavioral/Biological Modification of the Animal

- The Wildlife Detection and Dispersal Team (WDDT) primarily consists of Base Operations personnel who actively patrol WSAAF and uses various management techniques to disperse wildlife (e.g., horn/siren on a vehicle; bioacoustic distress calls; pyrotechnics).
- A remote-controlled and solar-powered ScareWars System of propane cannons and distress calls was installed on WSAAF in 2021.

Physical Deterrence/Exclusion

- The airfield perimeter fence should be inspected weekly, and damaged and/or vulnerable areas are repaired.
- Ensure gates close tightly together or against the adjacent fence to so there are not gaps to allow wildlife to enter.
- If deer are considered more than a minimal threat, a secondary perimeter fence could be constructed between the tarmac and the existing perimeter fence especially in one or more of the four ravine areas to provide a second barrier to prevent deer from inadvertently running across the runway.

Habitat Modification

- Grass adjacent to developed areas (e.g., runways, taxiways and ramps) will be mowed regularly to maintain a regulated uniform grass height 6-12 inches. No other grass management is required since the “native” grass on WSAAF is a unique, native short bunch grass community that occurs in the sandy soils in the immediate area and does not grow excessively long or lush.
- Outside developed areas (primarily along the west and north ends of WSAAF), the goal is to remove all woody vegetation and eventually maintain the entire

area as native grassland—this precludes having a diverse habitat which promotes diverse wildlife. Grassland habitat also makes land management and wildlife management activities easier. Most forested areas have been removed inside the WSAAF perimeter and only shrubs exist in the four ravine areas. The primary forested stand remaining within the WSAAF perimeter is around the 174th Attack Wing's forward operating location compound. Although these trees have not historically been a problem, they provide diversity to the airfield and ample perching sites for raptors and corvids (crows and ravens) that are typically large-bodied birds to be avoided in an airfield environment. Woody vegetation will continue to be cut and mowed into the future.

- There are four ravines on the western side of WSAAF. These four ravines represent the greatest management challenge due to their steep slopes, difficulty to access with machinery, and presence of water precluding certain herbicide treatments. From an airfield management perspective, the ravines are unmowable and make maintenance less efficient; they impede perimeter patrols; they make a breach in the perimeter fence more likely to be undetected exactly at a point wildlife are most likely to enter; and at least one has become an erosion problem. From a biological perspective, the ravines represent another diverse habitat area within the WSAAF perimeter; the heavy vegetation provides a refuge and heavy cover for deer and turkey to hide and likewise make it difficult to be seen for control purposes; and the ravines provide a natural travel corridor. Ravine management will continue to be explored in the future.
- Practically all forested areas outside the WSAAF perimeter between the fenceline and adjacent roads have now been removed. Any existing woody vegetation will be removed and maintained into the future.

<u>Non-Lethal Removal</u>

- Typically if a wildlife species is encountered in the WSAAF perimeter and it does not disperse after the methods deployed *Behavioral Modification of the Animal*, then the animal will most likely be lethally removed. One exception to this policy is Snowy Owls which occur only during the winter and at certain times. Snowy Owls have not been involved with any incidents at WSAAF to date. If Snowy Owls pose a risk, USDA-APHIS-Wildlife Services will live-trap the owls and release them elsewhere after coordinating with NYSDEC.

<u>Lethal Removal</u>

- Lethal control should be the last option, but when human, health, and safety is at stake, Fort Drum personnel are authorized to lethally remove any wildlife species of concern whether it is specifically permitted or not. Occasional depredation also reinforces non-lethal methods—shooting one or two birds from a flock followed by a volley of pyrotechnics is generally a very effective strategy for future deterrence. Base Operations personnel as part of the Wildlife Detection and Dispersal Team (WDDT) are primarily responsible for the lethal removal of birds; USDA-APHIS-Wildlife Services contracted through DPW-Natural Resources Branch is primarily responsible for the lethal removal of mammals. DPW-Natural Resources Branch is responsible for all USFWS and NYSDEC permits and reporting requirements to conduct lethal removal.

4.4.4.2 White-tailed Deer in Cantonment Area

White-tailed deer are a highly visible and valued big game species that are arguably the most managed species on Fort Drum, primarily in the Cantonment Area. As a large-bodied herbivore, deer have the potential to create many conflicts both directly and indirectly in a number of situations including vehicle collisions; damage to landscape plantings; inhibiting forest regeneration which also impacts protected bats; and as an important host in the life cycle of the black-legged tick which can transmit Lyme disease and other diseases to humans and pets. See the Human-Wildlife Conflict Management Plan for more information on all of these impacts: *2.1.2.2 Life/Health/Safety - Lyme Disease & Other Tick-borne Diseases*; *Section 2.1.3 Life/Health/Safety - Vehicle Collisions; Section 2.2.1 Property Damage – Vehicles; Section 2.2.4 Grounds & Landscaping*; and *Section 2.3.1 Ecological Damage – Forest Resources.*

Deer have always been in the Cantonment Area ever since the perimeter fence was constructed in 1988. Starting in 2005, Fort Drum began its third major expansion with the transformation of the US Army, the Residential Communities Initiative (RCI) privatizing Army housing, and the eventual expenditure of more than $2 billion worth of construction projects. During this construction period, a sizable amount of deer habitat was removed. Also at this time (2006-2008), the federally-endangered Indiana bat was found on Fort Drum and over 2,000 ac of undeveloped land in the Cantonment Area was designated a Bat Conservation Area including forested areas for bat roosting habitat.

Although more deer were being concentrated into smaller areas, there was an apparent lag time as deer densities and populations increased before discernible browselines, lack of forest regeneration, or other signs of deer overpopulation began to become more apparent ca. 2011. Browselines on landscaped vegetation and in some forested areas, as well as a lack of variation in forest structure with dominant overstory trees but little understory regeneration became readily apparent in many areas of the Cantonment Area. In a balanced natural ecosystem there should be a progression of tree sizes/ages--seedlings, sapling/pole sizes, sawtimber—but the lack of young trees is most likely due to continuous overbrowsing of vegetation by deer and has long-term consequences if allowed to continue. This is a concern not only from an ecological standpoint, but also becomes a long-term regulatory issue as we continue to manage the Bat Conservation Area for not only the endangered Indiana Bat, but also the endangered Northern Long-eared Bat and other at-risk bat species.

At the same time, deer-vehicle collisions also started to increase. Directorate of Emergency Services provides annual statistics regarding reported deer-vehicle collisions in the Cantonment Area (Table 4.47). During the 9-year period (2009-2017) when deer numbers were known to be increasing, there was an average of 30.2 reported deer-vehicle collisions/year. (The actual number of deer killed by vehicles is assumed to be greater and these are only collisions reported to DES.)

Approximately the same time (2010-2012), Black-legged Ticks and Lyme disease became prevalent on Fort Drum, specifically in the Cantonment Area. Black-legged ticks and Lyme disease was common in the counties around NYC, Long Island, and Connecticut in the 1970s and virtually non-existent in the North Country. However, Black-legged Ticks and associated tick-borne diseases steadily became more common in the 2000s—one of the primary causes for the presence of ticks is thought to be the expanding deer population.

Table 4.47 Reported deer-vehicle accidents in the Cantonment Area from 1995 - 2020. The years 1996-2008 represent the pre-construction period; 2009-2017 represent post-construction and more noticeable increase in the deer population; 2018-2023 represent the period of intensive deer management.

YEAR	REPORTED COLLISIONS		YEAR	REPORTED COLLISIONS		YEAR	REPORTED COLLISIONS
1996	32		2009	35		2018	15
1997	24		2010	30		2019	19
1998	15		2011	22		2020	8
1999	28		2012	33		2021	2
2000	27		2013	31		2022	1
2001	24		2014	40		2023	0
2002	14		2015	32			
2003	15		2016	24			
2004	24		2017	25			
2005	18						
2006	23						
2007	14						
2008	13						
AVG	20.8		AVG	30.2		AVG	7.5

White-tailed Deer in the Cantonment Area have become one of the most studied species on Fort Drum with a long-term study conducted by Cornell University from 2015-2021 assessing survivorship and mortality, movements and home ranges, and population estimates. The Cornell study was begun in 2015 in order to start answering the deer overpopulation question which had become observable. Deer population estimates across the Cantonment Area averaged approximately 40 deer/mi^2, but the population was not uniform and in some areas the population was 120 deer/mi^2. Population modeling showed that the deer population would continue to increase.

The overall management goal in the Cantonment Area is to intensively harvest deer annually to minimize potential conflicts including deer-vehicle accidents, minimize deer browsing on landscape vegetation, allow forest regeneration, and reduce the incidence of Lyme disease. According to other research, deer densities need to be less than 20 deer/mi^2 to see less impact to forest regeneration and closer to 10-15 deer/mi^2 for both woody and non-woody plant species (Augustine and Frelich 1998; Horsley et al. 2003; Sage et al. 2003; Russell et al. 2017); and 7-13 deer/mi^2 to see a reduction in ticks (Telford 2017).

Until 2018, the deer population was managed only through recreational hunting (Table 4.48). Hunting is restricted to DoD identification card holders and historically was only archery hunters when it began in 1993; crossbows were allowed to be used regularly beginning in 2014; and shotguns have been allowed in specific areas since 2019. The hunting season is the entire 10-week period from 27 September until mid-December; but only approximately one-third of the Cantonment Area is available for hunting and not all areas are open daily. Fort Drum has received Deer Management Assistance Program (DMAP) permits which are additional antlerless tags for hunters in the Cantonment Area since 1999 to encourage more deer to be harvested. Beginning in 2018, enough DMAP permits were obtained from NYSDEC to issue a DMAP to every hunter for the entire hunting season.

The number of deer taken by hunters follows the trend in the increase in deer in the Cantonment Area. The most deer taken while hunting was 87 in 2018 when the most liberal regulations were put in place which wasn't much different than 84 in 2013 or 79 in both 2014 and 2017. Despite the increase in DMAPs, the most DMAP tags ever filled was 38 (in 2017). Hunting alone is not going to manage the increasing population.

Table 4.48 Harvested deer in the Cantonment Area from 1995 - 2017.

YEAR	DEER HARVEST		YEAR	DEER HARVEST
1996	16		2009	52
1997	13		2010	56
1998	13		2011	35
1999	39		2012	74
2000	41		2013	84
2001	33		2014	79
2002	28		2015	57
2003	40		2016	75
2004	62		2017	79
2005	53		See Table 4.49 for 2018 and beyond	
2006	42			
2007	62			
2008	70			
AVG	39.4		AVG	65.7

The overall goal is to keep the Cantonment Area deer population below a threshold of 110 deer. This number is based on a density of approximately 20 deer/mi^2 in the 2050 ac (3.2 mi^2) portion of the Bat Conservation Area inside the Cantonment Area where the goal is reforestation (64 deer) and a density of approximately 10 deer/mi^2 in the 2934 ac (4.6 mi^2) portion of undeveloped area inside the Cantonment Area outside the Bat Conservation Area where the goal is to reduce the incidence of ticks and Lyme disease (46 deer). The threshold of 110 deer equates to approximately 8.5 deer/mi^2 across the entire 8,255 ac Cantonment Area. Excluding buildings, roads, parking lots, and fenced-in compounds (3,271 ac; areas where deer would never live), the deer density at the threshold limit is closer to 14.0 deer/mi^2. A deer density any greater will not achieve any goals to human safety, property damage, and ecological function of the Cantonment Area; and these are approximations, and the desired threshold may be lower as research and monitoring continues.

Starting in 2018, USDA-APHIS-Wildlife Services was contracted to begin deer culling operations in the Cantonment Area. During three nights in September 2018, 87 deer were harvested opportunistically in the Cantonment Area by a shooting team in a vehicle; 166 deer were killed during six nights in February – April 2019. During nine nights in January – March 2020, culling started by shooting from a vehicle opportunistically but later included shooting from a blind over baited sites, and 95 deer were taken. In January – April 2021, there was a combination of culling from a vehicle and shooting from blinds over baited sites with no restrictions on the deer harvested and 187 were killed. Natural Resources Branch staff were also allowed to use crossbows starting in 2021. Starting in 2023, the deer population was in a "maintenance mode" where the harvest goal was approximately 45 deer/year to keep up with the natural reproductive effort and maintain the 110 deer threshold. A combination of methods have

been used to cull deer including shooting from blinds and clover traps. Combined with deer harvested during the hunting season, 871 deer have been removed from the Cantonment Area since September 2018 (Table 4.49).

Table 4.49 Overall deer population control efforts (culling and hunting) since September 2018.

	# Days or Nights	# Deer Harvested
Culling Season 2018 (Sep)	3	87
Hunting Season 2018 (Sep – Dec)	74	87
Culling Season 2019 (Feb – Apr)	6	166
Hunting Season 2019 (Sep – Dec)	80	42
Culling Season 2020 (Jan – Mar)	9	95
Hunting Season 2020 (Sep – Dec)	78	25
Culling Season 2021 (Jan – Apr)	-	187
Hunting Season 2021 (Sep – Dec)	77	16
Culling Season 2022 (Jan-Mar)	52	74
Hunting Season 2022 (Sep-Dec)	76	8
Culling Season 2023 (Jan-Mar)	-	38
Hunting Season 2023 (Sep – Dec)	75	5
Culling Season 2024 (Jan-Mar)	-	44
TOTAL		874

Once the Cantonment Area deer population is below the threshold, the population will continue to be maintained through hunting and culling. Each adult female deer normally has two fawns each year, and female deer can begin reproducing when they are only one year old. Thus, the population will always be increasing and a minimum of 40 deer will have to be harvested every year (including males and females). DMAPs will continue to be acquired from NYSDEC to encourage the harvest of antlerless deer during the hunting season.

There are various means to determine whether deer management goals are being achieved:

- To quantify whether management goals have been met, four deer exclosures and deer browse regeneration plots were established in the Cantonment Area in 2015. Each exclosure is approximately 1089 sq ft area and surrounded by an 8 ft high fence. The intent is to eliminate the effects of deer browse inside the fenced area and compare the seedling response with a nearby area that is left in its natural state (no barrier restrictions). Everything that was done inside the exclosure (some tree cutting & leaf litter removal) was repeated in the natural state (identified as “Control”) to avoid subjective differences between the two sites. Also, the exclosure and Control are located very close to each other to eliminate any environmental differences in soil types, overstory tree composition, habitat characteristics, and deer population densities. Photos of exclosure and control plots are taken every 2 years, usually in July or early August, to visually document vegetative changes, if any, that have occurred.
- A deer browse survey protocol was developed and 262 regeneration plots were established in 2015-2016. At each of these plots, seedling species and numbers occurring was recorded as well as whether any deer evidence (browse, buck rubs, scats) was found at that location. These plots will be reassessed ca. 2025-2026.

- Deer-vehicle collisions will continue to be assessed annually.
- The deer population will be reassessed in the future ca. 2027.

For more information about deer management in the Cantonment Area, see Section *4.1.1 White-tailed Deer* in the *Human-Wildlife Conflict Management Plan*.

4.4.4.3 Black Bear

The Black Bear is also an important large game animal in NYS and frequently encountered on Fort Drum—primarily in the Training Area, but occasionally in the Cantonment Area.

Conflicts with Black Bears are generally dependent on the abundance of natural foods—adequate amounts of natural foods on the landscape during a good growing season will result in practically no complaints or conflicts during the year as well as few bears seen roaming around; a poor growing season and few natural foods will result in an increased number of sightings of bears as they pursue food as well as an increase in complaints and conflicts as bears enter kitchen areas, tents, vehicles, etc. Historically this has only been an issue in the Training Area and not the Cantonment Area.

The most effective means of preventing bear conflicts is through education and modifying human behavior to not feed bears or other wildlife; maintaining a clean bivouac area; not storing food or garbage where it is easy for bears to obtain; etc.

If there are nuisance bears at a bivouac area that were becoming habituated to humans and taking food, DES- Conservation Law Enforcement Officers would respond and shoot the bear with rubberized buckshot or other pyrotechnics as a non-lethal measure; this is augmented by responses from NYSDEC Environmental Conservation Officers and/or USDA-APHIS-Wildlife Services personnel contracted through the Natural Resources Branch. Occasionally a culvert trap is deployed to live capture the bear and then it is hazed and released on Fort Drum property in an attempt to negatively reinforce the behavior of the bear.

Attempts to develop a protocol to share information about reports of “problem” bears has not been successful to date. A bear outreach campaign has been developed to create a dedicated “hotline” (Fort Drum Bear Hotline: 315-405-3189 (text or call)) to report all bear sightings no matter the activity of the bear. Information from this citizen science-like project will be used to determine where bears are most active and then focus efforts on those areas regarding units training, food and waste management, etc. To publicize the “hotline,” Range Control has put the bear hotline info into their weekly brief to incoming units and in the binders at each range head for the NCOIC to reference. The hotline number has also been included in the flyers for recreationists starting in August 2020. Physical signs will be deployed in the Training Area focused on ranges and highly used bivouac sites.

In response to a number of nuisance bear complaints in 2002 and 2003 at range facilities and bivouac sites, a Black Bear research project was developed by Fort Drum in cooperation with Cornell University and NYSDEC. The project occurred from October 2004 – April 2007 and had three main components: (1) determine bear home range size, movements, and den site use; (2) estimating population using DNA from hair samples; and (3) field test taste aversion techniques for non-lethal management of nuisance Black

Bears. Due to an abundance of natural foods on Fort Drum in 2005 and 2006, the taste aversive techniques were inconclusive. See the *Fort Drum Mammal Management Plan* (in progress), Fort Drum Bear Report (Rainbolt et al. 2010), and M.S. Thesis (Wegan 2008) for more information about the project.

For more information about bear management, see Section *4.1.3 Black Bear* in the *Human-Wildlife Conflict Management Plan*.

4.4.4.4 Raccoon/Skunk & Rabies

Raccoons and Striped Skunks are both common throughout Fort Drum including the Cantonment Area. In general, Raccoons and Striped Skunks often create simply a nuisance situation. Raccoons can get into garbage left out overnight or into dumpsters; raccoons can also be a nuisance raiding rucksacks in the Training Area if they become accustomed to food and/or feeding. Skunks simply create an undesirable situation due to their scent; however, their digging can cause problems with landscaped yards. However, most importantly from a conflict perspective, both animals have the highest incidence of rabies in Jefferson County, NY.

Rabies is a viral infection and one of the most common wildlife diseases known to occur in the Fort Drum area. The rabies virus is transmitted through saliva or brain/nervous system tissue—rabies can only be contracted by coming into contact with these specific bodily excretions and tissues. Rabies is a fatal disease. Rabies can be found in any mammal, but is most common in raccoons, skunks, and some bats. From 2001 to 2019 in Jefferson Co., there has been an average of 11.2 confirmed cases of rabies in animals per year ranging between 3 to 26 cases—raccoons and skunks account for 72.8% of those cases (http://www.wadsworth.org/rabies/index.htm).

Currently, as a part of the National Rabies Management Program (http://www.aphis.usda.gov/wildlife_damage/oral_rabies/index.shtml), USDA-APHIS-Wildlife Services conduct oral rabies vaccination bait drops throughout northern New York including Fort Drum. The goal of the program is to prevent the further spread and eventual elimination of wildlife rabies in the US. The bait drop usually occurs in the late summer or early fall. On Fort Drum, MEDCOM-Preventive Medicine assists the effort by hand-placing baits in the Cantonment Area. Natural Resources Branch personnel do not participate directly, but it is not uncommon to be contacted about it.

See the *Human-Wildlife Conflict Management Plan* for more information: Section *2.1.2.1 Rabies*; Section *4.1.12 Raccoon*; and Section *4.1.13 Striped Skunk.*

4.4.4.5 Beaver

The abundance of wetlands and extensive food sources provide habitat for Beaver throughout Fort Drum. Beavers do not typically create wetlands per se, but enhance or modify existing wetland areas and can increase the amount of wetland acreage in an area. The flooding activities that occur due to their dam-building abilities creates conflict as roads, ranges, and other infrastructure become submerged and unusable. Most of the conflict situations occur in the Training Area, but occasionally there are issues in the Cantonment Area and WSAAF.

The Beaver is the most popular fur-bearing animal trapped on Fort Drum by recreational trappers and trapping is encouraged during the trapping season. For conflict situations, management is generally complaint-driven and involves removal of dams and/or physical modification (e.g., installation of "beaver tubes" or other water control devices) and/or lethal removal of the beaver through trapping. Historically, this work has been done via a variety of different means. Now it is handled almost exclusively with USDA-APHIS-Wildlife Services personnel contracted by the Natural Resources Branch. In 2019, there were 26 conflict sites and 123 beavers were trapped; in 2020, there were 43 conflict sites and 94 Beavers were trapped.

Overtrapping Beaver has never been a concern. Potential habitat is across the installation; the 20,000 ac Main Impact Area remains off-limits to all trapping, except very limited cases to remove specific problem Beavers causing road or target flooding; and the Indian River and Black Creek systems traverse the width of Fort Drum providing a movement and dispersal corridor for Beaver throughout the region. The most Beaver ever taken in a single season by recreational trappers was 714 in 1999-2000 (when beaver pelts still had to be sealed; the next highest season was 510 in 2000-2001).

For more information about Beaver management, see Section *4.1.14 Beaver* in the *Human-Wildlife Conflict Management Plan*.

4.4.4.6 Bats

Two bats species on Fort Drum—the Indiana Bat (*Myotis sodalis*) and the Northern Long-eared Bat (*Myotis septentrionalis*)—are federally-protected under the Endangered Species Act. Although neither species has been found in human dwellings on Fort Drum, both bats are known to use human-made structures and occur in the Cantonment Area. They could be confused for other bat species like little brown or big brown bat, and therefore it must always be considered a possibility that any bat encountered is a protected species. Subsequently, all bats are treated the same in conflict situations.

Because of their protected status, there are guidelines concerning vertebrate pest control and pesticide use in *Appendix 6.4.1 Endangered Species Management Guidelines – Vertebrate Pest Control* and *Appendix 6.4.2 Endangered Species Management Guidelines – Pesticide Use*.

Typically, Fort Drum biologists are contacted to respond to conflict situations involving bats. If in a building with no reported contact with humans or pets, bats are usually captured by hand and released. Because of the potential for rabies, bats that have come into contact with humans or pets, will be retained and the County Health Department and/or MEDCOM Preventive Medicine will be contacted.

One of the largest colonies of Little Brown Bats on Fort Drum occurred in the historic LeRay Mansion. As repairs were made to the Mansion, a bat house was installed in May 2004 in order to draw bats away from the mansion and provide an alternative roost site. The bat house was capable of housing approximately 1000 bats. A small number of bats were using the bat house in July 2004 and approximately 200 bats were utilizing the structure in the summer of 2005. In 2008, approximately 800 Little Brown Bats were using the bat house and 300 were using LeRay Mansion. LeRay Mansion underwent more intensive remodeling efforts beginning in 2009, so a second bat house was constructed near the first bat house. Together, both houses are capable of housing

approximately 3000 bats. Unfortunately, due to white-nose syndrome the population of this maternity colony of Little Brown Bats has declined dramatically. This is also sadly the case for many bat populations in multiple areas of the United States. However, there is some indication that declines with certain bat species (including the Little Brown Bat) may have stabilized. In fact, evidence shows that the Fort Drum Little Brown Bat colony is actually rebounding, and the numbers of bats using the house has increased over the years since the initial decline from the disease (see *Section 4.3.2.1.1 Bats* for more information).

For more information about bat management in conflict situations, see Section *4.1.18 Bats* in the *Human-Wildlife Conflict Management Plan*.

4.4.4.7 Canada Geese in Cantonment Area

Canada Geese have always been present around Remington Pond and their droppings have created a nuisance around the beach, picnic, and playground areas of Remington Park. However, due to the extensive construction that occurred in the 2000s with required stormwater retention ponds, Canada Geese took advantage of the additional nesting habitat made available.

Geese have been involved in some of the worst airstrike incidents including one at Fort Drum in 2008 when a UH-60 helicopter was struck during a night training flight by three migrating Canada geese. The greatest loss of life from a military aircraft-wildlife strike occurred on 22 September 1995 when a US Air Force Boeing E-3B Sentry AWACS (a Boeing 707 derivative) at Elmendorf Air Force Base, Alaska crashed after the no. 1 and 2 engines ingested Canada geese on take-off killing all 24 crew members on-board.

Table 4.50 Number of geese removed and eggs oiled in Cantonment Area from 2010-2021.

YEAR	NESTS FOUND	EGGS OILED	GEESE CAPTURED & RELOCATED			GEESE EUTHANIZED
			ADULT	GOSLINGS	TOTAL	
2010	0	0	16	39	55	0
2011	5	25	14	27	41	0
2012	8	42	5	12	17	0
2013	6	39	12	22	34	0
2014	17	96	12	11	23	0
2015	10	54	4	15	19	0
2016	6	32	8	17	25	0
2017	9	44	4	3	7	3
2018	7	37	0	0	0	3
2019	7	39	0	0	0	0
2020	8	40	0	0	0	17
2021	10	60	8	16	24	0
2022	11	67	0	0	0	3
2023	9	54	0	0	0	6
TOTAL	113	**629**			**245**	**32**

Because the Cantonment Area is adjacent to WSAAF, active goose management (i.e., egg oiling, capture and relocation, and euthanasia) occurs on an annual basis to maintain a low population both to reduce potential aircraft strikes, but also to minimize nuisance situations with goose droppings on beaches, playgrounds, ballfields, etc.

(Table 4.50). In 2010, Fort Drum registered with the USFWS to conduct egg oiling (APHIS 2011) for the first time under the Resident Canada Goose Nest and Egg Depredation Order (50 CFR 21.50). That same year, 55 adult geese and goslings were captured in the Cantonment Area during their molting period and released at Matoon Marsh in Training Area 17.

For more information about Canada goose management, see Section *4.2.2 Canada goose* in the *Human-Wildlife Conflict Management Plan*.

4.4.4.8 Ticks in Cantonment Area & Lyme Disease

The occurrence of ticks on Fort Drum is a relatively recent phenomena and didn't start becoming prevalent until ca. 2010. The main tick of concern is the Black-legged Tick (*Ixodes scapularis*; also called Deer Tick); however, a Lonestar tick was captured in 2020 but no others were found.

A tick bite can transmit the bacterium *Borrelia burgdorferi* which causes Lyme disease in humans and pets. Lyme disease is the most commonly diagnosed vector-borne illness in the US military and in the general US population (Rossi et al. 2015). Typical symptoms of Lyme disease include fever, headache, fatigue, and a characteristic skin rash. Most cases of Lyme disease can be treated successfully with a few weeks of antibiotics; if left untreated, infection can spread to joints, the heart, and the nervous system. *Ixodes* ticks can also transmit other diseases such as Babesiosis, Anaplasmosis, and other *Borrelia* bacteria.

Ticks have a four-stage life cycle: egg, the 6-legged larva (seed ticks), and 8-legged nymph and adult. Each active stage ingests a single blood meal from a different individual host animal. Ticks search for host animals from the leaf litter on the forest floor or from the tips of grasses and shrubs and then crawl onto animals (and humans) as they brush against them—ticks cannot jump or fly. Larvae and nymphs typically become infected with *B. burgdorferi* when they feed on a reservoir host which can be a variety of small mammals and/or birds; the adult tick feeds on a third animal which tends to be a medium- to large-sized mammalian host—the white-tailed deer is the principal host for the adult stage. Adult ticks can also transmit the Lyme disease bacteria. Once engorged with blood, a female tick produces a single batch of about 2,000 eggs and dies.

To understand the ecology of ticks and small mammals, any relationship to mast production, and identification of potential reservoir hosts, a long-term project was conducted in cooperation with West Virginia University from 2015-2021.

There is an integrated approach to tick management:

<u>Education/Human Behavior</u>

- Prevention is the most effective means to ensure Lyme disease is not transmitted to humans. Various information sources are available to alert people to protective measures such as using repellents (e.g., DEET and permethrin); wearing long pants tucked into boots or socks; and checking themselves routinely for ticks.
    - There are signs along trails, playgrounds and other areas in the Cantonment Area alerting users to presence of ticks and precautions to take to avoid being bitten.

    - The Army has a pocket card *Tick-borne Disease* (Army Publication GTA-08-05-056) that is available to Soldiers.
    - There is an annual press release in the *Mountaineer* from MEDCOM Preventive Medicine.
    - There are numerous articles and other information published by NYS Department of Health.
- Soldiers are issued permethrin-treated uniforms to repel ticks. DEET or permethrin are both repellents that can be used for ticks.
- Natural Resources staff are provided permethrin-treated clothing (e.g., InsectShield) as PPE.

Behavioral/Biological Modification of the Animal

- Promote (or at least not discourage) predators of small mammals and deer including coyotes and foxes.
- Decrease the density of white-tailed deer in the Cantonment Area to reduce hosts of adult ticks as well as the transport mechanism brining ticks to areas frequented by humans. See Section *4.4.4.2 White-tailed Deer in Cantonment Area* for more information deer management.

Habitat Modification

- Maintain and/or create buffer areas (e.g., mowed grassy area) between places where humans walk/recreate (e.g., trails and playgrounds) and natural habitats where ticks are more likely to exist.
- Remove potential small mammal habitat such as firewood next to buildings or rock piles/rock walls next to trails to reduce the number of host organisms. (On Fort Drum, rock walls are a cultural resource and coordination with the Cultural Resources Program would be required.)

Lethal Removal

- Utilize 4-poster bait stations to apply permethrin to white-tailed deer and killing any ticks deer come into contact with. The 4-poster method was developed by the USDA to attract deer to a feeding trough with adjacent rollers which apply the insecticide to the neck and head of the deer as they feed. This method will be researched further once deer populations are at a stable low level in the Cantonment Area.

For more information about tick management, see Section *4.5.1 Ticks* in the *Human-Wildlife Conflict Management Plan*.

4.4.4.9 Invasive Forest Pests

Forest pests can cause severe economic and ecological damage to native forests. The primary invasive forest pests include the Spongy Moth (European Gypsy Moth; *Lymantria dispar*), *Sirex* Wood Wasp (*Sirex noctilia*), and Emerald Ash Borer (EAB, *Agrilus planipennis*).

All forest pests are monitored throughout the growing season with spot checks around the installation. When high numbers are observed, more intensive monitoring is conducted. In 2007, the Natural Resources Branch worked cooperatively with the US Forest Service and NYS Board of Agriculture and Markets to begin monitoring for

various forest pests. In 2009, the Natural Resources Branch worked with APHIS-Plant Protection Quarantine to monitor for the emerald ash borer. In the past, other monitoring efforts have been conducted on Fort Drum for the Spongy Moth.

Spongy Moth populations are highly dependent on weather conditions. Winter temperatures of -22°F (-30°C) for several days can cause considerable egg mortality. Following mild winter conditions there is a greater potential for larger scale gypsy moth infestations. The last large gypsy moth infestation on Fort Drum occurred in 2004. There was also a low level infestation in 2020 and 2021 in the Cantonment area and training areas surrounding the airfield. Defoliation was minimal with no noticeable mortality, but a moderate amount of egg masses were observed. Trees will typically survive 2-3 years of defoliation which most often makes active management (spraying) unnecessary as high populations usually collapse within that timeframe. If winter conditions continue to trend toward mild, it could lead to more severe infestations in the future due to increased egg mass survivability.

The *Sirex* Wood Wasp is present on Fort Drum, but does not pose a great threat to the pine forests in which they feed. Forest management activities that focus on thinning of high density pine plantations greatly reduce the potential for high populations and tree mortality.

The Emerald Ash Borer has been documented in Jefferson Co. and is likely already on Fort Drum although it has not been confirmed. EAB attacks all types of ash trees and has an extremely high mortality rate. The primary concern during an infestation of EAB is dealing with the dead ash trees as they become hazards in urban areas. Fort Drum has very few ash trees within urban areas, so the risk and cost of dealing with hazard trees will be minimal. Fort Drum foresters continue to monitor ash trees within the Cantonment Area and have adopted a strategy of not allowing any new plantings to be of ash species. Ash trees that start to show signs of infestation will be removed as soon as possible and in accordance with time of year tree cutting restrictions.

The most conspicuous forest pests are the native Eastern Tent Caterpillar (ETC, *Malacosoma americanum*) and Forest Tent Caterpillar (FTC, *Malacosoma disstria*). Outbreaks of forest tent caterpillars typically occur on a 10 year cycle, with infestations lasting up to three years. The last large-scale infestation of FTC occurred from 2003 to 2006 causing a great deal of tree mortality in the northeastern portion of the installation. ETC infestations have been more sporadic and less severe, causing very little tree mortality. Based on population cycles, the potential for a large scale infestation of FTC and/or ETC is likely in the near future. In most cases, a “do nothing” management strategy is followed during times of heavy infestations—natural control comes in the form of the Sarcophagid fly, which is a parasitic insect that feeds on the pupae of the caterpillars. Population spikes of this fly closely follow outbreaks of the caterpillars and are most often the only control necessary. Yellow-billed and black-billed cuckoos will also feed heavily on tent caterpillars.

If forest pest numbers ever reach a critical point, a request for forest pest suppression funding can be initiated. In the past, the US Forest Service has conducted forest pest suppression actions for Army Forestry Programs. A US Forest Service insect and disease specialist would come to Fort Drum and conduct a biological evaluation of the problem and validate approaches to control outbreak. Once this is complete, funding is sought, and once obtained; the Forest Service conducts the proposed action. Although

evaluations have been conducted and funding has been proposed on Fort Drum, no project has ever been funded.

4.5 Natural Resources Recreation & Outreach

For the purposes of this INRMP, natural resources recreation is defined as recreational programs, activities, or opportunities that depend on the natural environment (e.g., hunting, fishing, camping, hiking, bird-watching, etc.). Natural resources recreation and tourism are important to the economy of the North Country, and Fort Drum offers one of the largest tracts of public lands available for recreation in the region. Recreation in the outdoors also enhances the quality of life for military personnel and their families, and is a form of therapy for some people after experiencing stressful and/or traumatic events.

Fort Drum began to manage its fish and wildlife resources in 1958 when the Department of the Army issued AR 420-74 requiring Army installations to open all or part of installations to the public for hunting and fishing, if feasible. The Natural Resources Branch is primarily responsible for recreation in the Training Area as well as, hunting, fishing, and trapping in the Cantonment Area. The Natural Resources Branch is the proponent of *Fort Drum Regulation 420-3 Hunting, Fishing, & Other Outdoor Recreation*; has issued recreation passes since 2002; coordinates with DPTMS-Range Branch and DES- Conservation Law Enforcement Officer Section; and manages fish and wildlife resources for recreation in coordination with the NYSDEC Region 6 Office in Watertown.

Directorate of Families, Morale, Welfare, and Recreation (DFMWR)-Parks & Recreation promotes non-consumptive outdoor recreation primarily in the Cantonment Area; manages developed facilities and activities such as tennis courts, baseball fields, etc.; manages Remington Park; conducts outdoor recreation-related classes (ATV, snowmobile, boating, and hunter education); rents sporting equipment; and leads outdoor adventure trips mostly off the installation.

DES- Conservation Law Enforcement Officers and NYSDEC Environmental Conservation Officers patrol Fort Drum and enforce regulations. See *Section 5.3 Natural Resources Law Enforcement* for more information.

Harvesting firewood (or other forest products) is not considered a recreational activity. See *Section 4.2.4.1.3 Mid/Late Successional Forest Management for Commercial Timber Harvesting/Forest Products* for information on the firewood program.

See the *Fort Drum Natural Resources Recreation & Outreach Management Plan* (ROMP) for more information and background information.

4.5.1 Outdoor Recreation Regulations & Guidance Documents

4.5.1.1 Federal Statutes & Regulations

Sikes Act (16 USC 670a-670o, 74 Stat. 1052)

Section 101 provides for the DoD to carry out a program to provide for the “conservation and rehabilitation” of natural resources on military installations which are necessary to protect, conserve, and enhance wildlife, fish, and game resources to the maximum extent practicable. A separate provision provides for the sustainable multipurpose of installation resources which includes hunting, fishing, trapping, and non-consumptive uses as well as providing for public access subject to safety and security requirements.

Special hunting/fishing permits may also be issued and nominal fees for payment may be required. Any fees collected for this purpose shall be utilized for the protection, conservation, and management of fish and wildlife. Section 101 also provides for the creation and implementation of INRMPs which includes fish and wildlife-oriented recreation and public access.

Section 102 specifies the authorization to carry out a program for the conservation, restoration and management of migratory game birds on military installations.

Section 103 provides for the development and implementation of public outdoor recreation resources at military installations and requires that recreation programs and facilities are accessible for all persons with disabilities.

Section 107 specifies a sufficient number of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to perform tasks to carry out the Sikes Act including preparation and implementation of the INRMP.

Migratory Bird Treaty Act of 1918 (16 USC 703-712)

Implements various treaties and conventions between the US and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. As part of the MBTA, the USFWS Division of Migratory Bird Management works with state wildlife agencies and the governments of Canada and Mexico to set hunting seasons and regulations for migratory birds to ensure healthy game populations and fair distribution of hunting opportunities throughout each of the four migration flyways.

Engle Act of 1958 (10 USC 2671)

Provides that resident wildlife on military installations belong to the State. Requires hunting, fishing and trapping on installations comply with state fish and game laws including obtaining appropriate state licenses for these activities. Special installation rules require state concurrence. Allows public access for hunting, fishing and trapping.

Fish and Wildlife Act of 1956 (16 USC 742a-742j, not including 742 d-l; 70 Stat. 1119)

Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to administer the Act with regard to the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources.

Architectural Barriers Act (ABA) of 1968 (42 USC 4151 et seq.)

Requires access to facilities designed, built, altered, or leased with Federal funds. The ABA is functionally the federal version of the American with Disabilities Act of 1990 (ADA) which is concerned with prohibiting discrimination on the basis of disability and establishes design requirements for the construction or alteration of facilities for non-federal functions.

Rehabilitation Act of 1973 (29 USC 701)

Prohibits discrimination on the basis of disability in programs conducted by Federal agencies, in programs receiving Federal financial assistance, in Federal employment, and in the employment practices of Federal contractors. Established the Access Board which develops and maintains accessibility guidelines (Uniform Federal Accessibility Standards) and enforces the ABA which it does through the investigation of complaints. Guidelines include those for outdoor recreation facilities (parking areas, access trails, hiking trails, fishing piers, etc.)

Section 504 (as amended 1978) provides that no qualified individual with a disability in the United States shall be excluded from, denied the benefits of, or be subjected to discrimination under" any program or activity that either receives Federal financial assistance or is conducted by any Executive agency. Programs and activities include outdoor recreation.

4.5.1.2 Executive Orders & MOUs

Executive Order 13443, August 16, 2007 – Facilitation of Hunting Heritage and Wildlife Conservation

Federal agencies will facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Executive Order 12962, June 7,1995 – Recreational Fisheries

Federal agencies shall, to the extent permitted by law and where practicable, and in cooperation with States and Tribes, improve water quality, restore and enhance aquatic system function, monitor and improve fish health and populations, provide for increased access to public waterways, and develop outreach programs in support of recreational fisheries.

Executive Orders 11989, May 24, 1977 – Use of Off-Road Vehicles on Public Lands

Amends Executive Order 11644 (8 Feb 1972) specifying that off-road vehicles may not be used without special use and location designation on public lands and may be prohibited from use where soil, vegetation, wildlife, or other natural and cultural resources may be adversely affected.

Executive Order 11644, February 8, 1972 – Use of Off-Road Vehicles on Public Lands

Directs specific federal agencies (including DoD) to establish policies and procedures to ensure use of off-road vehicles on public lands will be controlled and resources of those lands will be protected. (Later amended by EO 11989 (May 24, 1977).)

4.5.1.3 Department of Defense & Army Regulations and Policy

DoD Instruction 4715.03 Environmental Conservation Program (Incorporating Change 2, 31 Aug 2018)

Enclosure 3 – 1(l) DoD shall ensure sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to manage their installations' natural resources.

Enclosure 3 – 6(c) Hunting, fishing, and access permitting and fees, if collected, must be deposited and used pursuant to the Sikes Act, and should be used only on the installation where collected. An installation shall use the same fee schedule for all participants with the exception of senior citizens, children, and the handicapped.

Enclosure 3 – 7(a) DoD lands shall be made available to the public for the educational or recreational use of natural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness.

Enclosure 3 – 7(b)(2) DoD installations shall ensure access to its land and waters for hunting, fishing, and non-consumptive use of wildlife to active and retired Military Service members and disabled veterans.

Enclosure 3 – 7(b)(4) DoD installations shall be available to the public for hunting where such programs exist and when not in conflict with mission or environmental and natural resources conservation program goals.

Enclosure 3 – 8 DoD shall engage in public awareness and outreach programs to educate DoD personnel and the public regarding the resources on military lands and DoD efforts to conserve those resources.

Enclosure 3 – 10 DoD shall coordinate with appropriate agencies to support conservation law enforcement to enforce Federal and applicable State laws and regulations pertaining to the management and use of natural resources.

DoD Instruction 5525.17 Conservation Law Enforcement Program (CLEP) (Incorporating Change 3, 3 Aug 2020)

Ensures sufficient numbers of conservation law enforcement personnel are available and assigned responsibility to perform tasks necessary to ensure military and public users remain in compliance with appropriate environmental, natural, and cultural resource laws and regulations.

Army Regulation 200-1 Environmental Protection & Enhancement (28 Aug 2007)

4-3.d(9)(a) Support the Provost Marshal in enforcement of State and Federal laws pertaining to hunting, fishing, and trapping.

4-3.d(9)(c) Deposit collected fees from the sale of Special State Licenses into the Army Fish and Wildlife Conservation Fund (21X5095). GCs are authorized to provide no-cost

Special State Licenses for junior enlisted soldiers (pay grade E4 and below) and to institute a sliding fee schedule for enlisted soldiers based on ability to pay.

4-3.d(9)(d) Provide for controlled recreational access where feasible at Army installations containing land and water areas suitable for recreational use. (LD: 16 USC 670a).

4-3.d(9)(e) Provide access to uniformed personnel, family members, and the public to hunting, fishing, and trapping, consistent with security requirements and safety concerns. Membership in an organization, including rod and gun clubs, has no bearing on receiving access.

4-3.d(9)(f) Provide access to disabled veterans, military dependents with disabilities, and other persons with disabilities when public access is available and when topographic, vegetative, and water resources allow access for such persons without substantial modification to the natural environment.

4.5.1.4 NYS Laws & Regulations

NYS Environmental Conservation Law Article 11

Hunting, fishing, and trapping on Fort Drum are conducted in accordance with Environmental Conservation Laws (ECL) of New York and applicable federal laws. All seasons, bag or daily limits, shooting times, minimum lengths, etc. are based on NYSDEC ECL. For hunting and trapping regulations, Fort Drum is Wildlife Management Unit (WMU) 6H in the Northern Zone; for fishing regulations, Fort Drum is in Region 6 in Jefferson and Lewis counties (including the Black River and Indian River). Fort Drum was originally part of Deer Management Unit 19, but Fort Drum was made its own WMU in 1997.

4.5.1.5 Fort Drum Plans & Standard Operating Procedures

Fort Drum Regulation 420-3 Hunting, Fishing, & Other Outdoor Recreation

All recreationists on Fort Drum must abide by *Fort Drum Regulation 420-3 Hunting, Fishing, & Other Outdoor Recreation* (FD Reg 420-3) which is considered supplementary to the NYSDEC regulations. FD Reg 420-3 is mainly focused on access control, restricted areas, safety, and regulations specific to Fort Drum. FD Reg 420-3 is reviewed annually by the Natural Resources Branch, DPTMS-Range Branch, DES-Conservation Law Enforcement Officers, NYSDEC Environmental Conservation Officers and the Command Safety Office and is approved by the Garrison Commander. Violation of this regulation may result in the loss of recreational privileges on Fort Drum.

Fort Drum cannot be less restrictive than NYSDEC regulations, but can be more restrictive.

Fort Drum Installation Policy Memorandum 21-18, Off-Limits Locations

Active duty military personnel are prohibited from the Black River that borders Fort Drum, except for fishing from the banks; the portion of Deer River referred to as “Kings Falls/High Gorge” along Co. Rte. 55 from the hamlet of Deer River on Co. Rte. 26 to

Copenhagen; and swimming in all waters within and adjacent to Fort Drum except Remington Pond and approved swimming areas.

4.5.2 Natural Resources Recreation Status

4.5.2.1 Status of Recreational Access

Approximately 69,000 ac (27,923 ha) of the Training Area are available for natural resources recreation including seven lakes and ponds (506 ac / 205 ha). Besides permanently restricted areas, recreationists can access any part of the training area that is open for recreational use, and there is no limit (or quota) for the number of recreationists checking into the training area on any given day. Recreationists are expected to use their judgment whether an area appears to be overcrowded. Training Areas 4A, 4B, 4D, 5A, 5D, and 6A have specific requirements for the type of weapon allowed to be used.

All recreationists in the Training Area must possess a Fort Drum Recreational Access Pass and check-in through the Sportsman's Hotline. Entry onto Fort Drum property by any means may begin two hours before sunrise. Recreationists must actively begin leaving Fort Drum at sunset and must be off the installation no later than two hours after sunset. Recreationists engaged in nighttime fishing, predator hunting, and/or camping activities in the Fort Drum Training Area are the only recreational users authorized to be in the Fort Drum Training Area two hours after sunset and two hours before sunrise.

A Joint Access Policy exists on Fort Drum to allow anglers and trappers the ability to utilize training areas when military training is occurring as long as activities do not interfere with military operations. To utilize the Joint Access Policy, anglers/trappers must call and speak directly with Range Control personnel who will determine whether joint use is allowed for that time, location, and activity.

Generally, areas permanently closed to recreational use are posted with NYS yellow and green (Restricted Area) signs; UXO warning signs posted around impact areas; and/or Off-Limits by Order of the Commander Signs and/or Seibert Stakes noting other sensitive areas. The largest areas where access by recreationists is prohibited include the Main Impact Area, Training Area 20, the part of the Indian River adjacent to the Main Impact Area, Range 48 and other specified ranges, and historical impact areas primarily due to safety concerns and the potential to encounter unexploded ordnance (UXO). Other areas where recreation is prohibited are due to special uses and/or ownership by other entities including all cemeteries throughout the installation; the CSX railroad track traversing or bordering Training Areas 12, 11, 5, 8, and 7; the islands on the Black River between Training Areas 6A and 6C; and the Town of Philadelphia Water Supply in Training Area 5B.

Training Areas 5E and 6C were closed to recreation due to safety and security concerns and the proximity to the Ammunition Supply Point and WSAAF facilities, respectively. However, in 2008, six sites within those areas were designated as disabled access hunting areas which would still allow for some recreational opportunities. (Beginning in 2020, Training Area 6C became a disabled access hunting area as part of Cantonment Area hunting). These areas may only be used by hunters possessing a New York State Non-Ambulatory Hunter Permit; persons with severe permanent disabilities eligible for a

New York State Parking Permit or License Plate; or persons with a life-threatening illness participating through a non-profit organization. See INRMP *Section 4.5.4.6* regarding disabled access opportunities for more information.

Vehicles are allowed to be used only on designated recreational roads noted on the Recreational Use Map.

4.5.2.2 Status of Recreationists

Several laws and regulations are specific to allow public access if applicable (see *Section 4.5.1 Outdoor Recreation Regulations & Guidance Documents*). In 1959 the first cooperative plan, or agreement, for the conservation and development of fish and wildlife resources was signed by Fort Drum, NYSDEC, and USFWS. The current tripartite agreement between Fort Drum, NYSDEC, and USFWS in this INRMP continues to ensure public access and Fort Drum remains the largest cooperator in NYS.

Allowing public access for outdoor recreation is one of Fort Drum's most important benefits to the North Country at large. The importance of public access to Fort Drum for outdoor recreation purposes was exemplified after the 9/11 terrorist attacks when Fort Drum was closed to the public for a year. There was substantial outcry from the community until it was re-opened one year later on September 11, 2002.

Table 4.51 Total Recreation Permits Issued by Status from FY 2003 – FY 2013, CY 2014-2017, and CY2019-2023 on Fort Drum Military Installation. (* Includes current and retired DoD Civilians).

Year	Total Permits Issued	Active Military	Military Family Member	Retired Military	DoD Civilian	General Public
FY 2003	2943	790 (27%)	339 (12%)	116 (4%)	64 (2%)	1634 (56%)
FY 2004	2863	686 (24%)	409 (14%)	133 (5%)	42 (1%)	1593 (56%)
FY 2005	3396	910 (27%)	558 (16%)	103 (3%)	74 (2%)	1751 (52%)
FY 2006	2760	636 (23%)	292 (11%)	108 (4%)	75 (3%)	1649 (60%)
FY 2007	2805	461 (16%)	261 (9%)	150 (5%)	115 (4%)	1818 (65%)
FY 2008	3245	712 (22%)	277 (9%)	161 (5%)	141 (4%)	1954 (60%)
FY 2009	3156	646 (20%)	272 (9%)	176 (6%)	146 (5%)	1916 (61%)
FY 2010	3575	772 (22%)	500 (14%)	210 (6%)	195 (5%)	1898 (53%)
FY 2011	4630	1041 (22%)	547 (12%)	253 (5%)	207 (4%)	2582 (56%)
FY 2012	4588	1362 (30%)	824 (18%)	215 (5%)	187 (4%)	2000 (44%)
FY 2013	4790	1413 (29%)	701 (15%)	273 (6%)	241 (5%)	2162 (45%)
CY 2014	5065	2009 (40%)	732 (14%)	280 (6%)	175 (3%)	1869 (37%)
CY 2015	4545	1642 (36%)	576 (13%)	295 (6%)	178 (4%)	1854 (41%)
CY 2016	4152	1425 (34%)	496 (12%)	282 (7%)	172 (4%)	1777 (43%)
CY 2017	3785	1210 (32%)	400 (11%)	249 (7%)	187 (5%)	1739 (46%)
CY 2018	Converted to new recreation permit system version in middle of year.					
CY2019	3343	1001 (30%)	316 (9%)	255 (8%)	241*(7%)	1530 (46%)
CY2020	3834	1222 (32%)	395 (10%)	257 (7%)	268 (7%)	1692 (44%)
CY2021	3709	1232 (33%)	292 (8%)	216 (6%)	267 (7%)	1702 (46%)
CY2022	3194	945 (30%)	247 (8%)	182 (6%)	249 (8%)	1567 (49%)
CY2023	3352	986 (29%)	271 (8%)	195 (6%)	235 (7%)	1655 (49%)

The number of recreational access passes issued annually has varied from between 2700-5000 from FY2003 to CY2016 (Table 4.51). The general public has constituted over 50% of the recreationists on Fort Drum until FY12 when an Army policy was implemented to register all firearms on the installation.

Recreation in the Cantonment Area is generally restricted to those who can access the installation with DoD-issued identification cards (active and retired military personnel, military family members, and civilian employees). The Cantonment Area is the only area that is restricted from the general public for hunting; other activities (e.g., fishing) are allowed, but individuals would have to be sponsored to access the Cantonment Area.

4.5.2.3 Status of Recreational Activities

Hunting is the most common recreational activity on Fort Drum—White-tailed Deer hunting and small game hunting for Ruffed Grouse, American Woodcock, and Snowshoe Hare are the most popular activities. Other game species on Fort Drum include Black Bear, Wild Turkey, Cottontail Rabbit, Gray Squirrel, Coyote, Bobcat, and Raccoon. Hunting in the Cantonment Area is restricted to archery/crossbow hunting for White-tailed Deer, Black Bear, and Wild Turkey only.

Of the popular game fish found across the North Country, many are found on Fort Drum with the exception of muskellunge. Indian Lake is the most popular fishery in the Training Area; Remington Pond is the main angling site in the Cantonment Area and is a catch-and-release fishery. Through the use of nighttime recreation passes and the joint use policy, fishing is permitted throughout Fort Drum practically 24 hours a day. Ice fishing is permitted on all non-trout waters on Fort Drum (Indian Lake, Narrow Lake, Indian Pond and Mud Lake only). NYSDEC stocks approximately 4000 trout in two ponds and two creeks annually to support a put-grow-and-take fishery.

Beaver is the most sought after furbearer by trappers. Other furbearers with open seasons on Fort Drum include Muskrat, River Otter, Mink, Raccoon, Red and Gray Fox, Fisher, Bobcat, Coyote, Virginia Opossum, Striped Skunk, and weasel. A joint access policy allows trapping to occur in areas closed due to military training. Recreational trapping is not permitted in the Cantonment Area.

Overnight camping in the Fort Drum Training Areas is allowed year-round. All camping in the Training Areas is primitive and there are no designated campsites. Trash receptacles are not provided, so campers are expected to carry-out what they carry in. Campers are also expected to dispose of human waste properly; however, campers are allowed to use permanent latrine facilities in the training areas.

There is limited use of off-road vehicles on Fort Drum. The use of snowmobiles for recreation riding only is allowed in Training Areas 7E, 7F and 7G; the use of ATVs for recreational riding only is allowed on designated recreational roads around Training Areas 7E, 7F, and 7G. Otherwise, snowmobiles and ATVs can be used for strictly utilitarian purposes (e.g., recovery of legally harvested big game, ice fishing, and trappers running traplines).

Other outdoor recreational activities allowed on Fort Drum include: scouting; boating (including canoeing and kayaking); target shooting (archery/crossbow any time or with firearms only on ranges designated by Range Branch); wildlife viewing and/or

photography; harvesting fruit, mushrooms, ramps/leeks, asparagus, fiddleheads, dandelions, and/or rhubarb (for private use only and not for commercial purposes); picnicking; hiking; geocaching; dog walking or training; cross country skiing; snowshoeing; bicycling; and horseback riding.

Knowing what recreational opportunities exist and which are utilized are two different things. However, to understand what recreationists are doing on Fort Drum has been challenging. During the FY2003-2010 seasons, the types of passes that were sold (big game hunting, small game hunting, fishing, trapping, combination I (all hunting and fishing), combination II (hunting, fishing, and trapping), and other activities) could be assessed to provide a general idea of the activities pursued. To further determine recreational use of Fort Drum and better prioritize resources, a comprehensive recreational use survey was implemented in 2004 for the 2003-2004 season. A more comprehensive implementation of the survey was completed the following year to gather information for the 2004-2005 season and then the survey was conducted annually beginning in 2007 (for the 2006-2007) season and continued through 2017 (for 2016). To ensure a high response rate, surveys were required for recreationists 18 years and older prior to receiving a Fort Drum Recreation Permit for the current year. However, these results had to be considered very conservatively because not all recreationists were surveyed (they must be renewing a pass to report on the previous year's activities), and although "mandatory," the survey is still voluntarily. Despite the limitations, the surveys did provide a no cost method to determine a relative trend of recreational activities on Fort Drum. Results of these surveys can be found in Section 3.2 of the *Fort Drum Natural Resources Recreation & Outreach Management Plan*. Beginning in 2019, the new iSportsman web site requires recreationists to check-out daily and harvest information will be recorded which will provide a better assessment of activities conducted on Fort Drum.

4.5.2.4 Status of Outreach Activities

Natural resources professionals on Fort Drum conduct numerous environmental education programs for the public. Environmental information is provided in formats suited to each audience, including displays and presentations for local schools and scouting organizations; events such as Earth Day; assistance with service and community projects; and publications in the form of brochures, newsletters, and press releases. Natural resources professionals also assist the Public Affairs Office with information, articles, and interviews when called upon.

The Natural Resources Branch is responsible for organizing special annual events such as Arbor Day (since 1992), Youth Fishing Derby (Since 1996), Maple Days (since 2007), International Migratory Bird Day (since 2008) and Outdoor Adventure Day (since 2013). These events have become cornerstones of our outreach message with thousands of attendees annually.

Public outreach also involves getting involved with community organizations such as scouting organizations. The Natural Resources Branch has been involved with several Eagle Scout projects: creating a trail to a fishing access site (2002); creating artificial fish habitat in Remington Pond (2003); creating touch boxes for outreach activities (2003); creating a nature trail in Remington Park (2002); planting willow trees to enhance fish habitat along West Creek (2004); building a bridge on the Remington Park nature trail (2006); and creating pollinator gardens in the Cantonment Area (2010). The Branch has

also been involved with service projects including the planting of willow trees to enhance fish habitat and the removal of the invasive plant Garlic Mustard (*Alliaria petiolata*) in Training Area 6A. Various programs have worked together as part of National Public Lands Day since 2006 and have included trail construction and maintenance, nest box construction, etc.

In 2003, a 1,550 ft^2 Natural Resources Branch satellite office was established in an existing building along NYS Rte. 26. This building is also a central location for various education displays and exhibits, serves as a classroom for outreach presentations, a meeting place for stakeholders, and an auxiliary office for field personnel.

4.5.3 Natural Resources Recreation & Outreach Management Principles & Methods

4.5.3.1 Outdoor Recreation is a Secondary Function

Access to the Training Area for all purposes including outdoor recreation is controlled by DPTMS-Range Branch. Although all efforts are made to accommodate outdoor recreation on Fort Drum, recreation is always secondary to military training.

A Joint Access Policy exists on Fort Drum to allow anglers and trappers the ability to utilize training areas when military training is occurring as long as activities do not interfere with military operations. When using the Joint Access Policy, anglers/trappers must call and check-in with Range Branch directly.

4.5.3.2 Recreation on Fort Drum is a Privilege

Recreation on Fort Drum is a privilege and not a right. All recreationists are invited guests and access can and will be revoked if regulations are not followed.

4.5.3.3 All Recreationists are Treated Fairly and Equitably Which Includes Accessibility.

No matter the rank or status of the recreationist (active duty military personnel, military retiree, military family members, civilian employees, general public), the primary goal is to provide a fair, equitable, and safe system for everyone to access recreational opportunities on Fort Drum.

All recreational infrastructure should be constructed with accessibility as a goal unless natural features on the landscape make it impossible.

4.5.3.4 Outdoor Recreation is Encouraged and Will be Made Available at the Least Cost Possible - Cost will not be a Barrier to Recreational Access

No fees were charged to recreate on Fort Drum through FY1991. Fees were charged from FY1992-2010, but were never more than $35 for an annual pass that allowed all activities. Since FY2011, no fees are charged in order to maximize the number of recreationists and not waste staff resources for accounting purposes.

Trout have been stocked on Fort Drum more or less annually by NYSDEC since the 1960s. This provides put-and-take angling opportunities at no cost to Fort Drum.

No food plots are maintained, but instead land management actions occur through normal forestry operations to benefit game species at no cost to the government or recreationists.

Due to presence of native game birds (e.g., ruffed grouse and American woodcock), and the prohibitive cost and lack of suitable habitat, there are no plans for the release or long-term management of ring-necked pheasants.

The desire is to maintain access control for recreation in the most simple and least restrictive process necessary, yet ensure safety, a quality experience, and no conflict to military training. There are no restrictions on the number of recreation passes issued or the number of people in the Training Area or subtraining area at any given time. Recreationists are expected to use their own judgment whether an area appears to be overcrowded. Recreationists are required to check-in when entering and check-out when leaving the Training Areas via the iSportsman Hotline or ISportsman website.

4.5.3.5 Harassing and/or Capturing Wildlife for Recreation is Discouraged

The capture of any raptor (e.g., hawk, falcon) on Fort Drum for falconry is prohibited.

The capture of any wildlife species for the purpose of dog training is prohibited on Fort Drum.

Training of dogs on Black Bears is prohibited on Fort Drum. Other forms of dog training permitted by NYS are allowed on Fort Drum.

4.5.3.6 Environmental Outreach and Education is Essential to Long-term Sustainability

In general, the more people know about an installation's unique and valuable natural resources and the reasons for protecting those resources, the more responsibly they will act toward them.

4.5.4 Natural Resources Recreation and Outreach Strategies

4.5.4.1 Access Control & Administration of the Recreation Program will be Maintained

Access will be maintained and control of access will continue taking into consideration operational security; safety of Soldiers and recreationists; and ensuring a fair, equitable, and cost efficient administration of the program. Annual meetings will continue with Range Branch and Law Enforcement personnel to continue to assess and improve recreation on Fort Drum and be as adaptable to changing missions, conditions, and opportunities. FD Reg 420-3 will continued to be updated and staffed on an annual basis. Fort Drum Recreation maps will continue to be provided. The iSportsman web site will continue to be the platform to issue recreation passes in an efficient and cost effective manner as well as provide control over access by Range Branch for recreation.

4.5.4.2 No Special Consideration is Given to Most Game Species Beyond "Fort Drum being Wildlife Management Unit 6H" and "NYSDEC Hunting/Fishing/Trapping Regulations Apply"

Most fish and wildlife game species are given no special consideration besides the normal seasons and bag limits established by NYSDEC.

Although recreational harvest may be a factor to manage certain game species that are also involved in human-wildlife conflicts (e.g., White-tailed Deer, Black Bear, Raccoon, Beaver), those situations and management strategies are addressed in INRMP *Section 4.4 Human-Wildlife Conflicts* and the *Human-Wildlife Conflict Management Plan*.

4.5.4.3 Deer are the Most Intensively Managed Game Animals for Recreational Purposes

White-tailed Deer are a high profile game species in NYS and deer hunting is the main recreational activity pursued on Fort Drum. The installation has been open to the public for deer hunting since 1959 as a part of NYSDEC Deer Management Unit 19, and in 1998 Fort Drum became its own Wildlife Management Unit 6H.

Deer management on Fort Drum is functionally two separate strategies—the Training Area and Cantonment Area—although the overall goal for the installation is to manage deer populations liberally to reduce conflicts with humans and impacts to the environment, yet provide quality recreational opportunities.

The specific harvest goal in the Training Area is to achieve a harvest ratio of approximately 1 female: 1 male. This is accomplished through the use of Deer Management Permits (DMPs) which allow the harvest of antlerless deer. DMPs have been issued on Fort Drum since 2002.

The antlerless harvest is analyzed each year and management decisions are made cooperatively with NYSDEC. Harvest information and the probability of a hunter receiving a DMP to harvest antlerless deer are calculated by NYSDEC which determines the number of DMPs available for a given year. Approximately one-third of DMPS are filled by hunters; hunters fill about half of those permits with adult does; therefore, it is necessary to issue about six permits for each adult doe to be killed—this equates to a target of issuing 700 DMPs each season.

Harvesting antlerless deer has always been a difficult concept to put in practice in the North Country, as harvesting only adult males is a long established tradition. However, Quality Deer Management is another concept that is popular among some local entities and an integral part of Quality Deer Management is controlling overall population numbers to have healthy sex and age ratios and be in concert with the habitat and human environment (Harper 2003). To achieve a healthy population, the liberal harvest of antlerless deer (with a focus on females) must be ensured. Each adult female normally has two fawns each year. Female deer can begin reproducing when they are only one year old. If only male deer are killed, deer numbers will continue to grow. Thus, female as well as male deer must be removed to control deer numbers. In general, about 40% of adult female deer must be killed each year to keep deer numbers stable. More must be taken to reduce a deer population (NYSDEC:

http://www.dec.ny.gov/animals/7211.html). DMPs will continue to be an integral part of Fort Drum's deer management in the future.

Table 4.52 Deer harvest information and deer hunter survey information on Fort Drum (Wildlife Management Unit 6H). Harvest information is based on NYSDEC calculations. Only deer without antlers or antlers less than 3" in length are considered "antlerless." * Deer hunter survey information based on responses to recreationist surveys conducted on Fort Drum and reflect a trend and not absolute numbers.

YEAR	Deer Harvest Information from NYSDEC				Deer Hunter Survey Information from Fort Drum*				
	TOTAL DEER HARVEST	Antlered (Adult Males) Harvest	Antlerless (Adult Female & Fawns) Harvest	Ratio Antler: Antlerless (Goal 1:1)	# OF HUNTERS SURVEYED	# DAYS CHECKED IN	AVG # UNTINGDAYS/ HUNTER	# DEER HARVESTED	AVG # DEER HARVESTED/ HUNTER
1995	332	264	68	3.9 : 1	*	*	*	*	*
1996	312	256	56	4.6 : 1	*	*	*	*	*
1997	337	258	79	3.3 : 1	*	*	*	*	*
1998	353	259	94	2.8 : 1	*	*	*	*	*
1999	386	267	119	2.2 : 1	*	*	*	*	*
2000	446	288	158	1.8 : 1	*	*	*	*	*
2001	338	208	130	1.6 : 1	*	*	*	*	*
Deer Management Permits began on Fort Drum (WMU 6H) in 2002									
2002	509	248	261	1.0 : 1	*	*	*	*	*
2003	404	167	237	0.7 : 1	*	*	*	*	*
2004	520	202	318	0.6 : 1	516	8598	17	209	0.41
2005	339	173	166	1.0 : 1	790	13052	17	273	0.35
2006	470	212	258	0.8 : 1	*	*	*	*	*
2007	464	244	220	1.1 : 1	551	8763	16	220	0.40
2008	447	194	253	0.8 : 1	620	9643	16	231	0.37
2009	346	171	175	1.0 : 1	770	11809	15	218	0.28
2010	472	196	276	0.7 : 1	855	13901	16	234	0.27
2011	303	151	152	1.0 : 1	916	13717	15	189	0.21
2012	406	207	199	1.0 : 1	641	8811	14	165	0.26
2013	434	241	193	1.2 : 1	642	8621	13	174	0.27
2014	379	166	213	0.8 : 1	598	8067	13	132	0.22
2015	239	137	102	1.3 : 1	497	6323	13	97	0.20
2016	360	205	155	1.3 : 1					
2017	366	221	145	1.5 : 1	*	*	*	*	*
2018	452	261	191	1.4 : 1					
2019	298	181	117	1.5 : 1					
2020	367	167	200	0.8 : 1					
2021	304	178	126	1.4 : 1					
2022	392	192	200	1.0 : 1					

Deer in the Cantonment Area are more intensively managed and have already been discussed in *Section 4.4.4.2 White-tailed Deer in Cantonment Area* and the *Human-Wildlife Conflict Management Plan*. The overall management goal is to intensively harvest deer annually to minimize potential conflicts including deer-vehicle accidents, deer browsing on landscape vegetation, and impact the life cycle of the deer tick which transmits Lyme disease. The secondary goal is to provide a recreational opportunity.

4.5.4.4 Stocking Game Species is Considered on a Case-by-Case Basis and Will Not Involve a Cost to Fort Drum.

NYSDEC stocks approximately 4,300 trout (brook, brown, and rainbow) annually on Fort Drum in Remington and Quarry ponds, Black Creek, and the West Branch of Black Creek (Table 4.53).

Table 4.53 Trout stocked on Fort Drum Military Installation from 1995 - 2021.

YEAR	Remington Pond	Black Creek	West Branch of Black Creek	Quarry Pond
1995	600 Brook Trout / 620 Brown Trout	3620 Brown Trout	0	200 Rainbow Trout
1996	600 Brook Trout k / 500 Brown Trout	3750 Brown Trout	0	200 Rainbow Trout
1997	560 Brook Trout / 500 Brown Trout	2160 Brown Trout	0	200 Rainbow Trout
1998	700 Brook Trout / 510 Brown Trout	2190 Brown Trout	0	200 Rainbow Trout
1999	700 Brook Trout / 510 Brown Trout	1890 Brown Trout	0	200 Rainbow Trout
2000	700 Brook Trout / 510 Brown Trout	1800 Brown Trout	0	200 Rainbow Trout
2001	640 Brook Trout / 700 Brown Trout	2700 Brown Trout	0	140 Rainbow Trout
2002	600 Brook Trout / 600 Brown Trout	2500 Brown Trout	430 Brook Trout	200 Rainbow Trout
2003	580 Brook Trout / 600 Brown Trout	2500 Brown Trout	420 Brook Trout	200 Rainbow Trout
2004	630 Brook Trout / 560 Brown Trout	2320 Brown Trout	450 Brook Trout	190 Rainbow Trout
2005	700 Brook Trout / 580 Brown Trout	1830 Brown Trout	500 Brook Trout	580 Rainbow Trout
2006	1000 Brook Trout	2420 Brown Trout	500 Brook Trout	200 Rainbow Trout
2007	1000 Brook Trout	2440 Brown Trout	500 Brook Trout	180 Rainbow Trout
2008	1000 Brook Trout	2320 Brown Trout	500 Brook Trout	200 Rainbow Trout
2009	1000 Brook Trout	2420 Brown Trout	500 Brook Trout	190 Rainbow Trout
2010	980 Brook Trout	3820 Brown Trout	490 Brook Trout	190 Rainbow Trout
2011	940 Brook Trout	2360 Brown Trout	470 Brook Trout	400 Rainbow Trout
2012	960 Brook Trout	2570 Brown Trout	480 Brook Trout	200 Rainbow Trout
2013	1000 Brook Trout	2100 Brown Trout	500 Brook Trout	200 Rainbow Trout
2014	1000 Brook Trout	3500 Brown Trout	425 Brook Trout	160 Rainbow Trout
2015	880 Brook Trout	2480 Brown Trout	440 Brook Trout	200 Rainbow Trout
2016	880 Brook Trout	2500 Brown Trout	440 Brook Trout	200 Rainbow Trout
2017	1000 Brook Trout	2500 Brown Trout	440 Brook Trout	200 Rainbow Trout
2018	980 Brook Trout	2700 Brown Trout / 20 Brook Trout	500 Brook Trout	200 Rainbow Trout
2019	1000 Brook Trout	2570 Brown Trout	500 Brook Trout	200 Rainbow Trout
2020	0	2000 Brown Trout	1500 Brook Trout	150 Rainbow Trout
2021	480 Brook Trout	3170 Brown Trout	480 Brook Trout	170 Rainbow Trout
2022	1000 Brook Trout	2232 Brown Trout	480 Brook Trout	200 Rainbow Trout
2023	1000 Brook Trout	2270 Brown Trout	480 Brook Trout	200 Rainbow Trout

4.5.4.5 The Best Long-term Management Strategy to Benefit Game Species is Habitat Management

For upland game species (e.g., deer, ruffed grouse, American woodcock, snowshoe hare/cottontail rabbit), the primary management emphasis is promoting early successional habitat. Early successional habitat management is addressed in *Section 4.2.4.1.10 Early Successional Forest Management.*

Fort Drum has an array of wetlands and surface waters for those game species that rely on adequate aquatic habitat. Some specific projects may enhance stream habitat for brook trout in West Creek and Pleasant Creek and overall fisheries in Quarry Pond.

4.5.4.6 Best Management Strategy for Recreation is to Provide/Enhance Access

An extensive road network through Fort Drum and improvement to FUSA Blvd in 2003-2005 has made Fort Drum lands relatively accessible for recreation throughout the installation.

Any cost barriers to participate in recreational activities on Fort Drum was eliminated when fees were no longer charged for recreational passes beginning in the FY11.

In 2015, an accessible waterfowl hunting blind was constructed at Matoon Creek Marsh in TA17.

Twenty-four angling sites with designated parking areas have been established and are regularly maintained with signage, removing vegetation, and trash removal.

Most efforts to improve access have been for fishing through the construction/ improvement of roads, access trails, and docks/piers.

- Access to Angling Site 20 on Indian Lake was improved with the demolition of a rocky ridge and realignment of the approach road by an Army engineering unit in 2012. This improvement also provided for a larger turn-around area. A buoy was attached to a partially submerged rock near the boat ramp to warn boaters of underwater hazards. A port-a-john was installed seasonally beginning in 2014 to provide facilities for anglers and boaters.
- Angling Site 3 on the West Branch of Black Creek was established in 2011 with a parking spot off of Co. Rte. 3A in Training Area 7.
- A road to improve access to Indian Pond was completed in 2012.
- A fishing pier was constructed at Remington Pond in 2011 with an accessible trail in 2015.
- A floating dock was installed in 2011 at Mud Lake near the Alpina Dam.
- A floating dock was installed at Indian Pond in 2014.
- Accessible parking areas and platforms were constructed at two Black Creek angling sites in 2015.
- Two floating docks were installed in Conservation Pond in 2015. In 2016, a trail around the pond was completed with the installation of a foot bridge over Buck Creek.
- A trail between angling sites 6 and 7 on the Black Creek was cut in 2015.

- The boat ramp at Indian Lake was improved with a dock in 2021 that is removed each winter season.
- Three kayak launches were installed at Indian Lake, Indian Pond, and Mud Lake in 2022.
- An accessible kayak launch was installed at Remington Pond in 2023.
- A new hiking trail system—Bonaparte Area Trail Complex—was constructed in Training Area 19C and opened in 2023.
- Additional projects are planned including the installation of a fishing pier in Indian Lake off the angling site 20 boat ramp.

4.5.4.7 Opportunities to Provide for Disabled Access Should Always be Considered—not only Because it is Required by Regulation, but Because it also Increases Opportunities for Both the Very Young and the Very Old.

Providing public outdoor recreation to disabled persons is also authorized and emphasized by Section 670c of the Sikes Act which includes disabled veterans, military dependents with disabilities, and other persons with disabilities. The Sikes Act also specifically allows for the acceptance of donations—services and property—to provide disabled access.

The Natural Resources Branch with the cooperation of the Fort Drum Equal Opportunities Office is committed to providing recreational opportunities for those persons with disabilities in compliance with the Americans with Disabilities Act.

The first step was issuing Fort Drum Recreation Permits free-of-charge for disabled veterans with a minimum 40% Rating Decision in a VA Award Letter. (Now everyone receives a free permit.) Hunters possessing a valid NYS Non-Ambulatory Hunter Permit are allowed to hunt from a vehicle or ATV parked on a designated recreational road. Archery hunters must also possess a valid NYS Modified Archer Permit or Modified Crossbow Permit to use modified bows per state regulations.

Beginning in 2008, Fort Drum began offering special hunting opportunities for Soldiers assigned to a Warrior in Transition Unit, persons possessing a New York State Non-Ambulatory Hunter Permit, or persons with a life-threatening illness participating through a non-profit organization. These hunting opportunities were at six designated sites in Training Areas 6C and 5E which were otherwise off-limits for recreational opportunities. Each site is designated with a post and sign labeled as a "center point." Hunting is allowed within a given distance from that center point and allowed for big game or small game during their respective seasons. Sites are reserved on the day or day before hunting on a “first come, first served” basis. Other persons can assist in hunting and/or hunt within proximity to the disabled hunter. (Beginning in 2020, Training Area 6C became a disabled access hunting area as part of Cantonment Area hunting so disabled hunters can hunt with archery or crossbows in one of the four areas if they are eligible to access and hunt in the Cantonment Area; Training 5E still has three sites available hunting with archery, crossbows, or shotguns). Promotion of these sites will be the further goal of the Natural Resources Branch, as well as development of other opportunities if there is interest.

In 2015, an accessible waterfowl hunting blind was constructed at Matoon Creek Marsh in TA17.

4.5.4.8 Develop Outreach Events and Publications to Promote Recreation and Recreational Opportunities.

The Natural Resources Branch promotes outdoor recreation opportunities in many formats. Since 2003, a web site has provided an overview of fish and wildlife management, various facets of outdoor recreation on the installation, regulations, brochures, and other publications; a new web site (www.fortdrum.isportsman.net) was launched in 2010. The branch hosts a Facebook page: Fort Drum Natural Resources (@FortDrumNaturalResources) and a web site (http://www.fortdrum.isportsman.net). Press releases were issued to the installation newspaper as well as local media, but the installation newspaper is no longer published.

Due to the popularity of small game hunting on Fort Drum, a brochure entitled *Small Game Hunting on Fort Drum* was created in 2005 and revised in 2009 as a *Hunting on Fort Drum* brochure (which was last updated in 2019). The brochure highlights the popular game species; provides hints how to sex and age certain species; and discusses what habitats these animals are likely to be found in. A map was also created to identify the dominant stands of preferred habitat for many of the species; however, hunters are likely to find wide distributions of animals throughout the installation.

A brochure entitled *Angling on Fort Drum* was first developed in 1999, but has been revised several times. The newest brochure *Fishing Fort Drum* lists 25 angling sites on many of the waterbodies throughout Fort Drum (which was last updated in 2021). The brochure describes the various waterbodies, associated fish communities, and general information.

To promote wildlife viewing, a brochure *The Birds of Fort Drum* was developed in 2003 which is revised almost biannually since 2010 as new birds are added—it was last revised in 2023. Fort Drum was the featured installation—*Birding on DoD Lands: Fort Drum, New York*—in the July/August 2006 issue of *Winging It*, the newsletter of the American Birding Association. The Natural Resources Branch also developed *The Nature Detective's Guide to the Trees & Forests of Fort Drum, NY* and several species-specific informational brochures (e.g., Canids, Snakes, Turtles, Frogs & Toads, Crayfish, Mussels, and Butterflies).

The Natural Resources Branch coordinates with NYSDEC for a youth fishing event at Remington Pond on the Saturday before Memorial weekend in May (Armed Forces Day)—no NYSDEC license is required to fish during the event or assist others to fish. may do so. NYSDEC also has state-wide free fishing days/weekends when no NYSDEC license is required in February, June, September, and November. A Fort Drum Recreational Access Pass, and normal check in procedures, are still required to access the training area during these free fishing days.

It is a goal of the Natural Resources Branch to continue to participate in outreach programs or events to explain contemporary natural resources issues and management as time and resources allow. Outreach participation has included Cub Scout Heritage Day (Pack 26 at Fort Drum), summer programs for Fort Drum's Youth Services at Remington Park; girl and boy scout organization badges for Forestry, Wildlife Conservation, etc.; birding field trips; programs for area schools (Copenhagen,

Alexandria Bay, and Carthage); and Environmental Awareness Days at a local state park for all area sixth graders organized by Cornell Cooperative Extension Service.

The Natural Resources Branch is responsible for organizing special annual events such as Arbor Day (since 1992), Youth Fishing Derby (Since 1996), Maple Days (since 2007), International Migratory Bird Day (since 2008) and Outdoor Adventure Day (since 2013). These events have become cornerstones of our outreach message with thousands of attendees annually.

Outreach to professional entities and universities are also important. Fort Drum natural resources professionals have conducted presentations at national meetings of the Society for American Foresters and National Military Fish and Wildlife Association; NYSDEC and regional wildlife meetings (e.g., Northeastern Bat Working Group), and numerous university classes and field trips.

Since 2014, natural resources displays have been exhibited at the entrance of the McEwen Library on a rotating basis with various themes related to Fort Drum (e.g., Spring, Fish, Raptors, Carnivores, Waterfowl, Fall, etc.). A permanent display of taxidermist mounts and other natural resources displays is located at the Natural Resources Outreach Facility (Bldg. S-2507) which also functions as an outreach opportunity for recreationists during operating hours.

5.0 Implementation

This chapter sets forth some of the mechanisms involved to implement the activities outlined in this INRMP as well as tools to evaluate the effectiveness of the implementation.

5.1 Funding

Natural resources management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different application rules. This section discusses the different sources of funding that may be used to implement this INRMP. (Not all of these options are currently used by Fort Drum.)

In general, there are three main focus areas for funding: staffing, compliance activities and stewardship activities.

1. Staffing of federal employees is considered a "must fund" for budgeting purposes. Staffing is further discussed in *Section 5.2*.
2. Activities and projects driven by requirements to comply with federal laws, applicable state laws, and applicable executive orders (EOs) are given the next priority for funding. Although compliance with federal laws and EOs should be a priority for all military installations, in reality, compliance is often split into two tiers of "must fund" and "will fund if funds are available." For the purposes of this INRMP, the top tier compliance activities include the Endangered Species Act, Bald and Golden Eagle Protection Act, Clean Water Act, and National Environmental Policy Act. The second tier compliance activities include the Sikes Act, Migratory Bird Treaty Act, and Invasive Species EO.
3. Stewardship, the responsibility to manage and conserve natural resources for the future, is essential to ensure sustainability of military lands for the mission and the environment. Oftentimes, stewardship efforts include natural resources projects that are proactive, noncompliance conservation efforts to maintain or enhance an installation's natural resources, which demonstrate environmental leadership and stewardship. Stewardship projects, that are not compliance/mission driven are the lowest priority and accomplished when funding is available or alternative sources for completion are identified. Alternative funding sources are outlined later in this section.

5.1.1 Environmental Funds

Environmental funds are a special subcategory of Public Works-Base Operations funds. They are set aside by the Department of Defense for environmental purposes but are still subject to restrictions of Base Operations funds. Environmental funds are most commonly used for projects that return the installation to compliance with federal or state laws, especially if noncompliance is accompanied by Notices of Violation or other enforcement agency actions.

"Must fund" classifications include mitigation identified within *Findings of No Significant Impact* and items required within Federal Facilities Compliance Agreements. This INRMP is a Federal Facilities Requirement Agreement, and some projects and programs

within it are used to mitigate various military activities. In addition, 1997 amendments to the Sikes Act require implementation of INRMPs, which make implementation of this INRMP a priority for funding. That said, full implementation of this INRMP, and all associated natural resources projects, is contingent upon the availability of funds. If funding does not meet the level needed for full implementation, projects and efforts will be prioritized based on importance for mission sustainability and statutory compliance.

In general, most environmental funds are categorized and prioritized as Class 0, 1, 2, and 3 as follows:

- Class 0: Recurring Natural Resources Conservation Management Requirements. Class 0 shall contain any INRMP action necessary to rehabilitate or prevent resource degradation that may affect military readiness.
- Class 1: Current Compliance Requirements. Class 1 shall contain requirements to manage species and habitats of concern to prevent listing of species that could affect military readiness.
- Class 2: Maintenance Requirements
- Class 3: Enhancement Actions Beyond Compliance.

Class 0 and 1 projects are typically deemed “must funds” by DoD. “Must Fund” conservation requirements are those projects and activities that are required to meet recurring natural resources conservation management requirements or current compliance needs. Per DoD policy, accomplishment of all Class 0 and 1 “must fund” projects constitutes the minimal acceptable level of implementation.

Funding for INRMP projects are projected 5 years in advance through the Program Objective Memorandum (POM). Proper planning and management are necessary to set goals and objective years in advance.

5.1.2 Forestry Reimbursable Funds & Forestry Reserve Account

In 1956, Congress provided authority for DoD to retain the receipts from the sale of forest products on military lands and established a reimbursable fund for the DoD's forestry program (Sale of Certain Interests in Land; Logs. 10 USC 2665). These funds are currently administered by the Army Conservation Reimbursable Forestry Program. By statute these funds are to be used “…for operation and maintenance…for all expenses of production of lumber or timber products...”. Other forest-related activities such as urban forestry, land clearing, outreach, and the like are to be funded with Environmental Funds.

Fort Drum’s Natural Resources Branch maintains a sustainable yield of forest products and generates revenue annually from the sale of forest products. These funds are placed in the Army Reimbursable Forestry Program with funds from all other installations. Every year, Fort Drum’s Natural Resources Branch requests funds from the Army Reimbursable Forestry Program for operating expenses for forest management. Army Regulation 200-1 (28 Aug 2007) outlines the collection and expenditure of these funds.

Each year, net proceeds (the amount not utilized by installations for operating expenses) go into a state entitlement fund and/or the DoD Forest Reserve Account (FRA). Beginning in 1982, 40% of net proceeds go into a state entitlement created to

compensate states for tax revenue lost on timber sales—these revenues are intended to be used for roads and schools in the counties affected. The remaining 60% of net proceeds are deposited into the DoD FRA. The FRA funds various natural resources projects for such things as timber management, reforestation, timber stand improvement, inventories, fire protection, construction and maintenance of timber area access roads, purchase of forestry equipment, disease and insect control, planning (including compliance with laws), marking, inspections, sales preparations, personnel training, and sales. In addition to forestry related projects, conservation projects may also funded with FRA funds. FRA funds can be used in multiple fiscal years.

5.1.3 Fish & Wildlife Reimbursable 21X Funds

The Sikes Act authorizes the collection of fees to hunt, trap, or fish on military installations These funds are accounted for in accordance with guidance provided for the appropriation titled “Wildlife Conservation, Military Reservations,” Army account 21X5095 (AR 37-100 and AR 37-108) and are known as “21X funds.” These funds are to be used only on the military installation on which they are collected for fish and wildlife management activities. Army Regulation 200-1 (28 Aug 2007) outlines the collection and expenditure of these funds. Unobligated balances can be accumulated with current fee collections and will carry over to the next fiscal year.

5.1.4 Agricultural Reimbursable Funds

Agricultural funds are derived from agriculture/grazing leases on installations. They are centrally controlled at Department of Army and Major Command levels with no requirements for spending where they were generated. Army Regulation 200-3 (Chapter 2) outlines procedures for the collection and spending of these funds. They are primarily intended to offset costs of maintaining agricultural leases, but they are also available for other uses. These are the broadest use funds available exclusively to natural resources managers. Funds from apiary leases and maple syrup/sap production are included in the agricultural reimbursable accounts.

5.1.5 Other DoD Funding Sources

Installations also have the opportunity to apply for alternative funding from DoD programs

5.1.5.1 Legacy Resource Management Program

The DoD Legacy Resource Management Program funds projects with an emphasis on regional or DoD-wide activities, not installation-specific projects except for national programs (e.g., National Public Lands Day) or demonstration projects. Projects may support the military mission or meet legal or statutory requirements; support or leverage DoD conservation initiatives and programs; or attempt new or innovative conservation management on DoD lands. Fort Drum has applied for these funds in the past and will again in the future.

5.1.5.2 Strategic Environmental Research and Development Program (SERDP) & Environmental Security Technology Certification Program (ESTCP)

Although both Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) fund federal and private sector research and development of new technologies in areas of munitions management and weapons systems and platforms, it also funds areas such as environmental restoration and sustainable infrastructure. Fort Drum and its university partners have applied for these funds in the past and will again in the future.

5.2 Staffing

The current growth of the installation population and supporting infrastructure mentioned at the end of *Section 2.3 Historic Land Use* and new Army initiatives and training demands mentioned in *Section 2.4.1 Mission & Population*, coupled with new environment compliance requirements and already low staffing levels, has created challenges for Fort Drum natural resources management.

5.2.1 Federal & Contract Personnel

As amended by Public Law 108-136, the National Defense Authorization Act of 2004, "Professionally trained civilian biologists in permanent Federal Government career managerial positions are essential to oversee fish and wildlife and natural resources conservation programs and are essential to the conservation of wildlife species on military land."

Staffing levels as of March 2021 have 14 Department of Army Civilian employees and 2 other full-time research associates within the Environmental Division in support of natural resources management on the installation.

5.2.2 Other Personnel

5.2.2.1 Interagency Agreements

Fort Drum can contract with other federal agencies for personnel. The *Intergovernmental Personnel Act* of 1972 (IPA) is a system whereby a federal or state agency "borrows" personnel from other federal or state agencies, including universities, for a limited term and a specific job. If used, Fort Drum would pay the borrowed employee's salary and administrative overhead. Currently a Form 7600 is the Interagency Agreement (IAA) and is utilized to transfer funds for goods and services between federal agencies. The standard IAA form is comprised of two sections: (1) the 7600A serves as the General Terms and Conditions (GT&C) form and (2) the 7600B serves as the Order Requirements and Funding Information (Order) form. All federal agencies recognize the 7600A, but the 7600B varies from agency to agency. The Natural Resources Branch has utilized this process with agreements between Fort Drum and the USDA for a US Forest Service staff member (2007-2009) and an Animal-Plant Health Inspection Service-Wildlife Services staff member (2019-present). Fort Drum is in the process of utilizing an Army-wide 7600A with the US Fish & Wildlife Service to provide seasonal technicians starting in 2024. The Army is currently working on an Army-wide 7600A with the US Geological Survey for future services.

5.2.2.2 Intergovernmental Support Agreements

Intergovernmental Support Agreements (IGSAs), 10 USC 2679, were established through Section 331 of the 2013 National Defense Authorization Act as formal public-public partnerships agreements between Army installations and their State or local governments for the provision, receipt, or sharing of installation support services. The Natural Resources Branch entered into their first IGSA with the State University of New York – College of Environmental Science and Forestry in 2021 which was then amended in 2023. Other IGSAs are being considered.

5.2.2.3 Oak Ridge Institute of Science and Education

Internships are available through the US Department of Energy's Oak Ridge Institute of Science and Education (ORISE). The program is open to those persons currently pursuing a degree or recently graduated within the past five years and allows them opportunities to gain experience in their respective fields. Stipends are equivalent to salaries for employees hired with similar educational backgrounds, and a 25% overhead is added. Installations may assist in the selection of ORISE personnel. ORISE interns were utilized by the Natural Resources Branch at various times—most recently from 2008- 2015 and then starting again in 2024.

5.2.2.4 Student Conservation Association, University Internships, & Volunteers

The Conservation Assistance Program of the *Student Conservation Association* is available to provide graduate students to work on specific projects at Fort Drum. These programs do not require the payment of salaries but do require per diem and housing for participants. There has also been an increased interest by universities in NYS to provide internships at Fort Drum. However, most options are limited because of a lack of housing available for participants and a lack of staff available to additional projects.

5.2.3 Professional Development

To keep current on regulatory requirements and stewardship practices to implement this INRMP and maintain mission sustainability, all staff should attend workshops, conferences, and seminars. Personnel are encouraged to give presentations at these venues, publish in peer-reviewed journals, and/or participate in professional organizations.

Army Regulation 200-1 (28 Aug 2007) in Section 15-3 (a) states that "All personnel who perform tasks that can cause significant environmental impacts will be competent on the basis of appropriate education, training, and/or experience" and (e) "organizations should use the most effective and efficient education and training sources available, such as academia, private vendors, Federal or State agencies, workshops and conferences, and distributive training."

Natural resources professionals on Fort Drum are members of such organizations as the Society of American Foresters, National Military Fish and Wildlife Association, The Wildlife Society, and other professional organizations. Personnel have also presented information at professional meetings of the National Military Fish and Wildlife Association, Sustainable Range Program, Society of American Military Engineers, DoD

Forestry Conference, Society of American Foresters, New York Historical Society; and published findings in peer-reviewed journals such as the Northeastern Naturalist.

5.3 Natural Resources Law Enforcement

The Sikes Act mandates that DoD installations employ adequate numbers of professionally trained natural resources personnel, including law enforcement personnel, to implement the INRMP. The Act authorizes DoD to enforce all federal and state environmental laws, including but not limited to: National Historic Preservation Act, Archeological Resources Protection Act, Endangered Species Act, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, and Clean Water Act when violations occur on the installation. DoD Instruction 5525.17 (3 Aug 2020) states that DoD installation will ensure sufficient numbers of Conservation Law Enforcement Officers (CLEOs) are available and assigned responsibility to perform tasks necessary to ensure military and public users remain in compliance with appropriate environmental, natural, and cultural resource laws and regulations.

Installation CLEOs are part of the Directorate of Emergency Services (DES), Law Enforcement Division. In addition to natural and cultural resources law enforcement, the DES, in conjunction with Headquarters and Headquarters Company US Army Garrison (HHC USAG), provides road and range patrols, police investigations, crime prevention, and physical security. Fort Drum CLEOs enforce all federal and state environmental and natural resources laws as well as Fort Drum regulations. CLEOs also perform traffic, penal, and criminal enforcement activities.

The number of CLEOs on the installation has fluctuated—currently there are three full-time civilian CLEOs. Military Police personnel assist CLEOs during busy seasons or as opportunities allow. The CLEO Section operates under Law Enforcement Policies & Procedures PP-3-4 which establishes uniform procedures for the efficient and professional training and conduct of personnel assigned to the CLEO Section. They are fully equipped with modern enforcement tools, including weapons and mobile radios, 4-wheel drive vehicles, all-terrain vehicles, snowmobiles, and watercraft.

The emphasis of natural resources enforcement on Fort Drum changes with the seasons. The installation experiences a large influx of hunters during the deer hunting season which often means more violations. Due to the co-use nature of a military installation, shooting from a vehicle or from a road and hunting in closed areas is an area of enforcement emphasis. The current enforcement emphasis strategy is adaptable to the needs of the installation.

Fort Drum CLEOs use the Federal Magistrate Court to adjudicate violators who are issued “1805” citations for State or federal natural resources-related violations and Fort Drum regulations. Approximately 120 recreation/natural resources-related citations are issued annually—trespassing/not having a recreation permit is generally the most common citation.

Issuance of a Fort Drum Recreational Access Pass is an administrative function to allow privileges on Fort Drum Military Installation. The advocate of the FD Reg 420-3 and issuance of permits is handled through the DPW-Natural Resources Branch. The CLEO Section will initially suspend recreational privileges through the iSportsman system, but

adjudication, and temporary/permanent revocation of recreational privileges is handled by the Natural Resources Branch and is based on the police report, seriousness of the violation, and any other relevant factors.

Fort Drum has concurrent jurisdiction so enforcement can also be performed by officers with federal or State commissions. The number of NYSDEC Environmental Conservation Officers covering Fort Drum have also fluctuated over time. During deer hunting season, as many as four NYS officers are on or in the immediate area of Fort Drum. Fort Drum CLEOs will coordinate with NYSDEC for special operations and major violations of NYS environmental conservation laws. The USFWS has a local special agent stationed in Albany, NY that Fort Drum CLEOs coordinate with regarding violations of federal fish and wildlife laws. State and federal enforcement officers use District or State courts for case adjudication.

Communication between Natural Resources and Law Enforcement staff has always been critical. *Fort Drum Regulation 420-3 Hunting, Fishing, & Other Outdoor Recreation* is typically reviewed annually between members of the PW-Environmental Division-Natural Resources Branch, DES-Law Enforcement Division-CLEO Section, DPTMS-Training Division-Range Branch; and NYSDEC conservation law enforcement officers. Beginning in 2019, the new iSportsman web site has become the central coordination tool for recreation—for recreationists (obtaining permits and signing in/out for recreational activities); for Range Branch (opening/closing areas for recreation); for the CLEO Section (noting violations and initially suspending recreationists); and for Natural Resources (managing the recreation program, providing information, and adjudicating suspended recreationists).

5.4 Metrics

The following metrics are developed in a two tiered approach to monitor and document performance as well as to provide feedback to management and stakeholders. Tier one is to fulfill annual Installation Status Reporting (ISR) requirements utilizing Common Levels of Service performance metrics which feed directly into the Garrison Commanders Program Management Review process. Tier two metrics are designed to be answered internally or by our stakeholders to assess the effectiveness of INRMP implementation annually.

5.4.1 Tier 1 Installation Status Reporting Metrics

Since 1996 Office of the Assistant Chief of Staff for Installation Management (OACSIM) has been using the ISR services reporting tool to evaluate the quality of performance of the base support Services provided within the “footprint” of an Installation. It includes Services delivered on-post and off post to Army customers (including Soldiers, Military Families, Civilian employees, Retirees, and Contractors). ISR-S focuses on a standard set of base support Services that if produced or provided on an Installation, are the responsibility of the Garrison Commander.

The quality of each Service is evaluated by one or more performance measures. Each performance measure uses one or more data elements related in some manner to generate the performance measure value. That performance measure uses two data elements to calculate the performance measure value. The ratio between the two data

elements is the performance measure value. Each performance measure value is calculated and then compared against the performance standard and subsequently assigned a color rating of Green (adequate), Amber (minimally adequate), Red (inadequate) or Black (major deficiencies) level of Service performance.

The Natural Resources metric is: Percentage of Natural Resource projects completed to number of Natural Resource projects identified in the annual work plan/spend plan for current fiscal year.

To calculate the number, we synthesized the annual work plan (in house DAC labor and projects) critical requirements reported in *Section 5.5 Five Year Work Plan* into the following questions:

Aquatic Resources Management

1. Did the NR Branch complete sufficient planning level surveys/monitoring of aquatic resources to characterize and classify ecological units as necessary to report presence/absence and/or conduct trend analysis?
2. Did the NR Branch complete required wetland bank and mitigation site monitoring?
3. Did the NR Branch complete all required wetland delineations to support installation wetland disturbing activities (construction/training/habitat management)?

Land Resources Management

4. Did the NR Branch complete sufficient planning level surveys/monitoring of land resources to characterize and classify ecological units as necessary to report presence/absence and/or trend analysis?
5. Did the NR Branch implement Integrated Pest Management strategies to effectively treat invasive species?
6. Did the NR Branch conduct all planned forest management harvesting activities?
7. Did the NR Branch complete all planned urban forest management activities?
8. Did the NR Branch complete all planned agricultural management activities?

Fish &Wildlife Resources Management

9. Did the NR Branch complete sufficient planning level surveys/monitoring of Fish & Wildlife species to characterize and classify ecological units as necessary to report presence/absence and/or trend analysis?
10. Did the NR Branch complete sufficient planning level surveys/monitoring of Threatened and Endangered species to characterize and classify ecological units as necessary to report presence/absence and/or trend analysis?
11. Did the NR Branch complete all activities required to comply with ESA, particularly Section 7?
12. Did the NR Branch complete all activities required to monitor and manage all Species at Risk and Candidate Species?
13. Did the NR Branch complete all activities required to monitor, manage and comply with MBTA and Executive Order 13186?

Human-Wildlife Conflict Management

14. Did the NR program conduct all reoccurring management actions to reduce wildlife human conflicts as well as WASH/BASH requirements?

Natural Resources Recreation & Outreach Management

15. Did the NR Branch complete all Garrison taskers for outreach events and stewardship projects?
16. Did the NR Branch meet Sikes Act requirements to support recreational opportunities on the installation?
17. Did the NR Branch complete all approved and Funded GERB projects for the FY?

Scoring for each question is as follows:

- Questions 1,2,4,5,6,8,9,10,12,14,15,16 are all scored quarterly with a successful score resulting in ¼ point.
- Questions 3, 7, 11, 13 are all scored quarterly with successful completion resulting in ¾ point.
- Questions question 17 is only scored in the fourth quarter to represent an annual requirement with a successful score resulting in 1 point.

This weighted system ensures failure of critical elements results in a reduced capability level which will notify leadership of issues requiring immediate resolution. .

Current IMCOM guidance is to operate at CLS Capability Level 2

- CAPABILITY LEVEL 1
  COST FACTOR 100% PERFORMANCE THRESHOLD 100% down to 90%
- CAPABILITY LEVEL 2
  COST FACTOR 90% PERFORMANCE THRESHOLD 89% down to 75%
- CAPABILITY LEVEL 2
  COST FACTOR 80% PERFORMANCE THRESHOLD 74% down to 50%

5.4.2 Tier Two INRMP Implementation

These metrics are concerned with overall implementation of the INRMP defined by management actions in Chapter 4 of this INRMP. These questions are to be answered by installation natural resources staff and specific internal stakeholders.

Forest Management

- % forest Inventory completed? Date last completed?
- # acres of forest managed this FY/CY?
- # acres / % of timber harvests primarily conducted for direct benefit of military mission?
- # acres / % of timber harvests primarily conducted for wildlife habitat creation/enhancement?
- # acres / % of timber harvests primarily conducted for silvicultural purposes?
- # acres of forest harvested due to construction activities?
- # official partnerships/agreements with external entities to implement forest management actions? (This does not apply to contracting actions, but having official agreements with other government agencies, universities, or NGOs.)

Vegetation Management

- Status of Planning Level Survey for flora (% complete)? (At a minimum, this is an installation-wide vascular plant survey that provides a list of plant species with verified nomenclature and classification and to determine the existence of special status species.)
- Status of Planning Level Survey for vegetative communities (% complete)? (At a minimum, the distribution and extent of vegetation communities are described, mapped, field-checked for accuracy, and included in a GIS data layer.)
- # acres / % of non-forest management primarily conducted for wildlife habitat creation/enhancement?
- # official partnerships/agreements with external entities to implement vegetation management actions? (This does not apply to contracting actions, but having official agreements with other government agencies, universities, or NGOs.)

Wetlands Management

- Status of Planning Level Survey for wetlands (% complete)? (At a minimum, wetlands will be identified, classified, mapped, and included in a GIS data layer.)
- # of wetland permits applied for and received from USACE this FY/CY.
- # of wetland permits applied for and received from NYSDEC this FY/CY.
- # (or %) of wetland permits completed through a Section 404 Regional General Permit (RGP) this FY/CY.
- # acres wetlands filled or drained this FY/CY?
- # miles/linear feet of stream lost or impacted this FY/CY?
- # acres wetlands created through mitigation by Cowardin type on-post? Off-post?
- # acres wetland impacts avoided/minimized through project review and design modification?
- # miles/linear feet of stream loss or impact avoided through project review and design modification?

Soil & Water Management

- Status of Planning Level Survey for soil (% complete)? (At a minimum, soils are classified, categorized, described, mapped, and included in a GIS data layer.)
- Status of Planning Level Survey for surface water (% complete)? (At a minimum, the distribution and extent of surface waters will be described, mapped, and included in a GIS layer.)
- Status of Planning Level Survey for topography (% complete)? (At a minimum, a map showing elevational contours and associated data consistent with USGS standards and topographic map products and included in a GIS data layer.)
- Erosion Mgmt: Acres of Land/Stream miles rehabilitated through management actions? (This would be a reactive measure to restore lands after an impact occurred.)
- Erosion Mgmt: Acres of Land/Stream miles protected through management actions? (This would be a proactive measure before impacts occurred (e.g., hardened water crossings.)

- # official partnerships/agreements with external entities to implement vegetation management actions? (This does not apply to contracting actions, but having official agreements with other government agencies, universities, or NGOs.)

Invasive Species Management

- # invasive species on the installation / approximate acreage cover of each species
- # invasive species actively managed
- # invasive species partially managed
- # acreage of invasive species treated this FY/CY
- # official partnerships/agreements with external entities to implement vegetation management actions? (This does not apply to contracting actions, but having official agreements with other government agencies, universities, or NGOs.)

Fish & Wildlife Management

- Status of Planning Level Survey for mammals (% complete)? (At a minimum, this is an installation-wide survey of mammals to provide a list of species with verified nomenclature and determine the existence of special status species.)
- Status of Planning Level Survey for birds (% complete)? (At a minimum, this is an installation-wide survey of birds to provide a list of species with verified nomenclature and determine the existence of special status species.)
- Status of Planning Level Survey for reptiles and amphibians (% complete)? (At a minimum, this is an installation-wide survey of reptiles and amphibians to provide a list of species with verified nomenclature and determine the existence of special status species.)
- Status of Planning Level Survey for fish (% complete)? (At a minimum, this is an installation-wide survey of fish to provide a list of species with verified nomenclature and determine the existence of special status species.)
- Status of Planning Level Survey for aquatic invertebrates (% complete)? (At a minimum, this is an installation-wide survey of aquatic invertebrates to provide a list of species with verified nomenclature and determine the existence of special status species.)
- Status of Planning Level Survey for terrestrial invertebrates (% complete)? (At a minimum, this is an installation-wide survey of terrestrial invertebrates to provide a list of species with verified nomenclature and determine the existence of special status species.)
- Migratory Bird Conservation. What % of habitat or vegetation management projects (or # acres not impacted) are conducted outside the primary nesting season for migratory birds (Apr 15 - Aug 1)? How many acres are impacted during the nesting season and which bird species are affected? (Are other actions taken to minimize or mitigate the impacts of these actions on migratory birds?)
- Migratory Bird Conservation. # of acres of habitat that has been conserved, created, or enhanced for the benefit of migratory birds? Have monitoring projects been implemented to evaluate the success of these habitat actions?
- # official partnerships/agreements with external entities to implement fish and wildlife management actions? (This does not apply to contracting actions, but

having official agreements with other government agencies, universities, or NGOs.)

Pest Management

- Is there an Installation Pest Management Plan? (Include date signed.)
- Are the IPMP and INRMP integrated?
- # of nuisance beaver situations handled? #killed, #dams breached, number of culverts cleaned

Wildlife-Aircraft Strike Hazard Management

- Is there a Wildlife-Aircraft Strike Hazard Plan? (Include date signed.)
- Are the Wildlife-Aircraft Hazard Plan and INRMP integrated?
- Last meeting of Wildlife-Aircraft Hazard Working Group?
- # of reported strikes?
- # and species of wildlife culled?

Law Enforcement

- # of formal meetings with LE & Environmental staff?

Wildland Fire Management

- Is there an Installation Wildland Fire Management Plan? (Include date signed.)
- Are the IWFMP and INRMP integrated?

GIS Management

- Date of the most recent wetlands (NWI) data layer in GIS.
- Date of the most recent soils (NRCS) data layer in GIS.
- Date of the most recent surface water (NWI) data layer in GIS.
- Date of the most recent vegetation cover data layer in GIS.
- Date of the most recent T&E information data layer in GIS.

Leases

- # of Ag leases (activity)
- # acres in ag lease for cropland/hay, grazing, and other
- $ value of services
- $ cost savings

T&E Species and Critical Habitat

These metrics are concerned with federally listed threatened and endangered species. These questions are to be answered by installation natural resources staff.

- # and names of T&E Species
- # ac / % of the installation designated as Critical Habitat
- Status of Planning Level Surveys for T&E species (% complete for each species)? (At a minimum, this survey shall produce a map that shows the kinds and known distribution of federal T&E species.)
- Status of Planning Level Surveys for T&E species habitat (% complete for each species)?
- # of individual consultations with the USFWS this FY/CY.
- # (or %) of consultations completed through a comprehensive Biological Assessment this FY/CY.

- What % of conservation measures of BA (Fort Drum 2015) are being met? If less than 100%, identify which areas and % completeness.
- # acres of habitat impacts avoided/minimized through project review and design modification?
- # acres of habitat that has been conserved, created, or enhanced on the installation for the benefit of endangered species? Have monitoring projects been implemented to evaluate the success of these habitat actions?
- How many acres of habitat have been conserved, created, or enhanced off the installation through installation programs (e.g., ACUB) for T&E species?
- $ Expenditures on T&E Management (for each species).

Public Use & Outdoor Recreation

These metrics are concerned with public use and outdoor recreation. These questions are to be answered by installation natural resources staff.

- Does the installation allow the following activities (hunting, fishing, trapping, wildlife viewing, other). If so, how often?
- How many recreation permits are issued?
- % of recreation permits issued to the public?
- Last revision of installation hunting/fishing regulations?
- Was public outreach conducted? What types of outreach and # of times public outreach conducted?

Ecosystem Integrity

These metrics are concerned with how management actions relate to long-term ecosystem health as well as long-term monitoring. These questions are to be answered by installation natural resources staff and specific internal stakeholders.

- Status of Planning Level Survey for state-listed fauna (% complete)? (Including state endangered, threatened and species of special concern, and species of greatest conservation need, as determined by NYSDEC. At a minimum, the status of these species is assessed and their distribution on the installation mapped.) [On Fort Drum, there are 5 state-endangered species, 7 state-threatened species, & 18 species of special concern)
- Status of Planning Level Survey for state listed rare plant species (% complete)? (Including species as determined by New York Natural Heritage Program. At a minimum, the status of these species is assessed and their distribution on the installation mapped.) [There are 22 rare plant species on Fort Drum.]
- Status of Planning Level Survey for unique ecological communities (% complete)? (Including ecological communities as determined by New York Natural Heritage Program. At a minimum, the status of these communities is assessed and their distribution on the installation mapped.) [On Fort Drum, this would include Northern White Cedar Swamps, Vernal Pools, Dwarf Shrub Bogs, Eastern Lake Ontario Ecoregion Grasslands; Bogs & Fens; and Heritage Sugar Maple Stands.]
- Long-term monitoring for state-listed and/or indicator species (list them): (Yes/No). If “yes” to monitoring, are they increasing, decreasing or stable.
- Long-term monitoring for sensitive vegetation communities (list them): (Yes/No) If “yes” to monitoring, are they good/bad; decreasing/increasing/stable.

Partnership Effectiveness (External Stakeholders)
These metrics are to be answered by natural resources staff and external stakeholders (i.e. USFWS & NYSDEC).

- How many formal meetings were held between the installation & USFWS?
- How many informal meetings were held between the installation & USFWS? (This can include sharing information, discussing issues, etc.)
- Has the installation sought and received support from USFWS, as needed?
- How well has natural resources management supported geographical/regional USFWS objectives (e.g., Migratory Bird Initiative and the Fish Habitat Initiative)? (Not supported, Minimally supported, Satisfactorily supported, Well supported, or Very well supported.)
- Is natural resources program execution meeting USFWS expectations? (Dissatisfied, Minimally satisfied, Somewhat satisfied, Highly satisfied, or Completely satisfied).
- How many formal meetings were held between the installation & NYSDEC?
- How many informal meetings were held between the installation & NYSDEC? (This can include sharing information, discussing issues, etc.)
- Has the installation sought and received support from NYSDEC, as needed?
- How well has natural resources management supported geographical/regional NYSDEC objectives (e.g., State Wildlife Comprehensive Plan)? (Not supported, Minimally supported, Satisfactorily supported, Well supported, or Very well supported.)
- Is natural resources program execution meeting NYSDEC expectations? (Dissatisfied, Minimally satisfied, Somewhat satisfied, Highly satisfied, or Completely satisfied).
- What was the date of the last meeting with USFWS & NYSDEC to discuss INRMP “operations & effect”?

Team Adequacy (Internal Stakeholders)
These metrics are to be answered by natural resources staff and internal stakeholders.

- Are staffing levels of natural resources professionals at the installation adequate to meet current requirements? (Members of the team do not have to be within the natural resources department.) If no, how many professionals are required?
- Does staff have current Individual Development Plans (IDP)? Are training requirements being fulfilled?
- Has the installation received support from the Army field offices/commands as needed?
- What was the date of the last meeting with internal stakeholders to discuss INRMP “operations & effect”?
- How many formal meetings did Training Division and Environmental Division have during the calendar year? (e.g., monthly coordination meetings, Range Facilities Steering Committee meeting, Natural Resources Conservation Meeting, forest management annual work plan review, INRMP review meetings).

INRMP Impact on the Installation Mission
These metrics are to be answered by the Command Group or their designee considering the mission of the installation.

- Has Coordination between natural resources staff and trainers been successful/ effective? Do the Training Division and Environmental Division coordinate and cooperate? (No coordination, Minimal coordination, Satisfactory coordination, Effective coordination, or Highly effective coordination.)
- To what level do NR compliance requirements support the installation's ability to sustain the operational mission? (Cannot accomplish mission requirements; Meet mission requirements, but with significant work-arounds; Meet mission requirements, but with minimal work-arounds; Meet mission requirements, but with diminished value; or Accomplish all mission requirements with no work-arounds.)
- Has there been a net loss of training lands? The Sikes act states that each INRMP shall, where appropriate and applicable, provide for no net loss in the capability of military installations lands to support the military mission of the installation. Has the implementation of the installation INRMP resulted in a net loss of lands to support the military mission? (Yes, to such degree that a training activity could not be conducted on the base; Yes, the loss resulted in modification of the training so that it could be conducted on the base; Yes, a loss occurred but it only affects future training activities; No loss occurred; or No loss occurred and the base was able to recover areas for training previously lost due to natural resources requirements.)
- Does the INRMP process effectively consider current mission requirements? (Strongly disagree, Disagree, Not sure (neutral), Agree, or Strongly agree.)
- How well has natural resources management supported other local/regional/national conservation initiatives including public/community initiatives? (Not supported, Minimally supported, Satisfactorily supported, Well supported, or Very well supported.)

5.5 Five-Year Work Plan

To execute this INRMP, a five-year work plan has been developed for each of the five functional areas.

Table 5.1 Work plan requirements, staffing and prioritization for Aquatic Management Activities.

AQUATIC MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
NEPA project/activities review	Regular	DAC Labor	0
Delineate wetlands for projects	Regular	DAC Labor	0
Prepare USACE/NYSDEC permits for projects	Regular	DAC Labor	0
Facilitate culvert replacement (see Table 4.7)	Regular	DAC Labor	0
Update Aquatic Species Management Plan	Annual	DAC Labor	0
Update Noxious & Invasive Plant Management Plan re: aquatic invasive species	Annual	DAC Labor	0
Update/Create Significant Community & Rare Plant Management Plan re: aquatic plants & communities	Project	DAC Labor	0

AQUATIC MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Build the riparian area GIS layer (RIPARIAN_AREA) and develop a Riparian Condition Score (RCS) for the WCI	2026	DAC Labor	0
Develop the Land Management Activity (LMA) subindex for the WCI	2026	DAC Labor	0
Develop the Slope Highly Erodible Lands (%HEL) subindex for WCI	2026	DAC Labor	0
Update forest management and land cover data for the LCS (Land Condition Score) for the WCI	2026	DAC Labor	
Create Watershed Management Plan	Annual	DAC Labor	0
Program, install, download and redeploy Long Term Monitoring data collection probes	Regular	DAC Labor	0
Collect water chemistry/biological data at LTM sites	Regular	DAC Labor	0
Maintain Flow monitoring cross sections at 11 LTM sites	Regular	DAC Labor	0
Conduct aquatic macroinvertebrate sampling and analysis and fish community assessment from all 13 LTM sites	2024	Project	0
Remove sand deposition from LeRay Reflecting Pool	Annual	DAC Labor	2
Upper Airfield Creek Sediment Remediation and Bed and Bank Stabilization Project	2021-2024	Project	1
Remove north end of Plank Road, reestablish stream	2025	DAC Labor	3
Quarry Pond Fisheries Assessment (nutrients, pumpkinseed populations, trout fishery, etc.)	2025	Project	3
Design/Construct Lower Airfield Creek Sediment remediation and Habitat Restoration	2023-2025	Project	1
Pre-project data collection for Conservation Pond Dredging including bathymetry data, sediment analysis, and dam structure strength analysis.	2024	Project	3
Dredge Conservation Pond to increase the volume of the pond and improve its largemouth bass fishery	2024	Project	3
Monitor the summertime usage of created pool habitat in the West Branch of Black Creek	2022-2026		3
Engineer pools in the West Branch of Black Creek between Warren Swamp and Hwy 3A to improve summer brook trout habitat	2024	DAC Labor	3
Install in-stream structure upstream of Rte. 3A in W. Branch Black Creek	2025	DAC Labor	3
Install in-stream structure downstream of Rte. 3A in W. Branch Black Creek	2026	DAC Labor	3
Reforest riparian area along Rising Warrior Creek	2025	DAC Labor	2
Replace Town of Philadelphia Reservoir Access Road crossing	2025	Project	2
Replace Putney Lane crossing on West Creek	2025	Project	2
Spawning Brook Trout Survey in Pleasant Creek Main and tributaries; West Creek; and West Branch of Black Creek.	2026	Project	3
Fish Contaminant Assessment of Largemouth Bass and Brown Bullhead in Remington Pond, Indian/Narrow Lake, Conservation Pond	2024-2025	Project	3
Conduct installation-wide Invasive Species Survey	2021-2029	Project	2
Invasive treatments Common Reed - chemical	Regular	DAC Labor	2
Invasive treatments Common Reed - mechanical	Regular	DAC Labor	2

AQUATIC MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Invasive treatments Release Purple Loosestrife - beetles	Regular	DAC Labor	2

Table 5.2 Work plan requirements, staffing and prioritization for Land Management Activities.

LAND MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
NEPA project/activities review	Regular	DAC Labor	0
Update forest management plan and create harvest plan	Annual	DAC Labor	0
Vegetation survey and data layer update	Annual	Project	0
Forest stand inventory	Annual	DAC Labor	0
Conduct Timber Stand Improvement (TSI) treatments 600-700 acres	Annual	DAC Labor	0
Conduct commercial timber harvests (administer sales) 550-700 acres (American beech control, thinning, etc.)	Annual	DAC Labor	0
Prepare commercial timber harvests (cruising and marking) 550-700 acres	Annual	DAC Labor	0
Take pre/post timber harvest inventory and photos	Annual	DAC Labor	0
Support tree clearing for annual construction projects	Annual	DAC Labor	0
Tree clearing SWPPP preparation and inspection	Annual	DAC Labor	0
Prepare 25-30 acres of firewood harvesting lots	Annual	DAC Labor	0
Assess hazard trees	Regular	DAC Labor	0
Support urban tree planting projects	Annual	DAC Labor	3
Administer/Monitor Firewood Sales Program	Regular	DAC Labor	0
Collection and Tracking of Local Proceeds	Regular	DAC Labor	0
Fire weather monitoring and reporting	Regular	DAC Labor	0
Oak regeneration in compacted soils TA 5	Annual	DAC Labor	3
TSI in Red Headed Woodpecker Habitat Stands	Annual	DAC Labor	2
Update/Create Significant Community & Rare Plant Management Plan re: terrestrial plants & communities	Project	DAC Labor	0
Conduct a comprehensive survey of rare plants (terrestrial).	2024-2027	Project	3
Assess significant communities and develop a monitoring protocol.	2024-2027	Project	3
Mow grass areas in Warbler blocks to keep out trees	2025	DAC Labor	2
Harvest next set of grouse blocks in TA7A	2030	DAC Labor	0
Harvest next set of grouse blocks in TA14E	2035	DAC Labor	0
Maintain upland sandplains grasslands TA7 by mowing	Annual	DAC Labor	2
Assess and document current and potential pollinator habitat	Annual	DAC Labor	2
Remove woody species from wildflower/pollinator habitat	Annual	DAC Labor	2
Convert roadside buffer zones along main tank trails to maintained grass areas	Annual	DAC Labor	0
Manage invasives within the Bat Conservation Area to improve bat roosting and foraging quality	Annual	Project/DAC Labor	0

LAND MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Cultivate 15-25 ac of non-contiguous habitat and plant a native northeast wildflower seed mix to promote pollinator habitat	Annual	DAC Labor	2
Update Noxious & Invasive Plant Management Plan	Annual	DAC Labor	0
15 m grid survey for invasive species	2021-2029	Project	3
Conduct ongoing buckthorn management in Cantonment Area/BCA	2021-2025	DAC Labor	1
Conduct Wild Parsnip control and reclamation	2021-2025	DAC Labor	2
Swallowwort control	Annual	DAC Labor	2
Japanese Knotweed control	Annual	DAC Labor	2
Oriental Bittersweet control	Annual	DAC Labor	2
Pull existing Himalayan Balsam	Annual	DAC Labor	2
Common Reed control	Annual	DAC Labor	2
Japanese Barberry control	Annual	DAC Labor	2
Purple Loosestrife control	Annual	DAC Labor	2
Conduct biological control for Purple Loosestrife	Annual	DAC Labor	2
Conduct biological control for Spotted Knapweed	Annual	DAC Labor	2
Conduct biological control for Leafy Spurge	Annual	DAC Labor	2
Conduct monitoring of biological control efforts	Annual	DAC Labor	2
Antwerp Cemetery/TA17B swallow-wort control	Annual	DAC Labor	2

Table 5.3 Work plan requirements, staffing and prioritization for Fish/Wildlife Management Activities.

FISH/WILDLIFE MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
NEPA project/activities review	Regular	DAC Labor	0
Update Fort Drum Migratory Bird Management Plan	Annual	DAC Labor	0
Update/Create Bat Conservation Area Management Plan	Annual	DAC Labor	0
Update Fort Drum Herptofaunal Management Plan Management Plan	Annual	DAC Labor	0
Update/Create Fort Drum Mammal Management Plan	Annual	DAC Labor	0
Obtain NYSDEC Collection & Salvage Permit	Annual	DAC Labor	0
Obtain NYSDEC T&E Collection Permit	Annual	DAC Labor	0
T&E Bat Acoustical monitoring	Annual	DAC Labor	0
White-Nose Syndrome Monitoring	Annual	DAC Labor	0
Prepare Biological Assessment for Indiana Bat and Northern Long-eared Bat	2026	DAC Labor	0
Roost tree recruitment planting in BCA (e.g., 1000 Shagbark Hickory)	2024-2025	DAC Labor	0
Assessing Installation Wide Bat Acoustical Monitoring	2025	Project	1
Installation Wide Bat Mist net Survey	2025	Project	0
Monitoring Bald Eagle nest in TA 19	Annual	DAC Labor	0
Grassland Bird Surveys	Annual	DAC Labor	0
Golden-winged Warbler/early Successional habitat Survey	Annual	DAC Labor	0
Sandplain Grassland Bird Survey/Upland Sandpiper Population Assessment in WSAAF	2025	DAC Labor	1
Cerulean Warbler Survey	Annual	DAC Labor	0
Red-headed Woodpecker Survey	Annual	DAC Labor	0
Nightjar Survey	Annual	DAC Labor	0

FISH/WILDLIFE MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
American Woodcock Survey	Biannual	DAC Labor	0
Owl Survey	2024-2025	DAC Labor	0
Forest Hawk Survey	2024	DAC Labor	0
Golden-winged Warbler Demography/Survivability Study	2022-2024	Project	0
Red-headed Woodpecker Nesting Success & Nestling Mortality Assessment	2023-2024	Project	3
Nightjar (Common Nighthawk) Population Assessment & Productivity Study	2024-2026	Project	1
Chimney Swift/Swallow Roost Mitigation	2025	Project	2
TA12/13 grassland bird response to management actions	2024-2027	DAC Labor /Project	
Grassland bird nest monitoring/productivity in sandplains	2025-2026	Project	
Maintenance for Motus Monitoring Stations	2024-2029	Project	2
Amphibian Monitoring Surveys: NAAMP	Annual	DAC Labor	0
Amphibian Monitoring Surveys: Live trapping/Audible Call Surveys	2025	DAC Labor	0
Turtle eDNA Survey	2024	Project	0
Wood and Spotted Turtle Survey and Monitoring	2024-2025	DAC Labor / Project	0
Maintain artificial nesting mounds for Wood Turtles	Annual	DAC Labor	3
Pollinator Planning level Survey	2025	Project	3
Milkweed/Monarch Butterfly Surveys	2024-2025	Project	2
Install, monitor, and upgrade (as needed) Bald Eagle nest camera system	annual	Project/ DAC Labor	0

Table 5.4 Work plan requirements, staffing and prioritization for Human-Wildlife Conflict Management Activities.

HUMAN-WILDLIFE MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Update Fort Drum Human-Wildlife Conflict Management Plan	Annual	DAC Labor	0
USDA-APHIS-Wildlife Services Support	Annual	Project	0
Maintain NYSDEC Article 11-Nuisance Beaver Permit and NYSDEC General Permit-Breaching/Removal of Beaver Dams	Annual	DAC Labor	0
Maintain USFWS Migratory Bird Depredation Permit & submit annual reports	Annual	DAC Labor	0
Maintain NYSDEC Airport Strike Hazard Permit & submit annual reports	Annual	DAC Labor	0
Obtain USFWS Resident Canada Goose Nest and Egg Depredation Permit & submit annual reports	Annual	DAC Labor	0
Obtain NYSDEC Deer Damage Permit & submit annual reports	Annual	DAC Labor	0
Obtain NYSDEC Deer Management Area Program Permits & submit annual reports	Annual	DAC Labor	0
Issue DMAPS	Annual	DAC Labor	0
Respond to inquiries/reports re: wildlife conflict questions/situations	Annual	DAC Labor/ Project	0

HUMAN-WILDLIFE MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Issue press releases for car/collisions, rabies, baby wildlife, etc.	Annual	DAC Labor	0
Continue to cull deer in Cantonment Area	Annual	DAC Labor/ Project	0
Conduct deer browse forest regeneration survey	2025	DAC Labor	0
Conduct Deer Population Assessment in Cantonment Area	2030	Project	0
Maintain “Bear Hotline” to record bear activity	Annual	DAC Labor	0
Maintain bear spray and bear trap for bear incidents	Annual	DAC Labor	0
Search for nests and oil and addle goose eggs. Apply for Egg Oiling Permit and Submit Annual Report	Annual	DAC Labor	0
Capture, band, and relocate Canada Geese in June.	Annual	DAC Labor	0
Trap nuisance beavers/breach dams	Annual	DAC Labor/ Project	1
Maintain bat house to prevent bats from returning to LeRay Mansion	Annual	DAC Labor	3
Conduct tick monitoring transects in Cantonment Area	Annual	DAC Labor	3
Determine most effective integrated approach to manage ticks / 4-posters?	2025-2027	Project	3
Conduct forest pest surveys	Annual	DAC Labor	0

Table 5.5 Work plan requirements, staffing and prioritization for Recreation/Outreach Management Activities.

RECREATION/OUTREACH MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Update Fort Drum Natural Resources Recreation & Outreach Management Plan	Annual	DAC Labor	0
Coordinate FD Reg 420-3 review meeting. Edit FD Reg 420-3 and staff changes.	Annual	DAC Labor	0
Coordinate with conservation law enforcement officers, assist in investigations, communicate with violators of FD Reg 420-3, write letters of revocation, and coordinate with GC office.	Regular	DAC Labor	0
Assist with training for Fort Drum conservation law enforcement officers and temporary military police staff as needed.	Annual	DAC Labor	1
Maintain iSportsman web site for permit issuance, recreation surveys, customer interface, and access control.	Regular	DAC Labor	0
Maintain web site with updated information.	Regular	DAC Labor	2
Maintenance contract with iSportsman for web site.	Annual	Project	0
Maintain social media (Facebook)	Annual	DAC Labor	3
Answer inquiries from recreationists in person, via phone, via email re: recreation on Fort Drum. Stock maps and brochures in kiosk at S2507.	Regular	DAC Labor	0

RECREATION/OUTREACH MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Post/maintain recreational signage (hunting, parking, boundaries, etc.)	Annual	DAC Labor	0
Maintain waterfowl hunting area in TA17B: signage, vegetation removal around parking lot & access trail, functionality of blinds, etc.	Annual	DAC Labor	1
Maintain waterfowl hunting area in TA13A: signage, vegetation removal around parking lot & access trail, functionality of blinds, etc.	Annual	DAC Labor	1
Maintain parking area at grouse blocks in TA14E: signage, vegetation removal around kiosk and parking lot, clean up litter, stock brochures, etc.	Annual	DAC Labor	2
Maintain hiking/nature trails near 45th Infantry Drive, Conservation Pond	Annual	DAC Labor	3
Maintain hiking/nature trails and bridges/docks at Conservation Pond	Annual	DAC Labor	3
Maintain a trail network between the “grouse blocks” in TA 7 and 14	Annual	DAC Labor	3
Maintain signs, trails, and 7 hunting locations for Disabled Access Hunting in CHA44 and TA5E.	Annual	DAC Labor	2
Maintain ATV trails for disabled access hunting in TA6A, 7E, 7F, 7G, and 17D.	Annual	DAC Labor	2
Maintain designated angling sites: signage, vegetation removal of trails and parking lot, clean up litter, ensure maintenance of Indian Lake kiosk, stock brochures, etc.	Regular	DAC Labor	2
Develop Cantonment Area Hunting Safety/Info Briefing	Annual	DAC Labor	2
Coordinate Special Waterfowl Hunting Area lottery	Annual	DAC Labor	2
Ensure placement of latrine at Indian Lake.	Annual	DAC Labor	2
Regularly check status of docks, fishing access trails, and shoreline habitat (vegetation/fallen trees) at Remington Pond. Coordinate with DFWMR Remington Park Manager as necessary.	Regular	DAC Labor	3
Coordinate with NYSDEC to stock Black Creek, Remington Pond, West Branch of Black Creek, & Quarry Pond	Annual	DAC Labor	1
Coordinate with NYSDEC for free fishing events at Remington Pond.	Annual	DAC Labor	1
Coordinate with NYSDEC re: issuance of DMPs	Annual	DAC Labor	1
Update Fort Drum Recreational Use Map	2025	DAC Labor	0
Update Birds of Fort Drum brochure	Annual	DAC Labor	3
Update Angling on Fort Drum brochure	2025	DAC Labor	3
Update Hunting on Fort Drum brochure	2027	DAC Labor	3
Maintain Bldg. 4700 Conservation Cottage and displays, taxidermy mounts, etc.	Regular	DAC Labor	0

RECREATION/OUTREACH MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Organize Maple Days Event in March	Annual	DAC Labor	3
Conduct a public birding field trip on Memorial Day weekend	Annual	DAC Labor	3
Organize Outdoor Adventure Day in mid-August.	Annual	DAC Labor	3
Maintain Bldg. S2507 and informational kiosk.	Regular	DAC Labor	0
Develop a series of designated “camping spots” with a cleared area and fire ring throughout Fort Drum and create a brochure.	2025	DAC Labor	3
Maintain the fishing area at the Indian Lake boat ramp (docks, kayak launcy, latrine, picnic area).	Annual	DAC Labor	2
Create boat Launch and Parking area at Bridge 1 on Indian River	2024	DAC Labor	2
Develop and construct a second dock/pier and fishing access trail for shoreline fishing at Indian Lake	2025	DAC Labor	3
Complete fishing access trail to dock on west side of Remington Pond	2025	DAC Labor	3
Construct parking area, access trail & dock for shoreline fishing at Mud Lake	2025	DAC Labor	2
Increase the dock size or install a different dock to increase shoreline fishing opportunities at Indian Pond.	2025	DAC Labor	3
Construct picnic area & nature/hiking trail along Black Creek	2026	DAC Labor	3
Maintain Bonaparte Trail Complex between FUSA Blvd to Lake Bonaparte	Regular	DAC Labor	3
Develop & construct a nature/hiking trail to Matoon Marsh in TA17.	2025	DAC Labor	3
Develop & construct a nature/hiking trail in TA 18.	2026	DAC Labor	3
Develop a canoe trail for east side of Indian River	2026	DAC Labor	3
Construct a bridge/trail to traverse Mud Lake/Bonaparte Creek from FUSA Blvd to opposite shoreline	2025	DAC Labor	2
LeRay Grounds/Trail Maintenance/Improvement	Annual	DAC Labor	3
Establish a mountain biking trail in TA 7.	2025	DAC Labor	
Establish an area for recreational use near S-2507 (e.g., Frisbee golf course, nature trail, biathlon trail)	2028	DAC Labor	3
Develop a self-guided tour birding brochure	2024	DAC Labor	3
Develop a brochure re: camping and designated “camping spots” throughout Fort Drum	2025	DAC Labor	3
Develop a brochure re: hiking and designated hiking trails/wildlife viewing areas throughout Fort Drum	2025	DAC Labor	3
Develop a Remington Park Recreation Accessibility Plan	2026	Project	3

RECREATION/OUTREACH MANAGEMENT ACTIVITIES	Execution	DAC Labor / Project	Class
Develop a Fort Drum Training Area Recreation Accessibility Plan	2027	Project	3
Create an MOA or some other agreement to utilize/manage the area between the Fort Drum fence line and Black River	2027	DAC Labor	3

Appendix 1: List of Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
ABA	Architectural Barriers Act
ac	acres
ACUB	Army Compatible Use Buffer (re: encroachment)
ADA	American with Disabilities Act of 1990
AMC	Army Materiel Command
ANG	Air National Guard
APHIS	Animal-Plant Health Inspection Service (part of USDA)
AR	Army Regulation
ASP	Ammunition Supply Point
ATV	All-terrain Vehicle
BA	Biological Assessment (re: endangered species)
BASH	Bird-Aircraft Strike Hazard
BCA	Bat Conservation Area
BCE	Before the Common Era
BCT	Brigade Combat Team
Bd	*Batrachochytrium dendobatidis* (chytrid fungus affecting amphibians)
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BOD	Biological Oxygen Demand
BRAC	Base Realignment and Closure
CA	Cantonment Area
CACTF	Combined Arms Collective Training Facility
CE	Common Era
CESU	Cooperative Ecosystems Studies Unit
CFR	Code of Federal Regulations
CLCPA	Climate Leadership and Community Protection Act
CLEO	Conservation Law Enforcement Officer
cm	centimeter
CONUS	Continental United States
CSO	Command Safety Office
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy (state wildlife plan)
CY	Calendar Year
DANC	Development Authority of the North Country
DBH	Diameter at breast height
DDT	Dichloro-diphenyl-trichloroethane
DEM	Digital Elevation Model
DES	Directorate of Emergency Services
DFMWR	Directorate of Families, Morale, Welfare and Recreation
DMAP	Deer Management Assistance Program

DMP	Deer Management Permit
DoD	Department of Defense
DoDFMR	Department of Defense Financial Management Regulation
DoDI	Department of Defense Instruction
DPTMS	Directorate of Plans, Training, Mobilization and Security
DPW	Directorate of Public Works
DU	Ducks Unlimited
DZ	Drop Zone
EA	Environmental Assessment (re: NEPA)
EAB	Emerald Ash Borer (*Agrilus planipennis*)
ECL	Environmental Conservation Law (re: New York State)
EEO	Equal Employment Office
EIS	Environmental Impact Statement (re: NEPA)
EMS	Environmental Management System
EO	Executive Order
EQCC	Environmental Quality Control Committee
ERDC	Engineer Research and Development Center (part of USACE)
ESA	Endangered Species Act
ESTCP	Environmental Security Technology Certification Program
ETC	Eastern Tent Caterpillar (*Malacosoma americanum*)
FAA	Federal Aviation Administration
FAARP	Forward Air Refueling/Re-arming Point
FDMCH	Fort Drum Mountain Community Homes
FD	Fort Drum
FDRLO	Fort Drum Regional Liaison Organization
FGDC	Federal Geographic Data Committee
FNSI	Finding of No Significant Impact (re: NEPA)
FORSCOM	Forces Command
FR	Federal Regulation
FRA	Forest Reserve Account
FTC	Forest Tent Caterpillar (*Malacosoma disstria*)
FY	Fiscal Year
GC	Garrison Commander
GHG	Greenhouse Gas
GIS	Geographic Information System
ha	hectare
HEL	Highly Erodable Lands
ICRMP	Integrated Cultural Resources Management Plan
IGSA	Intergovernmental Support Agreement
IMCOM	Installation Management Command
in	inch
INRMP	Integrated Natural Resources Management Plan

IPA	Intergovernmental Personnel Act of 1972
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
ISR	Installation Status Reporting
ITAM	Integrated Training Area Management
IUCN	International Union for the Conservation of Nature
IWFMP	Integrated Wildland Fire Management Plan
JD	Jurisdictional Determination (re: wetlands)
JLUS	Joint Land Use Study
km	kilometer
LBCC	Lake Bonaparte Conservation Club
LI	Light Infantry
LID	Low Impact Development
LRAM	Land Rehabilitation and Maintenance (re: ITAM)
LTA	Local Training Area
LTM	Long Term Monitoring (re: aquatic resources)
MBTA	Migratory Bird Treaty Act
MCA	Military Construction, Army
MEDCOM	Medical Command
mi	mile
MICC	Mission and Installation Contracting Command
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
NAAMP	North American Amphibian Monitoring Protocol
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NR	Natural Resources
NRCMP	Natural Resources Conflict Management Plan
NRCS	Natural Resources Conservation Service (part of USDA)
NWI	National Wetland Inventory
NYCRR	New York Codes, Rules and Regulations
NYFO	New York Field Office (part of the USFWS)
NYNHP	New York Natural Heritage Program
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health

OACSIM	Office of the Assistant Chief of Staff for Installation Management
ODEP	Office of the Director Environmental Program
OEA	Office of Economic Adjustment
OMA	Operations and Maintenance, Army
ORISE	Oak Ridge Institute for Science and Education (part of Dept. of Energy)
PAIO	Planning, Analysis and Integration Office
PAO	Public Affairs Office
PCB	Polychlorinated Biphenyl
PCN	Pre-Construction Notice
PEA	Programmatic Environmental Assessment
POL	Petroleum, Oil and Lubricants
POM	Program Objective Memorandum
PPQ	Plant Protection Quarantine (part of USDA-APHIS)
PRISM	Partnership for Regional Invasive Species Management
RCI	Residential Communities Initiative
REC	Record of Environmental Consideration (re: NEPA)
RFMSS	Range Facility Management Support System
RFSC	Range Facilities Steering Committee
RGP	Regional General Permit (re: wetlands)
RTLA	Range and Training Land Assessment (formerly Land Condition Trend Analysis (LCTA); re: ITAM)
SAIA	Sikes Act Improvement Act
SAR	Species At Risk
SECP	Sediment and Erosion Control Plan
SERDP	Strategic Environmental Research and Development Program
SFD	Snake Fungal Disease
SGCN	Species of Greatest Conservation Need (re: NYSCWCS / SWAP)
SHPO	State Historic Preservation Office (re: cultural resources)
SJA	Staff Judge Advocate
SLRwP	St. Lawrence River Watershed Partnership
SOP	Standard Operating Procedure
SPDES	State Pollutant Discharge Elimination System
SLELO	St. Lawrence-Eastern Lake Ontario (PRISM: Partnership for Regional Invasive Species Management)
SRM	Sustainment-Restoration-Modernization
SRP	Sustainable Range Program (part of ITAM)
SUNY-ESF	State University of New York – College of Environmental Science & Forestry
SWAP	State Wildlife Action Plan
SWG	State Wildlife Grants
SWPPP	Stormwater Pollution Prevention Plan

TA	Training Area
THTLT	Tug Hill Tomorrow Land Trust
TSI	Timber Stand Improvements
UAV	Unmanned Aerial Vehicle (sometimes TUAV for Tactical Unmanned Aerial Vehicle)
US	United States
USACE	United State Army Corps of Engineers
USAEC	United States Army Environmental Command
USAF	United States Air Force
USC	United State Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service (part of Department of Interior)
USGS	United States Geological Survey
UTI	Urban Tree Inventory
UXO	Unexploded Ordnance
WCI	Watershed Condition Index
WDDT	Wildlife Detection and Dispersal Team
WMA	Wildlife Management Area
WMU	Wildlife Management Unit
WQC	Water Quality Certification (re: wetlands)
WQS	Water Quality Standard
WNS	White-nose Syndrome (re: wildlife diseases and bats)
WS	Wildlife Services (part of USDA-APHIS)
WSAAF	Wheeler-Sack Army Airfield

Appendix 2:

Referenced Natural Resources Management Plans

The following plans are managed by the Natural Resources Branch and can be requested for more details regarding each subject matter area. Most plans are updated annually based on most current field work.

- Fort Drum Aquatic Species Management Plan
- Fort Drum Encroachment Management Plan
- Fort Drum Forest Management Plan
- Fort Drum Herptofaunal Management Plan
- Fort Drum Human-Wildlife Conflict Management Plan
- Fort Drum Migratory Bird Management Plan
- Fort Drum Range Wetland Management Plan

In Progress:

- Fort Drum Bat Conservation Area Management Plan
- Fort Drum Grassland Management Plan
- Fort Drum Mammal Management Plan
- Fort Drum Natural Resources Recreation and Outreach Management Plan
- Fort Drum Noxious and Invasive Plant Management Plan
- Fort Drum Significant Community & Rare Plant Management Plan
- Fort Drum Watershed Management

Appendix 3: Flora Known to Occur on Fort Drum

LIST OF FLORA KNOWN TO OCCUR ON FORT DRUM as of January 2021. An asterisk indicates an introduced species. Plants recognized as rare by the NY Natural Heritage are given rarity rankings after common name if appropriate. (State Rank includes: S1 = 5 or fewer sites in NYS; S2 = 6-20 sites; S3 = 21-35 sites; SH = historical record only; SX = apparently extirpated. Global Rank includes: G1 = 5 or fewer sites throughout its range; G2 = 6-20 sites; G3 = 21-100 sites or a restricted range; G4 = apparently secure throughout its range but possibly rare in parts; G5 = demonstrably secure but possibly rare in parts; T? = status of the species unknown.)

FERNS AND FERN ALLIES

Adiantum pedatum	Fern, Maidenhair
Asplenium platyneuron	Spleenwort, Ebony
Asplenium rhizophyllum	Fern, Walking
Asplenium trichomanes	Spleenwort, Maidenhair
Athyrium angustum	Fern, Lady
Botrychium dissectum	Grape fern, Cut-leaved
Botrychium lanceolatum	Grape fern, Lance-leaf
Botrychium multifidum	Grape fern, Leathery
Botrychium simplex	Moonwort, Least
Botrypus virginianus	Fern, Rattlesnake
Cystopteris bulbifera	Fern, Bulblet Bladder
Cystopteris fragilis	Fern, Common Fragile
Dendrolycopodium dendroideum	Clubmoss, Northern Tree
Dendrolycopodium hickeyi	*Clubmoss, Hickey's*
Dendrolycopodium obscurum	*Clubmoss, Tree*
Dennstaedtia punctilobula	Fern, Hay-scented
Deparia acrostichoides	Spleenwort, Silvery
Diphasiastrum complanatum	Cedar, Ground G5 S1
Diphasiastrum digitatum	Groundcedar; Running-Pine
Diphasiastrum tristachyum	*Ground Cedar*
Dryopteris carthusiana	Wood fern, Spinulose
Dryopteris clintoniana	Fern, Clinton's Shield
Dryopteris cristata	Wood fern, Crested
Dryopteris goldiana	Fern, Goldie's
Dryopteris intermedia	Fern, Fancy
Dryopteris marginalis	Wood fern, Marginal
Equisetum arvense	Horsetail, Field
Equisetum fluviatile	Horsetail, Water
Equisetum hyemale affine	Scouring Rush
Equisetum sylvaticum	Horsetail, Wood
Equisetum variegatum	Horsetail, Variegated
Gymnocarpium dryopteris	Fern, Oak
Homalosorus pycnocarpos	*Fern, Glade*
Huperzia lucidula	Firmoss, Shining
Lycopodiella inundata	Clubmoss, Bog
Lycopodium clavatum	Clubmoss, Staghorn
Lycopodium lagopus	Clubmoss, One-cone
Matteuccia struthiopteris	Fern, Ostrich
Onoclea sensibilis	Fern, Sensitive
Osmunda claytoniana	Fern, Interrupted
Osmunda spectabilis	Fern, Royal
Osmundastrum cinnamomeum	Fern, Cinnamon
Parathelypteris noveboracensis	Fern, New York
Phegopteris connectilis	Fern, Long Beech
Phegopteris hexagonoptera	Fern, Broad Beech
Polypodium virginianum	Polypody, Common
Polystichum acrostichoides	Fern, Christmas
Pteridium aquilinum	Fern, Bracken
Spinulum annotinum	*Clubmoss, Bristly*
Thelypteris palustris	Fern, Marsh
Woodsia ilvensis	Woodsia, Rusty
Woodwardia virginica	Chain Fern, Virginia

GRASSES, SEDGES, AND RUSHES (GRAMINOIDS)

**Agrostis capillaris*	Bent, Colonial
**Agrostis gigantea*	Redtop; Black bent
Agrostis perennans	Bent, Autumn or Upland
Agrostis scabra	Bentgrass; Hairgrass
Agrostis stolonifera	Bent, Creeping or Carpet
Alopecurus aequalis	Foxtail, Short-awn
Ammophila breviligulata	Beachgrass
Andropogon gerardii	Bluestem, Big
Andropogon virginicus	Broom-sedge
Anthoxanthum nitens	Sweetgrass, Indian
**Anthoxanthum odoratum*	Vernalgrass, Sweet
**Arrhenatherum elatius*	Oatgrass, Tall
**Beckmannia syzigachne*	Slough Grass, American
Bolboschoenus fluviatilis	Bulrush, River
Brachyelytrum septentrionale	Shorthusk, Northern
Bromus ciliatus	Brome, Fringed
**Bromus hordeaceus*	Chess, Soft
**Bromus inermis*	Brome, Smooth
**Bromus tectorum*	Chess, Downy
Bulbostylis capillaris	Sand-rush
Calamagrostis canadensis	Bluejoint, Canada
Calamagrostis stricta inexpansa	Reedgrass **G5 S2**
Carex albursina	Sedge
Carex alopecoidea	Sedge, Fox-like
Carex annectens	Sedge, Connecting
Carex aquatilis	Sedge, Aquatic
Carex arctata	Sedge, Compressed
Carex argyrantha	Sedge, Silver
Carex aurea	Sedge, Golden
Carex baileyi	Sedge, Bailey's
Carex bebbii	Sedge, Bebb's
Carex billingsii	Sedge, Billings'
Carex blanda	Sedge, Charming
Carex bromoides	Sedge, Brome-like
Carex brunnescens	Sedge, Brownish
Carex buxbaumii	Sedge **G5 S2**
Carex canescens	Sedge, Silvery
Carex cephaloidea	Sedge, Head-like
Carex communis	Sedge, Common
Carex comosa	Sedge, Bearded
Carex conoidea	Sedge, Cone-shaped
Carex crawfordii	Sedge, Crawford's
Carex crinita	Sedge, Fringed
Carex cristatella	Sedge, Small-crested
Carex cryptolepis	Sedge, Fertile yellow **G4 S3**
Carex debilis var. *rudgei*	Sedge, Weak
Carex deflexa	Sedge, Deflexed
Carex deweyana	Sedge, Dewey's
Carex diandra	Sedge, Two-stamened
Carex disperma	Sedge, Two-seeded
Carex eburnea	Sedge, Ivory

Carex echinata	Sedge, Prickly
Carex flava	Sedge, Yellow
Carex folliculata	Sedge
Carex gracillima	Sedge, Filiform
Carex granularis	Sedge, Granular
Carex gynandra	Sedge
Carex hirtifolia	Sedge, Hairy-leaved
Carex hitchcockiana	Sedge **G5 S3**
Carex houghtoniana	Sedge, Houghton's **G5 S2**
Carex hystericina	Sedge, Porcupine
Carex interior	Sedge, Inland
Carex intumescens	Sedge, Bladder
Carex lacustris	Sedge, Lake
Carex laevivaginata	Sedge, Smooth-Sheathed
Carex lasiocarpa	Sedge, Villose
Carex laxiculmis	Sedge, Loose-culmed
Carex laxiflora	Sedge, Loosely Flowered
Carex lenticularis	Sedge, Lens-Shaped
Carex leptalea	Sedge, Delicate
Carex leptonervia	Sedge, Finely Nerved
Carex limosa	Sedge
Carex lucorum	Sedge
Carex lupulina	Sedge, Hop
Carex lurida	Sedge, Shining
Carex michauxiana	Sedge, Michaux's
Carex normalis	Sedge, Right-angled
Carex novae-angliae	Sedge, New England
Carex oligosperma	Sedge, Few-Seeded **G4 S3**
Carex ormostachya	Sedge
Carex pallescens	Sedge, Pale
Carex paupercula var. *irrigua*	Sedge, Stunted
Carex peckii	Sedge, Peck's
Carex pedunculata	Sedge, Peduncled
Carex pellita	Sedge, Wooly
Carex pensylvanica	Sedge
Carex plantaginea	Sedge, Plantain leaved
Carex platyphylla	Sedge, Broad-leaved
Carex projecta	Sedge, Spreading
Carex pseudocyperus	Sedge, Cyperus-like
Carex radiata	Sedge, Radiate
Carex retrorsa	Sedge, Retrorse
Carex rosea	Sedge, Stellate
Carex rostrata var. *utriculata*	Sedge, Beaked
Carex rugosperma	Sedge
Carex scabrata	Sedge, Rough
Carex scoparia	Sedge, Broom
Carex sparganioides	Sedge, Sparganium-like
Carex sprengelii	Sedge, Sprengel's
Carex stipata	Sedge, Stipitate or Crowded
Carex stricta	Sedge, Tussock
Carex swanii	Sedge, Swan's
Carex tenera	Sedge, Slender
Carex tonsa	Sedge
Carex tribuloides	Sedge, Blunt Broom
Carex trisperma	Sedge, Three-seeded
Carex tuckermanii	Sedge, Tuckerman's
Carex umbellata	Sedge, Umbel-bearing
Carex vesicaria	Sedge, Bladdery
Carex virescens	Sedge, Greenish
Carex viridula	Sedge, Greenish
Carex vulpinoidea	Sedge, Fox
Carex willdenowii	Willdenow's sedge **G5 S2S3**
Carex woodii	Sedge, Wood's
Cinna arundinacea	Woodreed, Stout
Cinna latifolia	Woodreed, Drooping
Cladium mariscoides	Bog-rush; Twig-rush
Cyperus bipartitus	Cyperus; Flat sedge
Cyperus houghtonii	Cyperus; Flat sedge **G4? S3**
Cyperus lupulinus macilentus	Cyperus; Flat sedge
Cyperus schweinitzii	Cyperus; Flat sedge **G5 S2S3**
Cyperus strigosus	Galingale, Umbrella sedge
**Dactylis glomerata*	Grass, Orchard
Danthonia compressa	Oatgrass, Northern
Danthonia spicata	Grass, Poverty
Deschampsia flexuosa	Hairgrass, Common
Dichanthelium acuminatum	Grass, Hairy panic
Dichanthelium clandestinum	Grass, Deer-tongue
Dichanthelium depauperatum	Grass, Poverty Panic
Dichanthelium dichotomum	Grass, Smooth Panic
Dichanthelium linearifolium	Grass, Panic
Dichanthelium xanthophysum	Grass, Panic
Digitaria cognatum	Witchgrass, Fall
**Digitaria ischaemum*	Crabgrass, Smooth
**Digitaria sanguinalis*	Crabgrass, Tall
Dulichium arundinaceum	Sedge, Three-way
**Echinochloa crusgalli*	Grass, Barnyard
Echinochloa muricata	Grass, Cockspur
Eleocharis acicularis	Spikerush; Hairgrass
Eleocharis elliptica	Spikerush, Slender
Eleocharis erythropoda	Spikerush
Eleocharis intermedia	Spikerush
Eleocharis obtusa	Spikerush, Blunt
Eleocharis palustris	Spikerush, Creeping
Elymus hystrix	Bottlebrush
Elymus riparius	Wild-rye, Marsh
Elymus trachycaulus	Wheatgrass, Slender
Elymus virginicus	Wild-rye, Virginia
**Elymus repens*	Quackgrass, Witch-grass
Eragrostis frankii	Lacegrass
**Eragrostis minor*	Lovegrass
Eragrostis pectinacea	Lovegrass
Eragrostis spectabilis	Lovegrass, Purple
Eriophorum vaginatum ssp. *spissum*	Cottongrass
Eriophorum virginicum	Cottongrass, Tawny
**Festuca rubra*	Fescue, Red
Festuca subverticillata	Fescue, Nodding
**Festuca trachyphylla*	Fescue, Sheep
Glyceria borealis	Mannagrass, Northern
Glyceria canadensis	Grass, Rattlesnake
Glyceria grandis	Meadowgrass, Reed
Glyceria melicaria	Mannagrass, Slender
Glyceria septentrionalis	Mannagrass, Floating
Glyceria striata	Mannagrass, Fowl
**Holcus lanatus*	Grass, Velvet
**Hordeum jubatum*	Grass, Squirrel-tail
Juncus acuminatus	Rush, Sharp-fruited
Juncus alpinoarticulatus	Rush, Alpine
Juncus articulatus	Rush, Jointed
Juncus brevicaudatus	Rush, Narrow-panicled
Juncus bufonius	Toad-rush
Juncus canadensis	Rush, Marsh
Juncus dudleyi	Rush, Dudley's
Juncus effusus var. *solutus*	Rush, Soft; Candle-rush
Juncus marginatus	Rush, Grass-leaved
Juncus militaris	Rush, Bayonet
Juncus nodosus	Knot-rush
Juncus pelocarpus	Rush, Brown-fruited
Juncus tenuis	Path-rush
Juncus torreyi	Rush, Torrey's
Leersia oryzoides	Cutgrass, Rice

Leersia virginica	Whitegrass; Cutgrass
**Lolium perenne*	Ryegrass, English
Luzula acuminata	Woodrush
Luzula campestris multiflora	Woodrush, Field
Milium effusum	Milletgrass
Mühlenbergia frondosa	Muhly, Wirestem
Mühlenbergia glomerata	Timothy, Marsh
Mühlenbergia mexicana	Satin-grass; Muhly
Mühlenbergia uniflora	Muhly
Oryzopsis asperifolia	Ricegrass, Spreading
Panicum boreale	Grass, Northern panic
	G5 S3
Panicum capillare	Witchgrass
Panicum philadelphicum	Grass, Panic
Panicum villosissimum	Grass, Panic
	G5 S3?
Panicum virgatum	Switchgrass
Patis racemosa	Ricegrass
Phalaris arundinacea	Canary-grass, Reed
**Phleum pratense*	Timothy
**Phragmites australis*	Reed, Common
Piptatheropsis pungens	Ricegrass, Small
Poa alsodes	Bluegrass, Woodland
**Poa annua*	Bluegrass, Annual
**Poa compressa*	Bluegrass, Canada
Poa palustris	Bluegrass, Fowl
**Poa pratensis*	Bluegrass, Kentucky
Poa saltuensis	Bluegrass, Old-pasture
**Poa trivialis*	Bluegrass, Rough
Rhynchospora alba	Beakrush, White
Rhynchospora capitellata	Beakrush
**Schedonorus arundinaceus*	Fescue, Tall; Reed fescue
**Schedonorus pratensis*	Fescue, Meadow
Schizachne purpurascens	Melic, False
Schizachyrium scoparium	Blue-stem, Little
Schoenoplectus acutus	Bulrush, Hard-stem
Scirpus atrovirens	Bulrush
Scirpus cyperinus	Woolgrass; Bulrush
Scirpus hattorianus	Bulrush
Scirpus microcarpus	Bulrush
Scirpus pendulus	Bulrush
Schoenoplectus subterminalis	Clubrush
Schoenoplectus tabernaemontani	Bulrush, Soft-stem; Tule
**Setaria italica*	Millet, Foxtail
**Setaria pumila*	Foxtail; Pigeongrass
**Setaria viridis*	Foxtail, Green
Sorghastrum nutans	Grass, Indian
Spartina pectinata	Cordgrass, Freshwater
Sphenopholis obtusata major	Wedgegrass, Prairie
**Sporobolus cryptandrus*	Dropseed, Sand
Sporobolus neglectus	Poverty-grass
Sporobolus vaginiflorus	Poverty-grass
Trichophorum alpinum	Cottongrass, Alpine

HERBACEOUS (NON-GRAMINOID) PLANTS

**Abutilon theophrasti*	Velvetleaf
Acalypha virginica	Mercury, Three-seeded
**Achillea millefolium*	Yarrow
**Achillea ptarmica*	Sneezeweed
Acorus americanus	Sweet flag
Actaea pachypoda	Baneberry, White
Actaea rubra	Baneberry, Red
Actaea x *ludovici*	Baneberry
**Aegopodium podagraria*	Goutweed, Goat's Foot
Agalinis tenuifolia	Gerardia; False-foxglove
Agalinis tenuifolia parviflora	Gerardia. False fox-glove
Ageratina altissima	Snakeroot, White
Agrimonia gryposepala	Agrimony
Agrimonia striata	Agrimony
Alisma triviale	Water-plantain
Alisma subcordatum	Water-plantain
**Alliaria petiolata*	Mustard, Garlic
Allium canadense	Garlic, Wild; Wild onion
**Allium schoenoprasum*	Chives, Wild
Allium tricoccum	Leek, Wild; Ramp
**Alyssum alyssoides*	Alyssum
Amaranthus retroflexus	Amaranth, Red-rooted
Ambrosia artemisiifolia	Ragweed
Amphicarpaea bracteata	Hog peanut
Anaphalis margaritacea	Everlasting, Pearly
Anemone canadensis	Anemone, Canada
Anemone quinquefolia	Anemone, Wood
Anemone virginiana	Thimbleweed
Antennaria neglecta	Pussytoes; Everlasting
Antennaria plantaginifolia	Pussytoes; Everlasting
Apios americana	Groundnut, Wild bean
Apocynum androsaemifolium	Dogbane, Rosy
Apocynum cannabinum	Indian hemp, Dogbane
Aquilegia canadensis	Columbine, Red
**Aquilegia vulgaris*	Columbine, Purple
Aralia hispida	Sarsaparilla, Bristly
Aralia nudicaulis	Sarsaparilla, Wild
Aralia racemosa	Spikenard
**Arctium lappa*	Burdock, Great
**Arctium minus*	Burdock, Common
**Arenaria serpyllifolia*	Sandwort, Thyme-leaved
Arethusa bulbosa	Swamp Pink **G4 S2**
Arisaema triphyllum	Jack-in-the-Pulpit
**Artemisia absinthium*	Wormwood; Absinthe
**Artemisia vulgaris*	Mugwort; Felon-herb
Asarum canadense	Wild Ginger
Asclepias incarnata	Milkweed, Swamp
Asclepias syriaca	Milkweed, Common
Asclepias tuberosa	Milkweed, Butterfly
**Asparagus officinalis*	Asparagus
Aster puniceus var. *firmus*	Aster, Cornel-leaf
**Barbarea vulgaris*	Rocket, Yellow
**Berteroa incana*	Alyssum, Hoary
**Bidens aristosa*	Beggar-ticks, Midwestern
Bidens beckii	Water-marigold, Beck's
	G4G5 S3
Bidens cernua	Bur-marigold
Bidens connata	Beggar-ticks; Stick-tights
Bidens frondosa	Beggar-ticks, Stick-tight
**Bidens tripartita*	Beggar-ticks, Stick-tight
Bidens vulgata	Beggar-ticks, Stick-tight
Blitum capitatum	Strawberry-blight
Boechera stricta	Rock-cress, Drummond's
	G5 S2
Boehmeria cylindrica	False-nettle
Brasenia schreberi	Water-shield
**Brassica juncea*	Mustard, Brown or Indian
Calla palustris	Calla; Water Arum
Callitriche heterophylla	Water-Starwort
Callitriche palustris	Water-Starwort
Calopogon tuberosus	Grass Pink
Caltha palustris	Marsh Marigold
Calystegia sepium	Bindweed, Hedge
Calystegia spithamea	Bindweed, Low
Campanula aparinoides	Bellflower, Marsh
**Campanula rapunculoides*	Bellflower
Campanula rotundifolia	Bluebell
Capnoides sempervirens	Corydalis, Pink
**Capsella bursa-pastoris*	Shepherd's Purse
Cardamine concatenata	Toothwort, Cut-leaved
Cardamine diphylla	Crinkleroot, Toothwort
Cardamine pensylvanica	Bittercress, Pennsylvania
Cardamine pratensis	Cuckoo-flower

Caulophyllum thalictroides	Blue Cohosh
**Centaurea jacea*	Knapweed, Brown
**Centaurea stoebe micranthos*	Knapweed, Bushy
**Centaurea nigra*	Knapweed, Black
**Centaurium erythraea*	Centaury
**Cerastium arvense*	Chickweed, Field
**Cerastium fontanum*	Chickweed, Mouse-eared
Cerastium nutans	Chickweed, Nodding
Ceratophyllum demersum	Coontail
Ceratophyllum echinatum	Hornwort **G4? S3**
**Chaenorrhinum minus*	Snapdragon, Dwarf
Chamaenerion angustifolium	Fireweed
**Chelidonium majus*	Celandine, Greater
Chelone glabra	Turtlehead
**Chenopodium album*	Lamb's Quarters
Chenopodiastrum simplex	Goosefoot, Maple-leaf
Chimaphila umbellata	Pipsissewa, Prince's Pine
Chrysosplenium americanum	Saxifrage, Golden
**Cichorium intybus*	Chicory
Cicuta bulbifera	Water-hemlock, Bulb-bearing
Cicuta maculata	Water-hemlock
Circaea alpina	Enchanter's Nightshade, Small
Circaea canadensis	Enchanter's Nightshade, Large
**Cirsium arvense*	Thistle, Canada
Cirsium discolor	Thistle, Field
**Cirsium vulgare*	Thistle, Bull or Common
Claytonia caroliniana	Spring-beauty
Clematis virginiana	Virgin's Bower
**Clinopodium acinos*	Mother-of-Thyme
**Clinopodium vulgare*	Basil
Clintonia borealis	Lily, Bluebead. Cornlily.
Comandra umbellata	Toadflax, Bastard
**Convallaria majalis*	Lily of the Valley
**Convolvulus arvensis*	Bindweed, Field
Coptis trifolia	Goldthread
Corallorhiza trifida	Coralroot, Pale or Early
**Coreopsis lanceolata*	Coreopsis
Cornus canadensis	Bunchberry
**Crepis tectorum*	Hawk's-beard
Crocanthemum canadense	Frostweed; Rockrose
**Cycloloma atriplicifolium*	Pigweed, Winged
**Cynanchum louiseae*	Swallowwort, Pale
**Cynanchum rossicum*	Swallowwort, Black
Cynoglossum virginianum boreale	Comfrey, Wild **G5T4T5 S1S2**
Cypripedium acaule	Ladyslipper, Pink
Cypripedium arietinum	Ladyslipper, Ram's Head **G3 S2**
Cypripedium parviflorum	Ladyslipper, Yellow
Cypripedium reginae	Ladyslipper, Showy
**Daucus carota*	Queen Anne's Lace
Decodon verticillatus	Water-Willow
Desmodium canadense	Tick-trefoil, Giant
**Dianthus armeria*	Pink, Deptford
**Dianthus deltoides*	Pink, Maiden
Dicentra canadensis	Squirrel-corn
Dicentra cucullaria	Dutchman's Breeches
**Dipsacus fullonum*	Teasel, Common
Doellingeria umbellata	Aster, Flat-topped
**Draba verna*	Whitlow-grass
Drosera rotundifolia	Sundew, Round-leaved
Drymocallis arguta	Cinquefoil, Tall
Echinocystis lobata	Cucumber, Wild
**Echium vulgare*	Vipers bugloss, Blueweed
Elodea canadensis	Waterweed; Elodea
Epifagus virginiana	Beech-drops
Epilobium ciliatum	Willow-herb
Epilobium coloratum	Willow-herb
**Epilobium hirsutum*	Willow-herb
Epilobium leptophyllum	Willow-herb
**Epipactis helleborine*	Helleborine; Weed-orchid
Erigeron annuus	Daisy Fleabane
Erigeron canadensis	Horseweed
Erigeron philadelphicus	Daisy Fleabane
Erigeron strigosus	Daisy Fleabane
Eriocaulon aquaticum	Pipewort; Hatpins
**Erysimum cheiranthoides*	Mustard, Wormseed
Erythronium americanum	Troutlily; Dog-tooth violet
Eupatorium perfoliatum	Boneset
Eutrochium maculatum	Joe Pye Weed
**Euphorbia esula*	Spurge, Leafy; Wolf's Milk
Euphorbia maculate	Spurge; Spotted
Euphorbia glyptosperma	Spurge; Eyebane
Euphorbia vermiculata	Spurge, Hairy
**Euphrasia stricta*	Eyebright
Eurybia macrophylla	Aster, Big-leaved
Euthamia graminifolia	Goldenrod, Grass-leaved
Fallopia cilinodis	*Bindweed, Fringed*
**Fallopia convolvulus*	*Bindweed, Black*
Filipendula rubra	Queen-of-the Meadow
**Filipendula ulmaria*	Queen-of-the-Meadow
Fragaria vesca americana	Strawberry, Woodland
Fragaria virginiana	Strawberry, Wild
Galearis spectabilis	Orchis, Showy
**Galeopsis bifida*	Hemp-nettle
Galium aparine	Bedstraw, Cleavers
Galium asprellum	Bedstraw, Rough
Galium circaezans	Licorice, Wild
Galium lanceolatum	Licorice, Wild
**Galium mollugo*	Bedstraw, White
Galium palustre	Bedstraw, Ditch
Galium tinctorium	Bedstraw, Cleavers
Galium trifidum	Bedstraw, Small; Cleavers
Galium triflorum	Bedstraw, Sweet-scented
Gentiana andrewsii	Gentian, Bottle or Closed
Gentiana linearis	Gentian, Closed
Geranium bicknellii	Geranium; Cranesbill
Geranium robertianum	Herb-robert
Geum aleppicum	Avens, Yellow
Geum canadense	Avens, White
Geum fragarioides	Strawberry, Barren
Geum laciniatum	Avens, Rough
Geum macrophyllum	Avens
Geum rivale	Avens, Purple
**Glechoma hederacea*	Gill-over-the-ground
**Gnaphalium uliginosum*	Cudweed, Low; Everlasting
Goodyera pubescens	Rattlesnake-plantain, Downy
Gratiola neglecta	Hedge Hyssop
Hackelia virginiana	Stickseed; Beggar-lice
Hedeoma pulegioides	Mock-Pennyroyal
Helenium autumnale	Sneezeweed
Helianthus divaricatus	Sunflower, Woodland
Heliopsis helianthoides	Ox-eye
**Hemerocallis fulva*	Day-lily, Orange
Hepatica nobilis var. *acuta*	Liverleaf
Hepatica nobilis var. *obtusa*	Liverleaf
**Hesperis matronalis*	Dame's Rocket

Heteranthera dubia	Stargrass, Water
**Hieracium aurantiacum*	Hawkweed, Orange
**Hieracium caespitosum*	King-devil
**Hieracium piloselloides*	King-devil, Glaucous
Hieracium scabrum	Hawkweed, Rough
Hippuris vulgaris	Mare's-tail **G5 S1**
Houstonia caerulea	Bluets, Quaker Ladies
Houstonia longifolia	Bluets, Pale
Humulus lupulus	Hop, Common
**Hydrocharis morsus-ranae*	Frog's-bit
Hydrocotyle americana	Pennywort, Water
Hydrophyllum virginianum	Waterleaf, Virginia
Hylodesmum glutinosum	Wood Tick-trefoil, Sticky
Hylodesmum nudiflorum	Tick-trefoil
**Hylotelephium telephium*	Live-forever
Hypericum boreale	St. John's-wort, Northern
Hypericum canadense	St. John's-wort, Canadian
Hypericum ellipticum	St. John's-wort, Pale
Hypericum fraseri	St. John's-wort, Marsh; Pink
Hypericum mutilum	St. John's-wort, Dwarf
**Hypericum perforatum*	St. John's-wort
Hypericum punctatum	St. John's-wort
Hypopitys monotropa	Pinesap
Impatiens capensis	Jewelweed, Spotted
**Impatiens glandulifera*	Balsam, Himalayan
**Inula helenium*	Elecampane
Ionactis linariifolia	Aster, Stiff
Iris versicolor	Iris, Wild; Blue flag
Isoëtes echinospora	Quillwort
Lactuca biennis	Lettuce, Blue
Lactuca canadensis	Lettuce, Wild
**Lactuca serriola*	Lettuce, Prickly
Laportea canadensis	Wood-nettle
**Lathyrus latifolius*	Everlasting-pea
Lathyrus palustris	Vetchling
Lechea intermedia	Pinweed
Lemna minor	Duckweed
Lemna trisulca	Duckweed, Star
**Leonurus cardiaca*	Motherwort
**Lepidium campestre*	Cow-cress
**Lepidium densiflorum*	Peppergrass
**Leucanthemum vulgare*	Daisy, Ox-eye
Lilium canadense	Lily, Canada
**Linaria vulgaris*	Butter-and-eggs
Lindernia dubia	Pimpernel, False
Linnaea borealis	Twinflower
Liparis loeselii	Twayblade, Bog or Fen
**Lithospermum officinale*	Gromwell, European
Lobelia cardinalis	Cardinal Flower
Lobelia inflata	Indian-Tobacco
Lobelia kalmii	Lobelia, Kalm's or Brook
Lobelia spicata	Lobelia, Pale-spiked
**Lotus corniculatus*	Bird's Foot Trefoil
Ludwigia palustris	Purslane, Water
Lycopus americanus	Bugle-weed, Water horehound
Lycopus uniflorus	Bugle-weed, Water horehound
Lycopus virginicus	Bugle-weed, Water horehound
Lysimachia borealis	Starflower, Maystar
Lysimachia ciliata	Loosestrife, Fringed
**Lysimachia nummularia*	Creeping-Charlie, Moneywort
Lysimachia quadrifolia	Loosestrife, Whorled
Lysimachia terrestris	Swamp Candles
Lysimachia thyrsiflora	Loosestrife, Tufted
**Lythrum salicaria*	Loosestrife, Purple
Maianthemum canadense	Mayflower, Canada
Maianthemum racemosum	Solomon's seal, False
Maianthemum stellatum	Solomon's seal, Starry
Maianthemum trifolium	Solomon's seal, Three-leaf
Malaxis unifolia	Adder's-mouth, Green
**Malva moschata*	Musk-mallow
**Malva neglecta*	Cheeses
**Matricaria discoidea*	Pineapple-weed
Medeola virginiana	Cucumber-root, Indian
**Medicago lupulina*	Black medick
**Medicago sativa*	Alfalfa
Melampyrum lineare	Cow-wheat
**Melilotus alba*	Sweet-clover, White
**Melilotus officinalis*	Sweet-clover, Yellow
Mentha arvensis	Mint, Field
**Mentha x piperita*	Peppermint; Bergamot mint
Menyanthes trifoliata	Buckbean, Bogbean
Micranthes pensylvanica	*Saxifrage, Swamp*
Micranthes virginiensis	*Saxifrage, Early*
Mimulus ringens	Monkeyflower, Common
Mitchella repens	Partridge berry
Mitella diphylla	Miterwort
Mitella nuda	Miterwort
Moehringia lateriflora	Sandwort, Grove
Monarda fistulosa	Bergamot, Wild
Moneses uniflora	Pyrola, One-flowered
Monotropa uniflora	Indian-pipe
Myosotis laxa	Forget-me-not
**Myosotis scorpioides*	Forget-me-not
**Myriophyllum spicatum*	Milfoil, Eurasian Water
Nabalus albus	Rattlesnakeroot; Lion's Foot
Nabalus altissimus	Rattlesnakeroot; Lion's Foot
Nabalus trifoliolatus	Gall-of-the-earth
Najas flexilis	Naiad
**Narcissus poeticus*	Narcissus, Poet's
**Nepeta cataria*	Catnip
Nuphar x rubrodisca	Pondlily; Spatterdock
Nuphar variegata	Pondlily, Yellow
Nymphaea odorata	Water-lily, White
Oclemena acuminata	Aster, Whorled Wood
**Odontites vernus*	Bartsia, Red; Eyebright
Oenothera biennis	Evening-primrose, Common
Oenothera parviflora	Evening-primrose
Oenothera perennis	Sundrops
Orobanche uniflora	Cancer-root, One-flowered
Osmorhiza claytonii	Sweet Cicely
Osmorhiza longistylis	Anise-root
Oxalis dillenii ssp. *filipes*	Wood-sorrel; Wood-shamrock
Oxalis montana	Wood-sorrel, Common
Oxalis stricta	Lady's Sorrel
**Oxybasis glauca*	Goosefoot, Oak-leaf
Packera paupercula	Groundsel, Balsam
Panax quinquefolius	Ginseng; Sang
Panax trifolius	Ginseng, Dwarf
**Papaver orientale*	Poppy, Oriental
**Pastinaca sativa*	Parsnip, Wild
Peltandra virginica	Arrowleaf, Arrow-arum
**Penstemon digitalis*	False-Foxglove
Penstemon hirsutus	Beard-tongue
Penthorum sedoides	Ditch-stonecrop
Persicaria amphibia	Smartweed, Water
**Persicaria arifolia*	Tearthumb, Halberd-leaved

**Persicaria hydropiper*	Water-pepper, Smartweed
Persicaria hydropiperoides	Water-pepper, Mild
**Persicaria lapathifolia*	Smartweed, Pale
Persicaria pensylvanica	Pinkweed
**Persicaria maculosa*	Lady's Thumb
Persicaria punctata	*Smartweed, Water*
Persicaria sagittata	Tearthumb, Arrow-leaved
Persicaria virginiana	Jumpseed
Phlox divaricata	Phlox, Blue
**Phlox paniculata*	Phlox, Fall
Phlox subulata	Phlox, Moss or Mountain
Phryma leptostachya	Lopseed
Physalis heterophylla	Ground Cherry, Clammy
Physostegia virginiana	Dragonhead, False
Phytolacca americana	Pokeweed
Pilea pumila	Clearweed
**Plantago lanceolata*	Plantain, English
**Plantago major*	Plantain, Common
Plantago rugelii	Plantain, Rugel's
Platanthera aquilonis	Orchid, Northern green
Platanthera clavellata	Orchid, Green woodland
Platanthera flava	Orchid, Tubercled
Platanthera lacera	Orchid, Ragged fringed
Platanthera obtusata	Orchid, Blunt-leaaved
Platanthera orbiculata	Orchid, Large round-leaf
Platanthera psycodes	Orchid, Small Purple Fringed
Podophyllum peltatum	May-apple
Podostemum ceratophyllum	Riverweed; Rivermoss **G5 S2**
Pogonia ophioglossoides	Pogonia, Rose
Polygaloides paucifolia	Gay-wings; Fringed Polygala
Polygala polygama	Milkwort, Bitter
Polygala sanguinea	Milkwort, Rose
Polygala verticillata	Milkwort, Whorled
Polygonatum biflorum	Solomon's Seal, Small
Polygonatum pubescens	Solomon's Seal
Polygonum articulatum	Jointweed
**Polygonum aviculare* ssp. *depressum*	Doorweed
Pontederia cordata	Pickerel-weed
**Portulaca oleracea*	Purslane
Potamogeton amplifolius	Pondweed, Broad-leaved
**Potamogeton crispus*	Curly Pondweed
Potamogeton epihydrus	Pondweed
Potamogeton hillii	Pondweed, Hill's **G3 S2**
Potamogeton illinoensis	Pondweed
Potamogeton natans	Pondweed, Floating
Potamogeton perfoliatus	Pondweed, Clasping-leaved
Potamogeton berchtoldii	Pondweed, Small
Potamogeton richardsonii	Pondweed, Red-head
Potamogeton robbinsii	Pondweed
Potamogeton zosteriformis	Pondweed, Flat-stem
**Potentilla argentea*	Cinquefoil, Silvery
Potentilla norvegica	Cinquefoil, Three-leaved
Potentilla palustris	Cinquefoil, Marsh
**Potentilla recta*	Cinquefoil, Rough-fruited
Potentilla simplex	Cinquefoil, Old-field
**Poterium sanguisorba*	Salad-burnet
**Primula veris*	Cowslip
Proserpinaca palustris crebra	Mermaid-weed
**Prunella vulgaris*	Heal-all
Pseudognaphalium macounii	Cudweed; Everlasting
Pseudognaphalium obtusifolium	Everlasting, Sweet
Pycnanthemum tenuifolium	Mountain-mint
Pycnanthemum virginianum	Mountain-mint
Pyrola americana	Pyrola, Round-leaved
Pyrola chlorantha	Shinleaf, Green
Pyrola elliptica	Shinleaf
Ranunculus abortivus	Buttercup, Kidney-leaf
**Ranunculus acris*	Buttercup, Common
Ranunculus hispidus caricetorum	Buttercup, Swamp
Ranunculus longirostris	Water-crowfoot, White
Ranunculus recurvatus	Buttercup, Hooked
**Ranunculus repens*	Buttercup, Creeping
**Reseda lutea*	Mignonette, Yellow
**Reynoutria japonica japonica*	Knotweed, Japanese
**Ribes aureum*	Currant, Golden
Ribes americanum	Currant, Wild Black
Ribes cynosbati	Gooseberry, Prickly
Ribes glandulosum	Currant, Skunk
Ribes hirtellum	Gooseberry, Northern
Ribes lacustre	Currant, Swamp Black
Ribes triste	Currant, Swamp Red
Rorippa aquatica	Lake-cress; Rivercress **G4? S2**
Rorippa palustris	Watercress, Marsh
Rosa blanda	Rose, Smooth
Rosa palustris	Rose, Swamp
Rubus allegheniensis	Blackberry, Common
Rubus dalibarda	Dewdrop
Rubus flagellaris	Dewberry, Northern
Rubus hispidus	Dewberry, Swamp
Rubus idaeus	Raspberry, Red
Rubus occidentalis	Raspberry, Black
Rubus odoratus	Raspberry, Purple Flowering
Rubus pubescens	Raspberry, Dwarf
**Rudbeckia hirta*	Black-eyed-Susan
Rudbeckia laciniata	Black-eyed-Susan
**Rumex acetosella*	Sheep Sorel
**Rumex crispus*	Dock, Curly
**Rumex obtusifolius*	Dock, Red Veined or Bitter
Rumex verticillatus	Dock, Swamp
Sagittaria latifolia	Wapato; Duck-potato
Samolus valerandii	Pimpernel, Water; Brookweed
Sanguinaria canadensis	Bloodroot
Sanicula marilandica	Snakeroot, Black
Sanicula trifoliata	Snakeroot; Sanicle
**Saponaria officinalis*	Soapwort, Bouncing-bet
Sarracenia purpurea	Pitcher Plant
**Scleranthus annuus*	Knawel; German Knot-Grass
**Scorzoneroides autumnalis*	Dandelion, Fall; Hawkbit
Scutellaria galericulata	Skullcap, Marsh
Scutellaria lateriflora	Skullcap, Mad-dog
**Securigera varia*	Crown-vetch
**Sedum acre*	Stonecrop, Mossy
Senecio hieraciifolius	Pilewort, Fireweed
Silene antirrhina	Catch-fly, Sleepy or Sticky
**Silene flos-cuculi*	Ragged-robin
**Silene latifolia*	Campion, White
**Silene noctiflora*	Catchfly, Night-flowering
**Silene vulgaris*	Bladder-Campion
**Sinapis arvensis*	Charlock, Wild mustard
Sisyrinchium angustifolium	Blue-eyed grass
Sisyrinchium montanum	Blue-eyed grass
Sium suave	, Water
Solanum carolinense	Horse-nettle; Ball nightshade

**Solanum dulcamara*	Nightshade, Deadly
**Solanum nigrum*	Nightshade, Black
Solidago arguta	Goldenrod, Cut-leaf
Solidago bicolor	Goldenrod, White
Solidago caesia	Goldenrod, Blue-stemmed
Solidago canadensis	Goldenrod, Common
Solidago flexicaulis	Goldenrod, Zig-zag
Solidago gigantea	Goldenrod, Tall
Solidago hispida	Goldenrod, Hairy
Solidago juncea	Goldenrod, Early
Solidago nemoralis	Goldenrod, Gray or Rough
Solidago puberula	Goldenrod, Downy
Solidago rugosa	Goldenrod, Rough-leaved
Solidago uliginosa	Goldenrod, Swamp or Bog
Solidago uliginosa linoides	Goldenrod, Swamp or Bog
**Sonchus arvensis*	Sow-thistle
**Sonchus arvensis uliginosus*	Sow-thistle
**Sonchus asper*	Sow-thistle, Spiny
**Sonchus oleraceus*	Sow-thistle
Sparganium americanum	Bur-reed
Sparganium angustifolium	Bur-reed, Narrow-leaved
Sparganium emersum	Bur-reed, Green-fruited
Sparganium eurycarpum	Bur-reed, Giant
Sparganium fluctuans	Bur-reed, Floating
Sparganium nutans	Bur-reed, Small **G5 S2**
Spiranthes cernua	Lady's-tresses, Autumn
Spiranthes lacera	Lady's-tresses, Slender
Spiranthes lucida	Lady's-tresses, Shining
Spirodela polyrhiza	Duckweed, Giant
**Sporobolus cryptandrus*	Dropseed, Sand
**Stachys palustris*	Woundwort
**Stellaria graminea*	Stitchwort, Lesser
Stellaria longifolia	Starwort, Needle-leaf
**Stellaria media*	Chickweed, Common
Streptopus amplexifolius	Twisted-stalk, Clasping-leaved
Streptopus roseus	Twisted-stalk, Rose
Stuckenia pectinata	Pondweed, Sago
Symphyotrichum boreale	Aster, Rush or Bog **G5 S2**
Symphyotrichum cordifolium	Aster, Heart Leaved
Symphyotrichum ericoides	Aster, White Wreath; Heath
Symphyotrichum lanceolatum var. *lanceolatum*	Aster, Tall White
Symphyotrichum lateriflorum	Aster, Calico
Symphyotrichum novae-angliae	Aster, New England
Symphyotrichum ontarionis	Aster, Ontario **G5 S3**
Symphyotrichum pilosum	Aster, Heath
Symphyotrichum prenanthoides	Aster, Zig-zag
Symphyotrichum puniceum	Aster, Purple-stemmed
Symplocarpus foetidus	Skunk Cabbage
**Tanacetum vulgare*	Tansy
**Taraxacum officinale*	Dandelion
Thalictrum dioicum	Meadow-rue, Early
Thalictrum pubescens	Meadow-rue, Tall
Tiarella cordifolia	Foamflower
**Tragopogon dubius*	Goat's Beard
**Tragopogon pratensis*	Goat's Beard, Yellow
Trichostema dichotomum	Blue-curls
**Trifolium arvense*	Clover, Rabbit's Foot
**Trifolium aureum*	Clover, Yellow Hop
**Trifolium campestre*	Hop-clover, Low
**Trifolium hybridum*	Clover, Alsike
**Trifolium pratense*	Clover, Red
**Trifolium repens*	Clover, White or Lawn
Trillium erectum	Trillium, Purple or Red
Trillium grandiflorum	Trillium, White
Trillium undulatum	Trillium, Painted
Triosteum aurantiacum	Horse gentian
Turritis glabra	Mustard, Tower
**Tussilago farfara*	Coltsfoot
Typha angustifolia	Cat-tail, Narrow-leaf
Typha latifolia	Cat-tail, Common
Urtica dioica ssp. *gracilis*	Nettle, Stinging
Utricularia cornuta	Bladderwort, Horned
Utricularia geminiscapa	Bladderwort **G4G5 S3**
Utricularia gibba	Bladderwort, Cone-spur
Utricularia intermedia	Bladderwort, Milfoil
Utricularia macrorhiza	Bladderwort, Common
Utricularia minor	Bladderwort **G5 S3**
Uvularia grandiflora	Bellwort
Uvularia perfoliata	Bellwort
Uvularia sessilifolia	Wild-oats; Merrybells
Vallisneria americana	Tapegrass
Veratrum viride	Hellebore, False or White
**Verbascum lychnitis*	Mullein, Moth
**Verbascum thapsus*	Mullein
Verbena hastata	Vervain, Blue
Verbena urticifolia	Vervain, White
Veronica americana	Speedwell, American
**Veronica arvensis*	Speedwell, Corn
**Veronica officinalis*	Speedwell
Veronica peregrina xalapensis	Speedwell,Purslane **G5T5 S3**
Veronica scutellata	Speedwell, Marsh
**Veronica serpyllifolia*	Speedwell, Thyme-leaved
**Vicia cracca*	Vetch, Cow
**Vicia tetrasperma*	Vetch, Lentil
**Vinca minor*	Periwinkle; Myrtle
Viola adunca	Violet, Hookspur
Viola affinis	Violet, LeConte's
Viola blanda	Violet, Sweet White
Viola canadensis	Violet, Canada
Viola labradorica	Violet, American Dog
Viola cucullata	Violet, Blue Marsh
Viola macloskeyi ssp. *pallens*	Violet, Sweet White
Viola pubescens	Violet, Yellow
Viola renifolia	Violet, Kidney-leaved
Viola rostrata	Violet, Long-spurred
Viola rotundifolia	Violet, Early Yellow
Viola sagittata	Violet, Northern Downy
Viola sororia	Violet, Common
Wolffia borealis	Watermeal
Wolffia columbiana	Watermeal
Xanthium strumarium	Cocklebur; Clotbur
Zizia aurea	Golden Alexanders

SHRUBS

Acer spicatum	Maple, Mountain
Alnus incana ssp. *rugosa*	Alder, Speckled or Tag
Amelanchier sanguinea	Juneberry, Roundleaf
Amelanchier spicata	Juneberry; Shadbush
Andromeda glaucophylla	Bog Rosemary
Aronia melanocarpa	Chokeberry, Black
**Berberis vulgaris*	Barberry, Common
Cephalanthus occidentalis	Buttonbush
Chamaedaphne calyculata	Leatherleaf
Comptonia peregrina	Sweet-fern
Cornus alba	Dogwood, Red osier
Cornus alternifolia	Dogwood, Pagoda

Cornus amomum	Dogwood, Silky
Cornus racemosa	Dogwood, Stiff or Gray
Cornus rugosa	Dogwood, Round Leaved
Corylus cornuta	Hazelnut, Beaked; Hazel
Crataegus crus-galli	Hawthorn, Cockspur
Crataegus punctata	Hawthorn
Diervilla lonicera	Honeysuckle, Bush
Dirca palustris	Leatherwood
Epigaea repens	Trailing Arbutus
**Frangula alnus*	Buckthorn, Smooth
Gaultheria hispidula	Snowberry, Creeping
Gaultheria procumbens	Wintergreen, Checkerberry
Gaylussacia baccata	Huckleberry, Black
Hamamelis virginiana	Witch-hazel
Ilex verticillata	Winterberry Holly
Juniperus communis	Juniper, Pasture
Kalmia angustifolia	Laurel, Sheep
Kalmia polifolia	Laurel, Pale
Lindera benzoin	Spice-bush
**Lonicera* x *bella*	Honeysuckle, European
Lonicera canadensis	Honeysuckle, Fly
Lonicera hirsuta	Honeysuckle, Hairy
**Lonicera morrowii*	Honeysuckle, Fly
Lonicera oblongifolia	Honeysuckle, Swamp fly
**Lonicera tatarica*	Honeysuckle, Tartarian
Lonicera villosa	Honeysuckle, Nothern Fly
Myrica gale	Sweet-gale
Nemopanthus mucronatus	Holly, Mountain
Potentilla fruticosa	Cinquefoil, Shrubby
Prunus nigra	Plum, Canada or Wild
Rhamnus alnifolia	Buckthorn, Alder-leaved
Rhododendron groenlandicum	Labrador Tea
Rhus typhina	Sumac, Staghorn
Salix eriocephala	Willow, Heart-leaved or Stiff
Salix humilis	Willow, Prairie or Gray
Salix lucida	Willow, Shining
Salix pedicellaris	Willow, Bog
Salix petiolaris	Willow, Slender
**Salix purpurea*	Willow, Purple or Basket
Salix pyrifolia	Willow, Balsam **G5 S3**
Salix sericea	Willow, Silky
Salix serissima	Willow, Autumn
Sambucus nigra ssp. *canadensis*	Elderberry, Black
Sambucus racemosa pubens	Elderberry, Red
Shepherdia canadensis	Soapberry; Buffalo-berry
**Sorbaria sorbifolia*	Spiraea, False
Spiraea alba	Meadow-sweet
Spiraea alba var. *latifolia*	Meadow-sweet
Spiraea tomentosa	Hardhack, Steeple-bush
Staphylea trifolia	Bladdernut
Symphoricarpos albus	Snowberry
**Symphoricarpos occidentalis*	Wolfberry
**Syringa vulgaris*	Lilac
Taxus canadensis	Yew, American
Toxicodendron vernix	Sumac, Poison
Vaccinium angustifolium	Blueberry, Lowbush
Vaccinium corymbosum	Blueberry, Highbush
Vaccinium macrocarpon	Cranberry, Large
Vaccinium myrtilloides	Blueberry, Velvetleaved
Vaccinium oxycoccos	Cranberry, Small
Vaccinium pallidum	Blueberry, Pale
Viburnum acerifolium	Viburnum, Maple-leaf
Viburnum dentatum lucidum	Arrowwood
Viburnum lantanoides	Hobblebush, Witch-hobble
Viburnum lentago	Nannyberry
Viburnum nudum cassinoides	Wild raisin
Viburnum opulus americanum	Cranberry, Highbush
Viburnum rafinesquianum	Arrowwood, Downy
Zanthoxylum americanum	Prickly Ash

TREES

Abies balsamea	Fir, Balsam
Acer ×freemanii	Maple, Freeman's
**Acer negundo*	Box-Elder
Acer nigrum	Maple, Black
**Acer palmatum*	Maple, Japanese
Acer pensylvanicum	Maple, Striped
**Acer platanoides*	Maple, Norway
Acer rubrum	Maple, Red
Acer saccharinum	Maple, Silver
Acer saccharum	Maple, Sugar
**Aesculus hippocastanum*	Horse-chestnut
Amelanchier arborea	Shadbush
Amelanchier laevis	Shadbush, Smooth
Betula alleghaniensis	Birch, Yellow
Betula lenta	Birch, Sweet or Black
Betula papyrifera	Birch, Paper or White
Betula populifolia	Birch, Gray
Carpinus caroliniana	Musclewood; Blue-beech
Carya cordiformis	Hickory, Bitternut
Carya glabra	Hickory, Pignut
Carya ovata	Hickory, Shagbark
Castanea dentata	Chestnut, American
Celtis occidentalis	Hackberry
Fagus grandifolia	Beech, American
Fraxinus americana	Ash, White
Fraxinus nigra	Ash, Black
Fraxinus pennsylvanica	Ash, Red or Green
Juglans cinerea	Butternut **G4 S4**
Juglans nigra	Walnut, Black
Juniperus virginiana	Cedar, Red
Larix laricina	Tamarack
**Malus pumila*	Apple
Ostrya virginiana	Hop Hornbeam; Ironwood
**Picea abies*	Spruce, Norway
Picea glauca	Spruce, White
Picea mariana	Spruce, Black
Picea rubens	Spruce, Red
Pinus banksiana	Pine, Jack
Pinus resinosa	Pine, Red
Pinus rigida	Pine, Pitch
Pinus strobus	Pine, White
**Pinus sylvestris*	Pine, Scotch
Platanus occidentalis	Sycamore
**Populus alba*	Poplar, Silver-or White
Populus balsamifera	Poplar, Balsam
Populus deltoides	Cottonwood; Poplar
Populus grandidentata	Aspen, Big-toothed
Populus tremuloides	Aspen, Quaking
Prunus pensylvanica	Cherry, Fire or Pin
Prunus serotina	Cherry, Black
Prunus virginiana	Cherry, Choke
Quercus alba	Oak, White
Quercus coccinea	Oak, Scarlet
Quercus macrocarpa	Oak, Mossy-cup or Bur
Quercus rubra	Oak, Northern Red
Quercus velutina	Oak, Black
**Rhamnus cathartica*	Buckthorn, Common
**Robinia pseudoacacia*	Locust, Black
**Salix alba*	Willow, White
Salix amygdaloides	Willow, Peach-leaf
**Salix babylonica*	Willow, Weeping
Salix bebbiana	Willow, Bebb's

Salix discolor	Pussy-willow
**Salix X fragilis*	Willow, Crack
Salix nigra	Willow, Black
**Salix x rubens*	Willow
Sorbus americana	Mountain Ash
Sorbus decora	Mountain Ash, Rowan tree
Thuja occidentalis	Cedar, White; Arbor Vitae
Tilia americana	Basswood
Tsuga canadensis	Hemlock
Ulmus americana	Elm, American
**Ulmus pumila*	Elm, Siberian or Dwarf
Ulmus rubra	Elm, Slippery; Red
Ulmus thomasii	Elm, Rock or Cork

G5 S2S3

WOODY VINES

**Celastrus orbiculatus*	Oriental Bittersweet
Celastrus scandens	Bittersweet
Lonicera dioica	Honeysuckle, Wild
Menispermum canadense	Moonseed
Parthenocissus quinquefolia	Virginia Creeper
Parthenocissus inserta	Virginia Creeper, Woodbine
Smilax herbacea	Greenbrier, Smooth
Smilax hispida	Greenbrier, Bristly
Toxicodendron radicans	Poison Ivy
Vitis riparia	Grape, Frost or Riverbank

Appendix 4: Fauna Known to Occur on Fort Drum

LIST OF FAUNA KNOWN TO OCCUR ON FORT DRUM as of March 2021. Federally listed species are noted with FT (Federal Threatened) and FE (Federal Endangered); state listed species are noted with SSC (Species of Special Concern), ST (State Threatened, and SE (State Endangered); introduced species are noted with I (Introduced).

INSECT SPECIES

Except where otherwise noted all insect and invertebrate taxonomy based on (1) Arnett, R.H. 2000. American Insects: A Handbook of the Insects of North America North of Mexico, 2nd edition, CRC Press, 1024 pp; (2) Marshall, S.A. 2013. Insects: Their Natural History and Diversity, Firefly Books, Buffalo, NY, 732 pp.; (3) Bugguide.net, 2003-2017, http://www.bugguide.net/node/view/15740, Iowa State University.

ORDER COLEOPTERA--Beetles

Taxonomy based on (1) Arnett, R.H., M.C. Thomas, P.E. Skelley, and J.H. Frank. 2000, 2002. American Beetles, Volumes I and II, CRC Press, 1344 pp; (2) Pearson, D.L, C.B. Knisley, and C.J. Kazilek. 2006. A Field Guide to the Tiger Beetles of the United States and Canada, Oxford University Press, Oxford, UK, 227 pp.

FAMILY GYRINIDAE—Whirligig Beetles
Dinetus sp.
Gyrinus sp.

FAMILY CARABIDAE—Ground Beetles
Bembidion versicolor
Calleida punctata
Chlaenius sericeus Green Ground Beetle
Cicindela duodecimguttata Twelve-spotted Tiger Beetle
Cicindela formosa Big Sand Tiger Beetle
Cicindela longilabris Boreal Long-lipped Tiger Beetle
Cicindela punctulata Punctured Tiger Beetle
Cicindela purpurea Cowpath Tiger Beetle
Cicindela sexguttata Six-spotted Tiger Beetle
Cicindela scutellaris Festive Tiger Beetle
Cicindela tranquebarica Oblique-lined Tiger Beetle
Ellipsoptera lepida Ghost Tiger Beetle
Harpalus erraticus
Lebia ornata
Scarites subterraneus Big-headed Ground Beetle

FAMILY HALIPLIDAE—Crawling Water Beetles
Haliplus sp.
Peltodytes sp.

FAMILY NOTERIDAE—Burrowing Water Beetles
Hydrocanthus sp.
Pronoterus sp.

FAMILY DYSTISCIDAE—Predaceous Diving Beetles
Agabus sp.
Copelatus sp.
Dytiscus harrassii Harris's Diving Beetle
Hydroporus sp.
Hygrotus sp.
Ilybius sp.
Laccophilus maculosus
Laccophilus sp.
Nebrioporus sp.
Neoporus sp.

FAMILY HYDROPHILIDAE—Water Scavenger Beetles
Ametor sp.
Berosus sp.
Crenitis sp.
Helochares sp.
Helocombus sp.
Helophorus sp.
Hydrobius sp.
Hydrochus sp.
Laccobius sp.
Paracymus sp.
Sperchopsis sp.
Tropisternus sp.

FAMILY SILPHIDAE—Carrion Beetles
Necrophilia americana American Carrion Beetle
Nicrophorus orbicollis Roundneck Sexton Beetle
Nicrophorus vespilloides Boreal Carrion Beetle

FAMILY STAPHYLINIDAE—Rove Beetles
Acidota sp.
Paederus littorarius
Sunius confluentus
Tachinus fimbriatus
Thinobius sp.

FAMILY LUCANIDAE—Stag Beetles
Lucanus placidus

FAMILY GEOTRUPIDAE—Earth-boring Scarab Beetles
Geotrupes splendidus Splendid Earth-boring Beetle

FAMILY SCARABAEIDAE—Scarab Beetles
Ceruchus piceus
Cotalpa lanigera Goldsmith Beetle
Diplotaxis sordida
Euphoria inda Bumble Flower Beetle
Euphoria fulgida Emerald Euphoria
Macrodactylus subspinosus/ angustatus Rose Chafer
Pelidnota punctata Grapevine Beetle
Phyllophaga sp. May Beetle
Popillia japonica Japanese Beetle

Trichiotinus affinis Hairy Flower Scarab
Trichiotinus assimilis Bee-mimic Beetle

FAMILY SCIRTIDAE—Marsh Beetles
Elodes sp.
Prionocyphon sp.

FAMILY BUPRESTIDAE—Metallic Wood-boring Beetles
Agrilus cyanescens
Agrilus ruficollis Red-necked Cane Borer
Brachys ovatus
Buprestis striata
Chalcophora fortis
Chalcophora virginiensis Scupltured Pine Borer
Dicerca sp.
Poecilonota cyanipes Eastern Poplar Buprestid

FAMILY ELMIDAE—Riffle Beetles
Ancyronyx sp.
Cleptelmis sp.
Dubiraphia sp.
Gonielmis sp.
Macronychus glabratus
Microcylloepus sp.
Neoelmis sp.
Optioservus sp.
Oulimnius sp.
Promoresia sp.
Stenelmis sp.
Zaitzevia sp.

FAMILY DRYOPIDAE—Long-toed Water Beetles
Helichus sp.

FAMILY PSEPHENIDAE—Water Penny Beetles
Dicranopselaphus sp.
Ectopria sp.
Psephenus sp.

FAMILY PTILODACTYLIDAE—Toe-winged Beetles
Anchytarsus sp.

FAMILY ELATERIDAE—Click Beetles
Alaus oculata Eyed Click Beetle
Ampedus nigricollis
Athous brightwelli
Athous neacanthus
Limonius sp.
Sylvanelater cylindriformis

FAMILY LYCIDAE—Net-winged Beetles
Caenia dimidiata
Calopteron reticulatum Banded Net-winged Beetle
Calopteron terminale End Band Net-winged Beetle
Leptoceletes basalis
Plateros sp.

FAMILY LAMPYRIDAE—Fireflies
Ellychnia corrusca Winter Firefly
Lucidota atra Black Firefly
Photinus consimilis
Photuris sp.
Pyractomena angulata
Pyractomena borealis
Pyropyga decipiens

FAMILY CANTHARIDAE—Soldier Beetles
Atalantycha bilineata Two-lined Leatherwing
Atalantycha neglecta
Chauliognathus pensylvanicus Goldenrod Soldier Beetle
Podabrus rugosulus
Rhagonycha mollis
Rhagonycha sp.

FAMILY MORDELLIDAE—Tumbling Flower Beetles
Mordella sp.
Mordellistena sp.

FAMILY RIPIPHORIDAE—Wedge-shaped Beetles
Ripiphorus fasciatus complex

FAMILY TENEBRIONIDAE—Darkling Beetles
Bolitotherus cornutus Forked Fungus Beetle
Lobopoda punctulata

FAMILY MELOIDAE—Blister Beetles
Epicauta funebris Margined Blister Beetle
Epicauta pennsylvanica Black Blister Beetle
Lytta sayi
Meloe sp. Oil Beetle
Nemognatha nemorensis
Tricrania sanginipennis Red-winged Blister Beetle
Zonitis bilineata

FAMILY PYROCHROIDAE—Fire-colored Beetles
Pedilus sp.

FAMILY CLERIDAE—Checkered Beetles
Enoclerus nigripes Red-bellied Clerid
Phyllobaenus pallipennis
Trichodes nuttalli Red-blue Checkered Beetle

FAMILY MELYRIDAE—Soft-winged Flower Beetles
Attalus terminalis

FAMILY TROGOSSITIDAE—Bark-gnawing Beetles
Gynocharis quadrilineata

FAMILY PHALACRIDAE—Shining Flower Beetles
Olibrus sp.

FAMILY COCCINELLIDAE—Lady Beetles
Anatis mali Eye-spotted Lady Beetle
Anisosticta bitriangularis Marsh Lady Beetle
Brachiacantha ursina Orange-spotted Lady Beetle
Chilocorus stigma Twice-stabbed Lady Beetle
Coccinella novemnotatus Nine-spotted Lady Beetle
Coccinella septempunctata Seven-spotted Lady Beetle
Coccinella trifasciata Three-banded Lady Beetle

Coleomegilla maculata Spotted Lady Beetle
Cycloneda munda Polished Lady Beetle
Harmonia axyridis Multicolored Asian Lady Beetle
Hippodamia convergens Convergent Lady Beetle
Hippodamia glacialis Glacial Lady Beetle
Hippodamia variegata Variegated Lady Beetle
Propylea quatuordecimpunctata Fourteen-spotted Lady Beetle
Psyllobora vigintimaculata Twenty-spotted Lady Beetle

FAMILY NITIDULIDAE—Sap Beetles
Conotelus obscurus Obscure Sap Beetle

FAMILY CUCUJIDAE—Flat Bark Beetles
Cucujus clavipes Red Flat Bark Beetle

FAMILY CERAMBYCIDAE—Long-horned Beetles

Clytus ruricola	
Cyrtophorus verrucosus	
Desmocercus palliates	Elderberry Borer
Knulliana cincta	Banded Hickory Borer
Megacyllene robinae	Locust Borer
Monochamus scutellatus	White-spotted Sawyer
Strangalepta abbreviata	
Saperda tridentata	Elm Borer
Tetraopes tetraopthalmus	Red Milkweed Beetle
Typocerus velutinus	Banded Longhorn Beetle

FAMILY ORSODACNIDAE—Ravenous Leaf Beetles

Orsodacne atra

FAMILY CHRYSOMELIDAE—Leaf Beetles

Acalymma vittatum	Striped Cucumber Beetle
Aphthona lacertosa	
Altica chalybea	Grape Flea Beetle
Calligrapha multipunctata	Common Willow Calligrapha
Calligrapha philadelphica	Dogwood Leaf Beetle
Calligrapha vicina	Dogwood Leaf Beetle
Capraita sp.	
Cerotoma trifurcata	Bean Leaf Beetle
Charidotella sexpunctata	Golden Tortoise Beetle
Chrysochus auratus	Dogbane Beetle
Chrysolina quadrigemina/hyperici	
Chrysomela sp.	
Diabrotica barberi	Northern Corn Rootworm
Diabrotica undecimpunctata	Spotted Cucumber Beetle
Donacia sp.	
Exema sp.	
Galerucella calmoriensis	Black-margined Loosestrife Beetle
Galerucella pussilla	
Labidomera clivicollis	Swamp Milkweed Leaf Beetle
Lema daturaphila	Three-lined Potato Beetle
Microrhopala excavata	
Neoclamisus sp.	
Pachybrachis nigricornis	
Paria sp.	
Phyllotreta striolata	Striped Flea Beetle
Plagiometriona clavata	Clavate Tortoise Beetle
Plagiodera versicolora	Imported Willow Leaf Beetle
Pyrrhalta viburni	Viburnum Leaf Beetle
Sumitrosis inaequalis	
Systena marginalis	Margined Leaf Beetle
Trirhabda adela	
Trirhabda borealis	Goldenrod Leaf Beetle
Xanthonia decemnotata	Ten-spotted Leaf Beetle

FAMILY CURCULIONIDAE—Snout & Bark Beetles

Anthonomus signatus	Strawberry Bud Weevil
Ceutorhynchus americanus	
Cianus scrophulariae	Figwort Weevil
Conotrachelus posticatus	
Donus zoilus	Clover Leaf Weevil
Hylobius transversovittatus	
Larinus planus	Canada Thistle Bud Weevil
Listronotus sp.	European Snout Beetle
Odontocorynus sp.	
Otiorhynchus ovatus	Strawberry Root Weevil
Polydrusus formosus	Green Immigrant Leaf Weevil
Rhodobaenus tredecimpunctatus	Cocklebur Weevil

ORDER DERMAPTERA--Earwigs

FAMILY FORFICULA

Forficula auricularia (European Earwig)

ORDER DIPTERA—True Flies

Taxonomic sources include (1) Kits, J.H., Marshall, S.A., and Evenhuis, N.L. 2008. The bee flies (Diptera: Bombyliidae) of Ontario, with a key to the species of eastern Canada. Canadian Journal of Arthropod Identification No. 6, 06 March 2008; (2) Thomas, A.W. and Marshall S. A. 2009. Tabanidae of Canada, east of the Rocky Mountains 1: a photographic key to the species of Chrysopsinae and Pangoniinae (Diptera: Tabanidae). Canadian Journal of Arthropod Identification No. 8, 25 June 2009; (3) Thomas, A. Tabanidae of Canada, east of the Rocky Mountains 2: a photographic key to the genera and species of Tabaninae (Diptera: Tabanidae) Canadian Journal of Arthropod Identification No.13, 16 February 2011; (4) Jackson, M.D., Marshall, S.A., Hanner, R. and Norrbom, A.L. 2011. The Fruit Flies (Tephritidae) of Ontario. Canadian Journal of Arthropod Identification No. 15, May 24 2011; (5) Miranda, G.F.G, Young, A.D., Locke, M.M., Marshall, S.A., Skevington, J.H., Thompson, F.C. 2013. Key to the Genera of Nearctic Syrphidae. Canadian Journal of Arthropod Identification No. 23, 23 August, 2013.

FAMILY PTYCHOPTERIDAE—Phantom Crane Flies

Bittacomorpha clavipes	Phantom Crane Fly
Ptychoptera quadrifasciata	

FAMILY LIMONIIDAE—Limoniid Crane Flies

Antocha sp.	
Cladura flavoferruginea	
Dactylolabis sp.	
Epiphragma fasciapenne	Band-winged Crane Fly
Erioptera needhami	
Hexatoma sp.	
Limnophila rufibasis	
Limnophila sp.	
Limonia annulata	
Limonia cinctipes	
Molophilus sp.	
Ormosia sp.	
Pilaria sp.	
Pseudolimnophila luteipennis	

Family Pediciidae—Pediciid Crane Flies

Dicranota sp.

Family Tipulidae—Large Crane Flies

Ctenophora nubecula
Tanyptera dorsalis
Leptotarsus sp.
Nephrotoma eucera
Nephrotoma ferruginea
Nephrotoma tenuis
Prionocera sp.
Tipula borealis

Tipula bicornis
Tipula ultima
Tipula furca
Tipula sayi
Tipula tephrocephala
Tipula tricolor

FAMILY TRICHOCERIDAE—Winter Crane Flies
Trichocera sp.

FAMILY BIBIONIDAE—March Flies
Bibio longipes
Bibio sp.

FAMILY CECIDOMYIIDAE—Gall Midges
Rhabophaga strobiloides Willow Pinecone Gall Midge

FAMILY MYCETOPHILIDAE—Fungus Gnats
Boletina sp.
Docosia sp.
Leptomorphus sp.

FAMILY CERATOPOGONIDAE—Biting Midges
Alluaudomyia sp.
Atrichopogon sp.
Bezzia sp.
Culicoides sp.
Mallochohelea sp.
Monohelea sp.
Probezzia sp.
Stilobezzia sp.

FAMILY CHIRONOMIDAE—Midges
Chironomus sp.
Cladotanytarsus sp.
Conchapelopia sp.
Cricotopus bincintus
Cricotopus/Orthocladius complex
Cryptochironomus sp.
Cryptotendipes sp.
Dicrotendipes sp.
Einfeldia natchitocheae
Endochironomus subtendens
Microspectra sp.
Microtendipes pedellus
Parametriocnemus sp.
Paraphaenocladius sp.
Paratanytarsus sp.
Paratendipes sp.
Polypedelium aviceps
Polypedelium flavum
Polypedelium illinoense
Polypedelium scalaenum
Polypedelium sp.
Procladius sp.
Rheotanytarsus exiguus
Stempellina sp.
Stempellinella sp.
Stictochironomus sp.
Smittia sp.
Tanytarsus sp.
Thienemanniella sp.
Thienemannimyia sp.

FAMILY CULICIDAE--Mosquitoes
Anopheles sp.
Ochlerotatus canadensis

FAMILY DIXIDAE—Meniscus Midges
Dixa sp.
Dixella sp.

FAMILY SIMULIIDAE—Black Flies
Ectemnia sp.
Prosimulium sp.
Simulium vittatum complex
Simulium sp.
Stegoperna sp.

FAMILY PSYCHODIDAE—Moth Flies and Sand Flies
Pericoma sp.

FAMILY STRATIOMYIDAE—Soldier Flies
Actina viridis
Caloparyphus sp.
Myxosargus sp.
Hedriodiscus vertebratus
Odontomyia sp.
Stratiomys badia

FAMILY ATHERICIDAE—Watersnipe Flies
Atherix sp.

FAMILY PELECORHYNCHIDAE
Glutops sp.

FAMILY RHAGIONIDAE—SNIPE FLIES
Chrysopilus proximus
Chrysopilus thoracicus Golden-backed Snipe Fly
Rhagio mystaceous Common Snipe Fly

FAMILY TABANIDAE—Horse and Deer Flies
Chrysops cincticornis
Chrysops frigidus
Chrysops geminatus
Chrysops indus
Chrysops lateralis
Chrysops macquarti
Chrysops mitis
Chrysops moechus
Chrysops montanus
Chrysops shermani
Chrysops univittatus
Chrysops venus
Chrysops vittatus
Hybomitra lasiopthalma
Silvius sp.
Tabanus atratus
Tabanus quinquevittatus

FAMILY ASILIDAE—Robber Flies
Atomosia puella
Dioctria hyalipennis
Diogmites basilis
Efferia aestuans
Holcocephala calva
Holopogon sp.
Laphria canis complex
Laphria flavicollis
Laphria index
Machimus lecythus
Machimus notatus
Machimus sadyates
Machimus snowii
Neoitamus flavofemoratus
Proctacanthus milberti
Promachus bastardii
Stichopogon trifasciatus Three-banded Robber Fly

FAMILY BOMBYLIIDAE—Bee Flies

Anthrax albofasciatus	
Anthrax georgica	
Bombylius atriceps	unnamed Bee Fly
Bombylius major	Greater Bee Fly
Exoprosopa fascipennis	
Geron calvus	
Hemipenthes sinuosa	Sinuous Bee Fly
Lepidophora lutea	Hunchback Bee Fly
Paravilla separata	
Poecilanthrax tegminipennis	
Systropus macer	
Systoechus vulgaris	Grasshopper Bee Fly
Thevenetimyia funesta	
Villa sp.	unnamed bee fly

FAMILY THEREVIDAE—Stiletto Flies

Ozodiceromyia argentata
Thereva frontalis

FAMILY XYLOPHAGIDAE

Xylophagus lugens
*Xylophagus sp (*possibly *reflectens)*

FAMILY DOLICHOPODIDAE—Long-legged Flies

Dolichopus comatus
Hydrophorus sp.
Condylostylus patibulatus

FAMILY EMPIDIDAE—Dance Flies

Chelifera sp.	
Hemerodromia sp.	
Rhamphomyia longicauda	Long-tailed Dance Fly

FAMILY HYBOTIDAE—Hybotid Dance Flies

Anthalia sp.
Platypalpus sp.

FAMILY SYRPHIDAE—Flower Flies

Allograpta obliqua	Common Oblique Syrphid
Anasimyria chrysostoma	Lump-legged Swamp Fly
Brachypalpus oarus	
Chalcosyrphus anthreas	Yellow-banded Forest Fly
Chalcosyrphus metallicus	Yellow-legged Forest Fly
Chalcosyrphus nemorum	Dusky-banded Forest Fly
Chelosia shannoni	unnamed flower fly
Chrysogaster sp.	
Chrysotoxum sp.	
Didea fuscipes	Undivided Lucent
Eristalis anthophorina	
Eristalis dimidiate	Black-shouldered Drone Fly
Eristalis flavipes	Orange-legged Drone Fly
Eristalis tenex	Common Drone Fly
Eristalis transversa	Transverse-banded Drone Fly
Eupeodes americanus	Long-tailed Aphideater
Eupeodes perplexus	Bare-winged Aphideater
Eurimyia stipata	Long-nosed Swamp Fly
Heliophilus fasciatus	Narrow-headed Sun Fly
Lapposyrphus lapponicus	
Lejops lineatus	
Melanostoma mllinum	Western Roundtail
Microdon sp.	
Myolepta nigra	
Neoascia globose	Black-margined Fen Fly
Ocyptamus fuscipennis	Dusky-winged Hover Fly
Orthonevra nitida	Wavy Mucksucker
Parhelophilus laetus	Common Bog Fly
Parhelophilus rex	Dusky Bog Fly
Platycheirus granditarus	Hornhand Sedgesitter
Pyrophaena granditarsis	
Sericomyia chysotoxoides	Oblique-banded Pond Fly
Somula decora	Spotted Wood Fly
Sphaerophoria asymmetrica	Asymmetrical Globetail
Sphaerophoria bifurcate	Forked Globetail
Sphaerophoria contigua	Tufted Globetail
Sphaerophoria philanthus	Black-footed Globetail
Spilomyia longicornis	Eastern Hornet Fly
Spilomyia sayi	Four-lined Hornet Fly
Syritta pipiens	Thick-legged Hover Fly
Syrphus knabi	Eastern Flower Fly
Syrphus ribesii	Common Flower Fly
Toxomerus geminatus	Eastern Calligrapher
Toxomerus marginatus	Margined Calligrapher
Toxomerus politus	Maize Calligrapher
Tropidia albistylum	
Tropidia quadrata	
Xanthogramma flavipes	American Painted Fly
Xylota subfasciata	Large-spotted Forest Fly

FAMILY PHORIDAE—Scuttle Flies

Dohrniphora sp.

FAMILY PLATYPEZIDAE—Flat-footed Flies

Platypeza sp.

FAMILY EPHYDRIDAE—Shore Flies

Parydra sp.

FAMILY LAUXANIIDAE

Homoneura incerta
Minietta lupulina

FAMILY MICROPEZIDAE—Stilt-legged Flies

Rainieria antennaepes

FAMILY DIOPSIDAE—Stalk-eyed Flies

Sphyracephala brevicornis

FAMILY CONOPIDAE—Thick-headed Flies

Physocephala furcillata
Zodion sp.

FAMILY SCIOMYZIDAE—Marsh Flies

Elgiva solicita
Tetanocera plebeja
Tetanocera sp.
Trypetoptera canadensis

FAMILY PLATYSTOMATIDAE—Signal Flies

Riviellia sp.

FAMILY TEPHRITIDAE—Fruit Flies

Campiglossa sp.	
Euaresta bella	
Eurosta comma	
Eurosta solidaginis	Goldenrod Gall Fly
Eutreta noveboracensis	
Icterica circinata	
Urophora quadrifasciata	Four-barred Knapweed Gall Fly

FAMILY ULIDIIDAE—Picture-winged Flies

Chaetopsis massyla

FAMILY AGROMYZIDAE—Leaf Miner Flies

Liriomyza sp.

FAMILY CHLOROPIDAE—Grass Flies

Thaumatomyia glabra

FAMILY OPOMYZIDAE
Geomyza tripunctata *Cereal Fly*

FAMILY PSILIDAE—Rust Flies
Loxocera sp.

FAMILY TANYPEZIDAE
Tanypeza longimana

FAMILY SEPSIDAE
Sepsis sp.

FAMILY ANTHOMYIIDAE—Root Maggot Flies
Egle sp. Willow Catkin Fly
Hydrophoria lancifer

FAMILY MUSCIDAE—House Flies and Kin
Mesembrina latreillii

FAMILY SCATHOPHAGIDAE—Dung Flies
Cordilura scapularis Leaf-mining Dung Fly
Scathophaga sterocoraria Golden Dung Fly

FAMILY CALLIPHORIDA—Blow Flies
Lucilia sp.
Pollenia sp.

FAMILY OESTRIDAE--Bot Flies
Cephenemyia phobifer Deer Nose Bot Fly

FAMILY SACRCOPHAGIDAE—Flesh Flies
Phrosinella aurifascies
Sarcophaga sp.
Senotainia trilineata
Senotainia vigilans

FAMILY TACHINIDAE—Parasitic Flies
Archytas sp.
Copecrypta ruficauda
Cylindromyia interrupta
Cylindromyia sp.
Epalpus signifer
Gonia sp.
Gymnoclytia sp.
Gymnosoma sp.
Hemyda aurata
Hystricia abrupta
Jurinopsis adusta
Strongygaster triangulifera

ORDER EPHEMEROPTERA--Mayflies

Taxonomy based on (1) Peckarsky, B.L., P.R. Fraissinet, M.A. Penton, and D.J. Conklin Jr. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press. 456 pp; (2) Merritt, R.W., K.W. Cummins, and M.B. Berg 2008. An Introduction to the Aquatic Insects of North America, 4th Edition. Kendall Hunt Publishing. 1158 pp.

FAMILY LEPTOPHLEBIIDAE—Pronggillled Mayflies
Habrophleboides sp.
Habrophlebia sp.
Leptophlebia sp.
Paraleptophlebia sp.

FAMILY CAENIDAE—Small Squaregilled Mayflies
Brachycercus sp.
Caenis sp.

FAMILY EPHEMERELLIDAE—Spiny Crawler Mayflies
Caurinella sp.
Drunela sp.
Ephemerella sp.
Eurylophella sp.
Serratella sp.

FAMILY LEPTOHYPHIDAE—Little Stout Crawler Mayflies
Tricorythodes sp.

FAMILY EPHEMERIDAE—Common Burrower Mayflies
Ephemera sp.
Hexagenia sp.
Litobrancha sp.

FAMILY POLYMITARCYDAE—Pale Burrower Mayflies
Ephoron sp.

FAMILY POTAMANTHIDAE—Hacklegilled Burrower Mayflies
Anthopotamus sp.

FAMILY AMELETIDAE—Combmouthed Minnow Mayflies
Ameletus sp.

FAMILY BAETIDAE—Small Minnow Mayflies
Acentrella sp.
Acerpenna sp.
Baetis sp.
Callibaetis sp.
Centroptilum sp.
Diphetor sp.
Heterocloeon sp.
Paracloeodes sp.
Plauditus sp.
Procloeon sp.
Pseudocentroptiloides sp.
Pseudocloeon sp.

FAMILY METRETOPODIDAE—Cleftfooted Minnow Mayflies
Siphloplecton basale
Siphloplecton sp.

FAMILY SIPHLONURIDAE—Primitive Minnow Mayflies
Siphlonisca aerodromia Tomah Mayfly
Siphlonisca sp.
Siphlonurus sp.

FAMILY HEPTAGENIIDAE—Flatheaded Mayflies
Epeorus sp.
Heptagenia sp.
Leucrocuta sp.
Macaffertium vicarium
Macaffertium sp.

Macdunnoa sp.
Stenacron sp.
Stenonema femoratum
Stenonema sp.

FAMILY ISONYCHIIDAE—Brushlegged Mayflies
Isonychia bicolor
Isonychia sp.

ORDER HEMIPTERA—True Bugs

Taxonomic sources include Paiero, S.M., Marshall, S.A., McPherson, J.E., Ma, M.-S. 2013. Stink bugs (Pentatomidae) and parent bugs (Acanthosomatidae) of Ontario and adjacent areas: A key to species and a review of the fauna. Canadian Journal of Arthropod Identification No. 24, 1 September, 2013.

FAMILY ACANTHOSOMATIDAE—Shield Bugs
Elacmostethus cruciatus Red-crossed Shield Bug

FAMILY ACHILIDAE—Achilid Planthoppers
Catonia pumila Dwarf Catonia

FAMILY ALYDIDAE—Broad-headed Bugs
Alydus conspersus
Alydus eurinus Black Broad-headed Bug

FAMILY APHIDIDAE--Aphids
Uroleucon sp. Red Aphid
Aphis nerii Oleander Aphid
Prociphilus tessellatus Wooly Alder Aphid

FAMILY ARTHENEIDAE
Chilacis typhae Cattail Bug

FAMILY BELOSTOMATIDAE—Giant Water Bugs
Belastoma sp.

FAMILY BERYTIDAE—Stilt Bugs
Jalysus sp.

FAMILY CERCOPIDAE—Spittlebugs
Aphrophora alni European Alder Spittlebug
Lepyronia quadrangularis Diamondback Spittlebug
Philaenus spumarius Meadow Spittlebug

FAMILY CICADELLIDAE—Leafhoppers
Arboridia plena
Argallia quadripunctata Four-spotted Clover Leafhopper
Athysanus argentarius Silvery Leafhopper
Chlorotettix sp.
Coelidia olitoria
Cuerna striata Red-and-black Leafhopper
Draeculacephala sp
Endria inimica Painted Leafhopper
Graminella fitchii
Graphocephala coccinea Candy-striped Leafhopper
Graphocephala picta
Helochara communis
Idiodonus kennecottii
Latalus ocellaris
Neokolla hieroglyphica
Penthimia americana
Scaphoideus sp.
Scaphytopius acutus Sharp-nosed Leafhopper
Tylozygus bifidus

FAMILY CICADIDAE--Cicadas
Neotibicen canicularis Dog Day Cicada

FAMILY CLASTOPTERIDAE
Clastoptera proteus Dogwood Spittlebug
Clastoptera testacea

FAMILY COCCIDAE—Soft Scale Insects
Parthenolecanium quercifex Oak Lecanium

FAMILY COREIDAE—Leaf-footed Bugs
Acanthocephala terminalis
Leptoglossus occidentalis W. Conifer Seed Bug

FAMILY CORIXIDAE—Water Boatmen
Hesperocorixa sp.
Palmacorixa sp.
Trichocorixa sp.

FAMILY CYDNIDAE—Burrowing Bugs
Microporus nigrita

FAMILY DERBIDAE—Derbid Planthoppers
Cedusa sp.

FAMILY DICTYOPHARIDAE—Dictyopharid Planthoppers
Scolops sulcipes Partridge Bug

FAMILY GERRIDAE—Water Striders
Limnogonus sp.
Limnoporus caniculatus
Metrobates sp.
Rheumatobates sp.
Trepobates sp.

FAMILY HEBRIDAE—Velvet Water Bugs
Hebrus sp.
Merragata sp.

FAMILY KERMESIDAE—Gall-like Scales
Allokermes galliforme

FAMILY LYGAEDAE
Lygaeus kalmia (Small Milkweed Bug)

FAMILY MEMBRACIDAE—Treehoppers
Acutalis tartarea
Ceresa alta
Ceresa diceros
Ceresa lutea
Ophiderma definita
Publilia concava

FAMILY MESOVELIIDAE—Water Treaders
Mesovelia sp.

FAMILY MIRIDAE—Plant Bugs
Dicyphus famelicus
Adelphocoris lineolatus Alfalfa Plant Bug
Lygus lineolaris Tarnished Plant Bug
Lygus sp.
Metriorrhynchomiris dislocatus
Neurocolpus nubilus Clouded Plant Bug
Poecilocapsus lineatus Four-lined Plant Bug

Stenotus binotatus
Leptopterna dolobrata Meadow Plant Bug
Stenodema vicinum
Trigonotylus caelestialium Rice Leaf Bug
Ilnacora malina
Lopidea instabilis
Slaterocoris stygicus
Plagiognathus sp.

FAMILY NABIDAE—Damsel Bugs
Nabis subcoleoptratus Black Damsel Bug
Nabis sp.

FAMILY NEPIDAE—Water Scorpions
Ranatra sp.

FAMILY NOTONECTIDAE—Backswimmers
Buenoa sp.

FAMILY OCHTERIDAE—Velvety Shore Bugs
Ochterus sp.

FAMILY PENTATOMIDAE—Stink Bugs
Apoecilus bracteatus
Picromerus bidens Predatory Stink Bug
Podisus brevispinus
Podisus maculiventris Spined Soldier Bug
Stiretrus anchorago Anchor Stink Bug
Neottiglossa undata
Cosmopepla lintneriana Twice-stabbed Stink Bug
Euschistus servus Brown Stink Bug
Euschistus tristigmus Dusky Stink Bug
Mormidea lugens
Brochymena arborea
Brochymena quadripustulata Four-humped Stink Bug
Chinavia hilaris Green Stink Bug

FAMILY REDUVIIDAE—Assassin Bugs
Acholla multispinosa
Sinea diadema Spined Assassin Bug
Zelus luridus Pale Green Assassin Bug
Phymata americana/ pennsylvanica Jagged Ambush Bug

Banasa dimidiata
Thyanta custator Red-shouldered Stink Bug

FAMILY RHOPALIDAE—Scentless Plant Bugs
Harmostes reflexulus
Arhyssus nigristernum
Stictopleurus punctiventris

FAMILY SALDIDAE—Shore Bugs
Pentacora ligata

FAMILY SCUTELLARIDAE—Shield-backed Bugs
Homaemus aeneifrons

FAMILY THYREOCORIDAE—Ebony Bugs
Corimelaena sp.

FAMILY TINGIDAE—Lace Bugs
Corythuca arcuate Oak Lace Bug

FAMILY TRIOZIDAE
Phylloplecta tripunctata Blackberry Psyllid

FAMILY VELIIDAE—Small Water Striders
Microvelia sp.
Rhagovelia sp.

ORDER HYMENOPTERA—Sawflies, Wasps and Bees

Taxonomic sources include (1) Buck, M., Marshall, S.A. and Cheung D.K.B. 2008. Identification Atlas of the Vespidae (Hymenoptera, Aculeata) of the northeastern Nearctic region. Canadian Journal of Arthropod Identification No. 5: 492 pp; (2) Packer, L., Genaro, J.A., and Sheffield C.S. 2007. The Bee Genera of Eastern Canada. Canadian Journal of Arthropod Identification No. 3, 25 September 2007

FAMILY PAMPHILIDAE—Webspinning & Leafrolling Sawflies
Onycholyda/Pamphilus sp.

FAMILY ARGIDAE—Argid Sawflies
Arge pectoralis Birch Sawfly
Arge quidia Willow Oak Sawfly

FAMILY CIMBICIDAE—Cimbicid Sawflies
Cimbex americana Elm Sawfly
Trichosoma triangulum

FAMILY DIPRIONIDAE—Conifer Sawflies
Diprion similis Introduced Pine Sawfly
Neodiprion lecontei Red-headed Pine Sawfly

FAMILY TENTHREDINIDAE—Common Sawflies
Macremphytus testaceus
Eriocampa ovata
Periclista sp.
Eutomostethus luteiventris

Stronglogaster tacitus
Macrophya flavolineata
Tenthredo basilaris

FAMILY SIRICIDAE—Horntails
Sirex noctilio European Wood Wasp
Tremax columba Pigeon Tremax

FAMILY PELECINIDAE—Pelecinid Wasps
Pelecinus polyturator

FAMILY EUPELMIDAE
Eupelmis vesicularis

FAMILY PERILAMPIDAE
Perilampus sp.

FAMILY PTEROMALIDAE—Pteromalids
UK Pteromalid

FAMILY TORYMIDAE
Torymus sp.

FAMILY BRACONIDAE—Braconid Wasps
Atanycolus sp.
Spathius sp.

FAMILY ICHNEUMONIDAE—Ichneumonid Wasps
Anomalon sp.
Therion sp.

Exetastes suaveolens
Glypta sp.
Cryptus albitarsis
Gelis tenellus
Gnamptopelta obsidianator
Coelichneumon sp.
Cratichneumon sp.
Ophion sp.
Itoplectis conquisitor
Pimpla pedalis
Theronia hilaris
Exyston sp.

FAMILY CRABRONIDAE—Crabronid Wasps
Astata leuthstromi
Alysson melleus
Alysson oppositus
Bembix americana
Bembix pallidipicta
Bicyrtes quadrifasciatus
Bicyrtes ventralis
Microbembex monodonta
Clitemnestra bipunctata
Gorytes caniculatus
Gorytes simillimus
Saygorytes phaleratus
Sphecius speciosus
Stictiella emarginata
Nysson daecki
Anacrabro ocellatus
Crabro advena
Crabro argusinus
Crabro cribellifer
Crabro latipes
Crabro monticola
Crossocerus maculiclypeus
Ectemnius arcuatus
Ectemnius continuus
Ectemnius sp. (probably decemmaculatus)
Ectemnius maculosus
Lindenius buccadentis
Lindenius columbianus
Tachysphex acutus
Tachysphex similis
Tachysphex tarsatus
Tachysphex terminalis
Tachytes obductus
Liris argentata
Lyroda subita
Miscophus americanus
Plenoculus davisi
Oxybelus bipunctatus
Oxybelus emarginatus
Oxybelus subcornutus
Oxybelus subulatus
Diodontus franclemonti
Passaloecus sp.
Pemphridon lethifer
Stigmus americanus
Mimesa basirufa
Mimesa cressonii
Aphilanthops frigidus
Cerceris clypeata
Cerceris fumipennis
Cerceris nigriscens
Cerceris robertsonii
Philanthus albopilosus
Philanthus bilunatus
Philanthus gibbosus
Philanthus lepidus
Philanthus politus
Philanthus solivagus
Philanthus ventilabris

FAMILY SPHECIDAE—Thread-waisted Wasps
Chalybion californicum Blue Mud Wasp
Sceliphron caementarium Black & Yellow Mud Dauber
Prionyx atratus
Isodontia mexicana
Sphex ichneumoneus Great Golden Digger Wap
Sphex pensylvanicus Great Black Wasp
Ammophila harti
Ammophila nigricans
Ammophila pictipennis
Ammophila procera
Ammophila urnaria
Eremnophila aureonotata
Podalonia luctuosa
Podalonia robusta

FAMILY CHRYSIDIDAE—Cuckoo Wasps
Hedychridium sp.
Hedychrum sp.
Caenochrysis sp.

FAMILY FORMICIDAE—Ants
Camponotus novaeboracensis New York Carpenter Ant
Camponotus pennsylvanicus Black Carpenter Ant
Formica exectoides Allegheny Mound Ant
Formica subsericea
Formica incerta
Crematogaster cerasi Acrobat Ant
Tetramorium species-e

FAMILY MUTILLIDAE—Velvet Ants
Pseudomethocha frigida
Timulla vagans

FAMILY POMPILDAE—Spider Wasps
Auplopus architectus
Auplopus mellipes
Caliadurgus hyalinatus
Dipogon papago
Dipogon sayi
Priocnemis minorata
Priocnemis cornica
Priocnemis germana
Priocnemis scitula
Priocnessus nebulosus
Evagetes crassicornis
Evagetes hyacinthus
Evagetes parvus
Episyron biguttatus
Episyron quinquenotatus
Anoplius aethiops
Anoplius atrox
Anoplius carolina
Anoplius cylindricus
Anoplius illinoensis
Anoplius marginatus
Anoplius nigerrimus
Anoplius relativus
Anoplius semirufus
Anoplius splendens
Anoplius subcylindricus
Anoplius tenebrosus
Anoplius ventralis
Anoplius virginiensis
Arachnospila arcta
Arachnospila scelestus

Anoplochares apicatus
Aporinellus completus
Ceropales maculata

FAMILY SCOLIIDAE—Scoliid Wasps
Campsomeris plumipes
Scolia bicinta Double-banded Scolid

FAMILY THYNNIDAE—Thynnid Wasps
Methocha stygia
Myzinum quinquecinctum Five-banded Tiphiid Wasp

FAMILY TIPHIIDAE—Tiphiid Wasps
Tiphia sp.
Paratiphia sp.

FAMILY VESPIDAE—Yellowjackets, Hornets, Paper Wasps, Potter, Mason, & Pollen Wasps
Ancistrocerus adiabatus
Ancistrocerus campestris
Ancistrocerus catskill
Eumenes crucifera
Eumenes fraternus
Euodynerus castigatus
Euodynerus foraminatus
Monobia quadridens
Symmorphus sp.
Polistes dominula European Paper Wasp
Polistes fuscatus Northern Paper Wasp
Dolichovespula arenaria Common Aerial Yellowjacket
Dolichovespula maculata Bald-faced Hornet
Vespa carabro European Hornet
Vespula acadica Forest Yellowjacket
Vespula consobrina Blackjacket
Vespula maculifrons Eastern Yellowjacket

FAMILY ANDRENIDAE—Mining Bees
Andrena alleghaniensis Appalchian Miner Bee
Andrena barbara Barbara's Miner
Andrena barbilabris Bearded Miner Bee
Andrena carlini Carlinville Miner Bee
Andrena carolina Carolina Miner Bee
Andrena ceanothi Ceanothus Miner Bee
Andrena chromotricha Pigmented Miner Bee
Andrena commoda Advantaged Miner Bee
Andrena crataegi Hawthorn Miner Bee
Andrena cressonii Yellow-legged Miner Bee
Andrena distans Distant Miner Bee
Andrena erythronii Trout Lily Miner Bee
Andrena frigida Cold Miner Bee
Andrena hirticincta Hairy-belted Miner Bee
Andrena integra Intact Miner Bee
Andrena mandibularis Toothed Miner Bee
Andrena milwaukeensis Milwaukee Miner Bee
Andrena miranda Singular Miner Bee
Andrena miserabilis Smooth-faced Miner Bee
Andrena nasonii Bumped Miner Bee
Andrena nivalis Snow Miner Bee
Andrena nubecula Cloudy-winged Miner Bee
Andrena rugosa Wrinkled Miner Bee
Andrena sigmundi Sigmund's Miner Bee
Andrena tridens Trident Miner Bee
Andrena vicina Neighbouring Miner Bee
Andrena wheeleri Wheeler's Miner Bee
Andrena wilkella European Legume Miner Bee
Pseudopanurgus aestivalis Summer Miner Bee
Pseudopanurgus andrenoides Small Black Miner Bee
Pseudopanurgus parvus Small Miner Bee
Pseudopanurgus rudbeckiae Rudbeckia Miner Bee
Andrena bradleyi Bradley's Andrena
Perdita octomaculata Eight-spotted Perdita

FAMILY APIDAE—Honey, Bumble, Digger, and Cuckoo Bees
Anthophora bomboides Bumblebee-like Digger Bee
Anthophora furcate Fork-tailed Flower Bee
Anthophora terminalis Orange-tipped Wood Digger
Apis mellifera European Honey Bee
Bombus bimaculatus Two-spotted Bumble Bee
Bombus borealis Northern Amber Bumble Bee
Bombus citrinus Lemon Cuckoo Bumble Bee
Bombus fervidis Golden Northern Bumble Bee
Bombus griseocollis Brown-belted Bumble Bee
Bombus impatiens Common Eastern Bumble Bee
Bombus rufocinctus Red-belted Bumble Bee
Bombus ternarius Tricolored Bumble Bee
Bombus terricola Yellow-banded Bumble Bee
Bombus vagans Half-black Bumble Bee
Ceratina calcarata Wide-legged Little Carpenter Bee
Ceratina dupla Common Eastern Little Carpenter Bee
Ceratina mikmaqi Mikmaq Little Carpenter Bee
Epeolus autumnalis
Epeolus scutellaris
Melissodes denticulate Denticulate Long-horned Bee
Melissodes desponsa Thistle Long-horned Bee
Melissodes druriella Drury's Long-horned Bee
Nomada cressonii Cresson's Nomad Bee
Nomada maculata Spotted Nomad Bee
Triepeolus cressonii Eucera Cuckoo Nomad Bee
Triepeolus helianthi Sunflower Cuckoo Nomad Bee
Triepeolus lunatus Crescent-shaped Cuckoo Nomad B
Triepeolus pectoralis White-breasted Cuckoo Nomad B
Triepeolus simplex Simple Longhorn-Cuckoo

FAMILY COLLETIDAE—Plasterer, Cellophane, and Masked Bees
Colletes ciliates unnamed cellphane bee
Colletes compactus
Colletes impuctatus unnamed cellopane bee
Colletes inaequalis Common Eastern Plasterer Bee
Colletes simulans Deceptive Plasterer Bee
Colletes thoracicus Rufous-backed Cellophane Bee
Hylaeus affinis Eastern Masked Bee
Hylaeus annulatus Ringed Yellow-faced Bee
Hylaeus illinoensis unnamed cellophane bee
Hylaeus messilae Mesilla Masked Bee
Hylaeus modestus Modest Yellow-faced Bee

FAMILY HALICTIDAE—Sweat Bees
Agapostemon sericeus Whitish Sweat Bee
Agapostemon splendens Splended Sweat Bee
Agapostemon texanus Texas Sweat Bee
Agapostemon virescens Bicolored Sweat Bee
Augochlora pura Pure Sweat Bee
Augochlorella aurata Golden Sweat Bee
Augochlorella persimilis unnamed sweat bee
Augochloropsis metallica Northern Sweat Bee
Halictus confuses Confused Sweat Bee
Halictus ligatus Ligated Gregarious Sweat Bee
Halictus parallelus Parallel-striped Sweat Bee
Halictus poeyi/ligatus Poey's/Ligated Furrow Bee
Halictus rubicundus Polymorphic Sweat Bee
Halictus tectus unnamed Sweat Bee
Lasioglossum acuminatum Pointed Sweat Bee
Lasioglossum athabascense Athabasca Sweat Bee
Lasioglossum coeruleum Deep-blue Sweat Bee
Lasioglossum coriaceum Leathery Sweat Bee
Lasioglossum leucozonium White-banded Sweat Bee
Lasioglossum obscurum Obscure Sweat Bee
Lasioglossum truncatum Truncate Sweat Bee

Lassioglossum vierecki Viereck's Sweat Bee
Lassioglossum zephrum
Lasioglossum zonulum Banded Sweat Bee
Sphecodes atlantis Atlantic Cuckoo Sweat Bee
Sphecodes coronus Crowned Cuckoo Sweat Bee
Sphecodes cressonii Cresson's Cuckoo Sweat Bee
Sphecodes davisii Davis's Cuckoo Sweat Bee
Sphecodes illinoensis Illinois Cuckoo Sweat Bee
Sphecodes minor Minor Cuckoo Sweat Bee
Sphecodes sp.

FAMILY MEGACHILIDAE—Leaf-cutter and Mason Bees
Anthidium oblongatum Oblong Woolcarder Bee
Coelioxys octodentatus 8-toothed Cuckoo Leafcutter
Coelioxys rufitarsis Red-legged Cuckoo Leafcutter
Coelioxys sayi Say's Cuckoo Leafcutter Bee
Dianthidium simile Similar Carder Bee
Heriades carinata Carinate Sculptured Mason Bee
Heriades leavitti Leavitt's Sculptured Mason Bee
Heriades variolosa unnamed mason bee
Hoplitis albifrons White-faced Summer Mason Bee
Hoplitis pilosifrons Hairy-faced Summer Mason Bee
Hoplitis producta Prolonged Summer Mason Bee
Hoplitis simplex unnamed leafcutter bee
Hoplitis spoliata Robber Mason Bee
Megachile addenda Cranberry Leafcutter Bee
Megachile brevis Short Leafcutter Bee
Megachile frigida Frigid Leafcutter Bee
Megachile gemula Small-handed Leafcutter Bee
Megachile inermis Unarmed Leafcutter Bee
Megachile lapponica Lapland Leafcutter Bee
Megachile latimanus Broad-handed Leafcutter Bee
Megachile melanophaea Black-and-gray Leafcutter Bee
Megachile mendica Beggar Leafcutter Bee
Megachile montivaga Hills Leafcutter Bee
Megachile pugnata Pugnacious Leafcutter Bee
Megachile relativa Relative Leafcutter Bee
Megachile sculpturalis Sculptured Resin Bee
Osmia atriventris Maine Blueberry Bee
Osmia bucephala Bufflehead Mason Bee
Osmia collinsiae Collins's Mason Bee
Osmia conjuncta Eastern Snail Shell Mason Bee
Osmia lignaria Intact Mason Bee
Osmia pumila Blue Orchard Bee
Osmia simillina Dwarf Mason Bee
Osmia taurus Taurus Mason Bee
Stelis permaculata unnamed mason bee

ORDER LEPIDOPTERA—Butterflies & Moths

Butterfly taxonomy based on: (1) Cech, R., and G. Tudor. 2005. Butterflies of the East Coast: An Observer's Guide. Princeton University Press, Princeton, NJ. 345 pp. (2) Covell, C.V., Jr. 1984. Moths of Eastern North America. The Easton Press, Norwalk, CT. 496 pp. Moth taxonomy based on (1) Moth Photographers Group, http://mothphotographersgroup.msstate.edu/, Mississippi State University; (2) Beadle, D and S. Leckie. 2012. Peterson Field Guide to Moths of Northeastern North America. Houghton Mifflin Harcourt, Boston, MA. 624 pp.

FAMILY PAPILIONIDAE—Swallowtails & Parnassians
Papilio canadensis Canadian Tiger Swallowtail
Papilio cresphontes Giant Swallowtail
Papilio glaucus Eastern Tiger Swallowtail
Papilio polyxenes Black Swallowtail

FAMILY PIERIDAE—Whites, Sulphurs & Yellows
Pieris oleracea Mustard White
Pieris rapre Cabbage White
Pieris virginiensis West Virginia White
Colias eurytheme Orange Sulphur
Colias philodice Clouded Sulphur

FAMILY LYCAENIDAE—Blues, Coppers, Hairstreaks & Harvester
Celastrina ladon Spring Azure
Celastrina 'neglecta' Summer Azure
Cupido comyntas Eastern Tailed-Blue
Feniseca tarquinius Harvester
Glaucopsyche lygdamus Silvery Blue
Lycaena hyllus Bronze Copper
Lycaena phlaeas American Copper
Satyrium calanus Banded Hairstreak
Satyrium titus Coral Hairstreak

FAMILY NYMPHALIDAE—Brush-footed Butterflies
Aglais milberti Milbert's Tortoiseshell
Boloria selene Silver-bordered Fritillary
Boloria bellona Meadow Fritillary
Cercyonis pegala Common Wood Nymph
Coenonympha tullia inornata Common Ringlet
Enodia anthedon Northern Pearly-Eye
Euphydryas phaeton Baltimore Checkerspot
Limenitis arthemis arthemis White Admiral
Limenitis archippus Viceroy
Megisto cymela Little Wood Satyr
Nymphalis antiopa Mourning Cloak
Nymphalis vaualbum Compton Tortoiseshell
Phyciodes cocyta Northern Crescent
Polygonia comma Eastern Comma
Polygonia interrogationis Question Mark
Polygonia progne Gray Comma
Satyrodes appalachia Appalachian Brown
Satyrodes eurydice Eyed Brown
Speyeria aphrodite Aphrodite Fritillary
Speyeria cybele Great Spangled Fritillary
Vanessa atalanta Red Admiral
Vanessa cardui Painted Lady
Vanessa virginiensis American Lady

FAMILY HESPERIDAE—Skippers
Amblyscirtes hegon Common Roadside Skipper
Anatrytone logan Delaware Skipper
Ancyloxypha numitor Least Skipper
Epargyreus clarus Silver-spotted Skipper
Erynnis juvenalis Juvenal's Duskywing
Erynnis icelus Dreamy Duskywing
Euphyes vestries Dun Skipper
Hesperia leonardus Leonard's Skipper
Hesperia sassacus Indian Skipper
Poanes hobomok Hobomok Skipper
Polites mystic Long Dash
Polites origenes Crossline Skipper
Polites peckius Peck's Skipper
Polites themistocles Tawny-edged Skipper

Thorybes pylades Northern Cloudywing
Thymelicus lineola European Skipper
Wallengrenia egeremet Northern Broken Dash

FAMILY ARGYRESTHIIDAE—Shiny Head-standing Moths
Argyresthia oreasella Cherry Shoot Borer

FAMILY PSYCHIDAE—Bagworm Moths
Psyche casta Common Bagworm Moth

FAMILY COLEOPHORIDAE—Casebearer Moths
Coleophora deauratella

FAMILY DEPRESSARIIDAE
Depressaria depressana Purple Carrot-seed Moth

FAMILY GELECHIIDAE—Twirler Moths
Dichomeris nonstrigella

FAMILY CHOREUTIDAE—Metalmark Moths
Prochoreutis inflatella Skullcap Skeletonizer Moth

FAMILY THYRIDIDAE—Window-wing Moths
Thyris maculata Spotted Thyris

FAMILY SCYTHRIDIDAE—Flower Moths
Landryia impositella

FAMILY PTEROPHORIDAE—Plume Moths
UK plume moth

FAMILY CRAMBIDAE—Crambid Snout Moths
Agiphila ruricolellus Lesser Vagabond Sod Webworm
Agiphila vulgivagellus Vagabond Crambus Moth
Anania funebris White-spotted Sable Moth
Elophila ekthlipsis Nymphala Moth
Elophila icciusalis Pondside Pyralid Moth
Loxostege cerealis Alfalfa Webworm
Nomophila nearctica Lucerne Moth
Paraponyx badiusalis Chestnut-marked Pondweed Moth

FAMILY PYRALIDAE—Pyralid Moths
Hypsopygia olinalis Yellow-fringed Dolichomia

FAMILY TORTRICIDAE—Tortricid Moths
Acleris celiana
Epinotia lindana Diamondback Epinotia Moth
Eucosma dorsisignatana Triangle-backed Eucosma
Eucosma umbrastriana
Olethreutes bipartitana Divided Olethreutes
Pandemis lamprosana Woodgrain Leafroller
Sparganothis sulfureana Sparganothis Fruitworm

FAMILY LIMACODIDAE—Slug Caterpillar Moths
Apoda biguttata Shagreened Slug Moth
Apoda y-inversum Inverted Y Slug Moth
Euclea delphinii Spiny Oak Slug Moth
Lithacodes fasciola Yellow-shouldered Slug Moth
Tortricidia flexuosa Abbreviated Button Slug Moth

FAMILY SESIIDAE—Clearwing Moths
Synanthedon proxima

FAMILY SATURNIIDAE—Giant Silkworm & Royal Moths
Actias luna Luna Moth
Antheraea polyphemus Polyphemus Moth
Automeris io Io Moth
Callosamia promethean Promethea Silkmoth
Dryocampa rubicunda Rosy Maple Moth
Hyalophora cecropia Cecropia Moth

FAMILY LASIOCAMPIDAE—Tent Caterpillar & Lappet Moths
Malacosoma disstria Forest Tent Caterpillar
Malacosoma americana Eastern Tent Caterpillar
Phyllodesma americana American Lappet Moth
Tolype laricis Larch Tolype Moth
Tolype velleda Large Tolype Moth

FAMILY SPHINGIDAE—Sphinx Moths
Ceratomia undulosa Waved Sphinx Moth
Hemaris diffinis Snowberry Clearwing
Hemaris thysbe Hummingbird Clearwing
Hyles euphorbidae Spurge Hawkmoth
Pachysphinx modesta Big Poplar Sphinx
Paonias excaecatus Blinded Sphix Moth
Paonias myops Small-eyed Sphinx Moth
Smerinthus cerisyi One-eyed Sphinx Moth
Smerinthus jamaicensis Twin-spotted Sphinx Moth
Sphinx canadensis Canadian Sphinx Moth
Sphinx poecila Northern Apple Sphinx Moth

FAMILY NOCTUIDAE—Owlet Moths
Abagrotis alternata Greater Red Dart Moth
Acronicta grisea Gray Dagger Moth
Acronicta modica Medium Dagger Moth
Acronicta ovate Ovate Dagger Moth
Acronicta seperata Hopeful Dagger Moth
Agrotis ipsilon Dark Sword Grass Moth
Agrotis venerabilis Venerable Dart Moth
Agrotis vetusta Old Man Dart Moth
Allagrapha aerea Unspotted Looper
Amphipoea americana American Ear Moth
Amphipyra tragopoginis Mouse Moth
Anagrapha falcifera Celery Looper
Apamea devastator Glassy Cutworm Moth
Apamea lignicolora Wood-colored Apamea Moth
Balsa tristrigella Three-lined Balsa Moth
Callopistria cordata Silver-spotted Fern Moth
Capis curvata Curved Halter Moth
Chaetaglaea sericea Silky Sallow Moth
Chytonix palliatricula Cloaked Marvel Moth
Condica videns White-dotted Groundling Moth
Cucullia asteroides The Asteroid
Cucullia speyeri Speyer's Hooded Owlet Moth
Dargida diffusa Wheat Head Armyworm Moth
Diarsia sp.
Elaphria alapallida Pale-winged Midget
Elaphria versicolor Variegated Midget
Enargia infumata Smoked Sallow Moth
Eucirroedia pampina Scalloped Sallow Moth
Eudryas grata Beautiful Wood-Nymph
Eudryas unio Pearly Wood-Nymph
Eueretagrotis attentus Attentive Dart Moth
Euxoa campestris Flat Dart Moth
Euxoa declarata Clear Dart Moth
Euxoa detersa Rubbed Dart Moth
Euxoa redimicula Fillet Dart Moth
Euxoa tessellate Tessellate Dart Moth
Feltia geniculata Knee-joint Dart Moth
Feltia herilis Master's Dart Moth
Feltia jaculifera Dingy Cutworm Moth
Feltia subgothica Subgothic Dart Moth
Feltia tricosa Confused Dart Moth
Fishia illocata Wandering Brocade Moth
Galgula partita The Wedgeling
Homorthodes furfurata Northern Scurfy Quaker Moth

Hydraecia micacea Rosy Rustic Moth
Lacinipolia meditata Thinker Moth
Lacinipolia olivacea Olive Arches Moth
Lacinipolia renigera Bristly Cutworm Moth
Leucania commoides Two-lined Wainscot Moth
Leucania insueta Wainscot Moth
Leucania pseudargyria False Wainscot Moth
Leucania sp.
Leuconycta diphteroides Green Leuconycta
Leuconycta lepidula Marbled-green Leuconycta
Lycophotia phyllophora Phyllophora Dart Moth
Mythimna unipunta Armyworm Moth
Nedra ramosula Gray Half-spot
Neoligia exhausta Exhausted Brocade Moth
Nephelodes minians Bronzed Cutworm Moth
Noctua pronuba Large Yellow Underwing Moth
Ochropleura implecta Flame-shouldered Dart Moth
Ogdoconta cinereola Common Pinkband
Orthodes detracta Disparaged Arches Moth
Orthodes goodelli Goodell's Arches Moth
Orthodes majuscule Rustic Quaker Moth
Orthodes cynica Cynical Quaker Moth
Papaipema sp.
Peridroma saucia Variegated Cutworm Moth
Phlogophora periculosa Brown Angles Shades Moth
Plusia putnami Putnam's Looper
Plusia sp.
Polia nimbosa Stormy Arches Moth
Polia imbrifera Cloudy Arches Moth
Polia purpurissata Purple Arches Moth
Ponometia candefacta Olive-shaded Bird-dropping Moth
Protodeltote muscosula Large Mossy Lithacodia Moth
Protodeltote albidula Pale Glyph Moth
Protolampra brunneicollis Scarley-backed Dart Moth
Protorthodes oviduca Ruddy Quaker Moth
Proxenus miranda Miranda Moth
Pseudohermonassa tenuicula Morrison's Sooty Dart Moth
Pseudorthodes vecors Small Brown Quaker Moth
Raphia frater Brother Moth
Schinia florida Primrose Moth
Sideridis rosea Rosewing Moth
Spaelotis cladenstina Clandestine Dart Moth
Spirameter lutra Otter Spirameter Moth
Striacosta albicosta Western Bean Cutworm Moth
Tricholita signata Signate Quaker Moth
Ulolonche culea Sheathed Quaker Moth
Ulolonche modesta
Xestia c-nigrum Lesser Black-letter Dart Moth
Xestia dilucida Dull Reddish Dart Moth
Xestia normanianus Norman's Dart Moth
Xestia praevia Praevia Dart Moth
Xestia smithii Smith's Dart Moth

FAMILY EREBIDAE
Amolita fessa Feeble Grass Moth
Arctia caja Great Tiger Moth
Ascalpha odorata Black Witch
Bleptina caradrinalis Bent-winged Owlet Moth
Caenurgina crassiuscula Clover Looper Moth
Caenurgina erechtea Forage Looper Moth
Catocala antinympha Sweetfern Underwing
Catocala cara Darling Underwing
Catocala mira Wonderful Underwing
Catocala relicta White Underwing
Cisseps fulvicollis Yellow-collared Scape Moth
Crambidia casta Pearly-winged Lichen Moth
Crambidia pallida Pale Lichen Moth
Ctenucha virginica Virginia Ctenucha Moth
Cycnia oregonensis Oregon Cycnia Moth
Drasteria grandirena Figure-seven Moth
Dyspyralis nigellus Slaty Dyspyralis
Dyspyralis puncticosta Spot-edged Dyspyralis
Estigmene acrea Saltmarsh Moth
Euchaetes egle Milkweed Tussock Moth
Grammia arge Arge Moth
Grammia figurate Figured Tiger Moth
Grammia parthenice Parthenice Tiger Moth
Grammia virgo Virgin Tiger Moth
Grammia williamsi Williams' Tiger Moth
Halysidota tessellaris Banded Tussock Moth
Haploa confusa Confused Haploa Moth
Hypena scabra Green Cloverworm Moth
Hypenodes fractilinea Broken-line Hypenodes Moth
Hypenodes franclemonti
Hyperstrotia pervertens Dotted Graylet
Hyphantria cunea Fall Webworm Moth
Hypoprepia fucosa Painted Lichen Moth
Idia americalis American Idia Moth
Idia concisa
Idia dimineuendis Orange-spotted Idia Moth
Idia forbesii
Idia julia
Idia laurentii
Idia rotundalis Rotund Idia Moth
Idia scobialis Smoky Idia Moth
Lascoria ambigualis Ambiguous Moth
Lophocampa caryae Hickory Tussock Moth
Lophocampa maculata Spotted Tussock Moth
Macrochilo absorptalis Slant-lined Owlet Moth
Macrochilo litophora Brown-lined Owlet Moth
Macrochilo orciferalis Bronzy Macrochilo Moth
Orgyia leucostigma White-marked Tussock Moth
Palthis angulalis Dark-spotted Palthis Moth
Phalaenophana pyramusalis Dark-banded Owlet Moth
Phalaenostola eumelusalis Dark Phalaenostola Moth
Phalaenostola larentoides Black-banded Owlet Moth
Phalaenostola metonalis Tufted Snout Moth
Phragmatobia fuliginosa Ruby Tiger Moth
Renia flavipunctalis Yellow-spotted Renia Moth
Renia sobrialis Sober Renia Moth
Renia sp.
Rivula propinqualis Spotted Grass Moth
Spilosoma congrua Agreeable Tiger Moth
Spilosoma virginica Virginia Tiger Moth
Virbia aurantiaca Orange Holomelina Moth
Virbia ferruginosa Rusty Holomelina Moth
Virbia opella Tawny Holomelina
Zale sp.
Zanclognatha jacchusalis Wavy-lined Zanlognatha Moth
Zanclognatha laevigata Variable Zanclognatha Moth
Zanclognatha sp
Zale helata Brown-spotted Zale

FAMILY EUTELIIDAE
Marathyssa inficita Dark Marythyssa Moth

FAMILY NOTODONTIDAE—Prominent Moths
Clostera albosigma Sigmoid Prominent Moth
Clostera apicalis Apical Prominent Moth
Datana integerrima Walnut Caterpillar Moth
Datana ministra Yellow-necked Caterpillar Moth
Gluphisia septentrionis Common Gluphisia Moth
Heterocampa biundata Wavy-lined Heterocampa
Heterocampa oblique Oblique Heterocampa
Heterocampa umbrata White-blotched Heterocampa
Lochmaeus manteo Variable Oakleaf Caterpillar Moth
Macrurocampa marthesia Mottled Prominent Moth

Nadata gibbosa White-dotted Prominent Moth
Peridea angulosa Angulose Proninent Moth
Peridea basitriens Oval-based Prominent Moth
Peridea ferruginea Chocolate Prominent Moth
Schizura unicornis Unicorn Prominent Moth
Symmerista sp

FAMILY GEOMETRIDAE—Geometrid Moths
Anavitrinella pampinaria Common Gray Moth
Aplocera plagiata St. John's Wort Inchworm
Archiearis infans The Infant
Besma quercivoraria Oak Besma Moth
Cabera variolaria Pink-striped Willow Spanworm
Caripeta divisata Gray Spruce Looper Moth
Chlorochlamys chloroleucaria Blackberry Looper Moth
Costaconvexa centrostrigaria Bent-line Carpet Moth
Cyclophora pendulinaria Sweetfern Geometer
Digrammia ocellinata Faint-spotted Angle Moth
Ectropis crepuscularia Small Engrailed Moth
Ennomos magnaria Maple Spanworm Moth
Ennomos subsignaria Elm Spanworm Moth
Eppirrhoe alternate White-banded Toothed Carpet Moth
Euchlaena johnsonaria Johnson's Euchlaena Moth
Euchlaena madusaria Scrub Euchlaena Moth
Euchlaena marginaria Ochre Euchlaena Moth
Euchlaena muzaria Muzaria Euchlaena
Euchlaena serrata Saw Wing
Eufidonia convergaria Pine Powder Moth
Eugonobapta nivosaria Snowy Geometer
Eulithis diversilineata/gracilineata
Eulithis xylina/serrataria
Eumacaria madopata Brown-bordered Geometer
Eupithecia sp.
Euphyia intermediate Sharp-angled Carpet Moth
Eusarca confusaria Confused Eusarca
Eutrapela clemataria Curve-toothed Geometer
Haematopis grataria Chickweed Geometer
Hesperumia sulphuraria Sulphur Moth
Heterophelps triguttaria Three-spotted Fillip
Hydrelia inornata Unadorned Carpet Moth
Hypagyrtis unipunctata One-spotted Variant Moth
Idaea demissaria Red-bordered Wave
Idaea dimidiata Single-dotted Wave
Iridopsis ephyraria Pale-winged Gray Moth
Lambdina fiscellaria Hemlock Looper
Lompgrapha vestaliata White Spring Moth
Lytrosis unitaria Common Lytrosis
Macaria aemulataria Common Angle Moth
Macaria bisignata Red-headed Inchworm
Macaria minorata Minor Angle Moth
Macaria pinistrobata White Pine Angle Moth
Macaria signaria Pale-marked Angle Moth
Macaria transitaria Blurry Chocolate Angle Moth
Mesoleuca ruficillata White-ribboned Carpet Moth
Metanema inatomaria Pale Metanema Moth
Metarranthis duaria Ruddy Metarranthis Moth
Orthonama obstipata Gem Moth
Nematocampa limbata Horned Spanworm Moth
Nemoria bistriaria Red-fringed Emerald Moth
Nemoria mimosaria White-fringed Emerald Moth
Nemoria rubrifrontaria Red-fronted Emerald Moth
Nemorai sp.
Pero sp.
Plagodis fervidaria Fervid Plagodis Moth
Plagodis phlogosaria Straight-lined Plagodis Moth
Probole amicaria/alienaria Alien/Friendly Probole Moth
Prochoerodes lineola Large Maple Spanworm Moth
Protoboarmia porcelaria Porcelain Gray Moth
Rheumaptera hastate/subhastata
Scopula inductata Soft-lined Wave
Scopula limboundata Large Lace-border Moth
Selenia kentaria Kent's Geometer
Speranza pustularia Lesser Maple Spanworm
Stenoporpia polygrammaria Faded Gray Geometer
Synchlora aerata Wavy-lined Emerald Moth
Tetracis cachexiata White Slant-line Moth
Xanthorhoe ferrugata Red Twin-spot Moth
Xanthorhoe sp.
Xanthotype urticarial False Crocus Geometer

FAMILY DREPANIDAE—Hooktip & False Owlet Moths
Drepana arcuate Arched Hooktip Moth
Drepana bilineata Two-lined Hooktip Moth
Pseudothyatira cymatophoroides Tufted Thyatirid Moth

FAMILY BOMBYCIDAE—Silkworm Moths
Olceclostera angelica The Angel

ORDER MANTODEA—Mantids
FAMILY MANTIDAE
Mantis religiosa (European Mantis)

ORDER MEGALOPTERA—Alderflies, Dobsonflies & Fishflies

FAMILY SIALIDAE--Alderflies
Sialis sp.

FAMILY CORYDALIDAE—Dobsonflies and Fishflies
Corydalus cornutus Eastern Dobsonfly
Chauliodes pectinicornis Summer Fishfly
Chauliodes rasticornis Spring Fishfly
Nigronia serricornis

ORDER NEUROPTERA—Antlions, Lacewings & Mantidflies

FAMILY MYRMELIONTIDAE—Antlions
Myrmeleon immaculatus

FAMILY MANTISPIDAE—Mantidflies
Climaciella brunnea Wasp Mantidfly

FAMILY CHRYSOPIDAE—Green Lacewings
Chrysopa oculata Golden-eyed Lacewing
Chrysoperla rufilibris

ORDER ODONATA—Damselflies & Dragonflies

Taxonomy based on: (1) Mead, K. 2003. Dragonflies of the North Woods. Kollath-Stensaas Publishing, Duluth, MN. 203 pp. (2) Nikula, B., J. L. Loose, and M. R. Burne. 2003. A Field Guide to the Dragonflies and Damselflies of Massachusetts. Massachusetts Division of Fisheries & Wildlife, Westborough, MA. 197 pp.

FAMILY CALOPTERYGIDAE—Broad-winged Damselflies

Calopteryx aequabilis	River Jewelwing
Calopteryx amata	Superb Jewelwing
Calopteryx maculata	Ebony Jewelwing

FAMILY LESTIDAE—Spread-wing Damselflies

Lestes congener	Spotted Spreadwing
Lestes disjunctus	Common Spreadwing
Lestes forcipatus	Sweetflag Spreadwing
Lestes inaequalis	Elegant Spreadwing
Lestes rectangularis	Slender Spreadwing
Lestes vigilax	Swamp Spreadwing

FAMILY COENAGRIONIDAE—Pond Damselflies

Amphiagrion saucium	Eastern Red Damsel
Argia fumipennis	Variable Dancer
Argia moesta	Powdered Dancer
Chromagrion conditum	Aurora Damselfly
Enallagma ebrium	Marsh Bluet
Enallagma exsulans	Stream Bluet
Enallagma geminatum	Skimming Bluet
Enallagma hageni	Hagen's Bluet
Enallagma signatum	Orange Bluet
Ischnura posita	Fragile Forktail
Ischnura verticalis	Eastern Forktail
Nehalennia Irene	Sedge Sprite

FAMILY AESHNIDAE—Darners

Aeschna canadensis	Canada Darner
Aeschna clepsydra	Mottled Darner
Aeschna constricta	Lance-tipped Darner
Aeschna mutata	Spatterdock Darner
Aeschna tuberculifera	Black-tipped Darner
Aeschna umbrosa	Shadow Darner
Aeschna verticalis	Green-striped Darner
Anax junius	Common Green Darner
Basiaeschna Janata	Springtime Darner
Boyeria vinosa	Fawn Darner
Epiaeschna heros	Swamp Darner
Gomphaeschna furcillata	Harlequin Darner

FAMILY GOMPHIDAE—Clubtails

Arigomphus furcifer	Lilypad Clubtail
Arigomphus villosipes	Unicorn Clubtail
Dromogomphus spinosus	Black-shouldered Spinyleg
Gomphus exilis	Lancet Clubtail
Gomphus lividus	Ashy Clubtail
Gomphus spicatus	Dusky Clubtail
Hagenius brevistylus	Dragonhunter
Lanthus sp.	
Progomphus obscurus	Common Sanddragon
Stylogomphus albistylus	Least Clubtail

FAMILY CORDULEGASTRIDAE—Spiketails

Cordulegaster diastatops	Delta-spotted Spiketail
Cordulegaster maculata	Twin-spotted Spiketail
Cordulegaster oblique	Arrowhead Spiketail

FAMILY MACROMIIDAE—Cruisers

Didymops transversa	Stream Cruiser
Macromia illinoiensis	Swift River Cruiser

FAMILY CORDULIIDAE—Emeralds

Cordulia shurtleffii	American Emerald)
Dorocordulia libera	Racket-tailed Emerald
Epitheca canis	Beaverpond Baskettail
Epitheca cynosure	Common Baskettail
Epitheca princeps	Prince Baskettail
Epitheca spinigera	Spiny Baskettail
Somatochlora williamsoni	Williamson's Emerald

FAMILY LIBELLULIDAE—Skimmers

Celithemis elisa	Calico Pennant
Celithemis eponina	Halloween Pennant
Erythemis simplicollis	Eastern Pondhawk
Libellula incesta	Slaty Skimmer
Ladona julia	Chalk-fronted Corporal
Leucorrhinia frigida	Frosted Whiteface
Leucorrhinia intacta	Dot-tailed Whiteface
Leucorrhinia proxima	Red-waisted Whiteface
Libellula luctuosa	Widow Skimmer
Libellula pulchella	Twelve-spotted Skimmer
Libellula quadrimaculata	Four-spotted Skimmer
Libellula semifasciata	Painted Skimmer
Pachydiplax longipennis	Blue Dasher
Perithemis tenera	Eastern Amberwing
Plathemis lydia	Common Whitetail
Sympetrum internum	Cherry-faced Meadowhawk
Sympetrum obtrusum	White-faced Meadowhawk
Sympetrum semicintum	Band-winged Meadowhawk
Sympetrum vicinum	Autumn Meadowhawk
Tramea lacerate	Black Saddlebags

ORDER ORTHOPTERA—Grasshoppers, Crickets & Katydids

Taxonomy based on Capinera, J.L., R.D. Scott, and T.J. Walker 2005. Field Guide to Grasshoppers, Katydids, and Crickets of the United States., Comstock, 280 pp

FAMILY ACRIDIDAE—Short-horned Grasshoppers

Arphia suphurea Sulphur-winged Grasshopper
Chorthippus curtipennis Marsh Meadow Grasshopper
Chortophaga viridifasciata Northern Green-striped Grasshopper
Dissosteira carolina Carolina Grasshopper
Melanoplus bivittatus Two-striped Grasshopper
Melanoplus femurrubrum Red-legged Grasshopper
Melanoplus keeleri Keeler's Spur-throated Grasshopper
Melanoplus sanguinipes Migratory Grasshopper
Spharagemon collare Mottled Sand Grasshopper

FAMILY TETTIGONIIDAE—Katydids

Amblycorypha oblongifolia Oblong-winged Katydid
Conocephalus brevipennis Short-winged Meadow Katydid
Metrioptera roesilii Roesel's Katydid
Scudderia furcata Fork-tailed Bush Katydid

FAMILY RHAPHIDOPHORIDAE—Camel Crickets

Ceuthophilus sp.

FAMILY GRYLLIDAE—True Crickets

Allonemobius sp.
Eunemobius carolinus Carolina Ground Cricket
Gryllus pennsylvanicus Fall Field Cricket
Gryllus veletis Spring Field Cricket
Oecanthus nigricornis Black-horned Tree Cricket

ORDER PHASMIDA--Walkingsticks

FAMILY DIAPHEROMERIDAE

Diapheromera femorata (Northern Walkingstick)

ORDER PLECOPTERA—Stoneflies

Taxonomy based on Stewart, K.W. and B.P.Stark. 2002. Nymphs of North American Stonefly Genera (Plecoptera), 2nd Edition. 510 pp

FAMILY CAPNIIDAE—Small Winter Stoneflies

Allocapnia sp.

FAMILY CHLOROPERLIDAE—Green Stoneflies

Sweltsa sp.
Haploperla sp.
Suwallia sp.
Utaperla sp.

FAMILY LEUCTRIDAE—Rolled-winged Stoneflies

Leuctra sp.

FAMILY NEMOURIDAE—Spring Stoneflies

Amphinemura sp.
Paranemura sp.
Shipsa rotunda
Soyedina sp.

FAMILY PERLIDAE—Common Stoneflies

Acroneuria abnormis
Acroneuria sp.
Beloneuria sp.
Eccoptura sp.
Perlesta sp.
Perlinella sp.
Agentina sp.
Neoperla sp.
Paragnetina sp.

FAMILY PERLODIDAE—Perlodid Stoneflies

Clioperla sp.
Isoperla orata
Isoperla sp.
Arcynopteryx sp.
Remenus sp.
Oconoperla sp.

FAMILY PTERONARCYIDAE—Giant Stoneflies

Pteronarcys sp.

ORDER PSOCOPTERA—Barklice, Booklice & Parasitic Lice

FAMILY DASYDEMELLIDAE—Shaggy Psocids

Teliapsocus conterminus

ORDER THYSANOPTERA--Thrips

FAMILY PHLAEOTHRIPIDAE—Tube-tailed Thrips

UK Tube-tailed Thrips

ORDER TRICHOPTERA--Caddisflies

Taxonomy based on Wiggins, G.B. 2004. Larvae of the North American Caddisfly Genera (Trichoptera). University of Toronto Press, Scholarly Publishing Division, 424 pp.

FAMILY APATANIIDAE—Early Smoky-wing Sedges
Manophylax sp.
Madeophylax sp.

FAMILY BRACHYCENTRIDAE—Humpless Casemaker Caddisflies
Amiocentrus sp.
Brachycentrus sp.
Micrasema sp.

FAMILY CALAMOCERATIDAE
Heteroplectron sp.

FAMILY DIPSEUDOPSIDAE
Phylocentropus sp.

FAMILY GLOSSOSOMATIDAE—Little Black Caddisflies
Agapetus sp.
Glossosoma sp.
Culoptila sp.

FAMILY GOERIDAE
Goera sp.

FAMILY HELICOPSYCHIDAE—Snailcase Caddisflies
Heliopsyche sp.

FAMILY HYDROPSYCHIDAE—Netspinning Caddisflies
Parapsyche sp.
Diplectrona sp.
Cheumatopsyche sp.
Hydropsyche sp.
Potamyia sp.
Macrostemum zebratum

FAMILY HYDROPTILIDAE—Microcaddisflies
Hydroptila sp.
Oxyethira sp.

FAMILY LEPIDOSTOMATIDAE—Bizarre Caddisflies
Lepidostoma sp.

FAMILY LEPTOCERIDAE—Long-horned Caddisflies
Ceraclea sp.
Mystacides sp.
Nectopsyche sp.
Oecetis sp.
Setodes sp.
Triaenodes sp.

FAMILY LIMNEPHILIDAE—Northern Caddisflies
Ironoquia punctatissima
Ironoquia sp.
Onocosmoecus sp.
Frenesia sp.
Asynarchus sp.
Lenarchus sp.
Limnephilus sp.
Nemotaulius hostilis
Chyranda sp.
Hydatophylax sp.
Pycnopsyche antica
Pycnopsyche lepida
Pycnopsyche sp.
Pseudostenophylax sp.

FAMILY MOLANNIDAE—Hood Casemakers
Molanna sp.

FAMILY ODONTOCERIDAE—Mortarjoint Casemakers
Marilia sp.

FAMILY PHILOPOTAMIDAE—Fingernet Caddisflies
Chimarra sp.
Dolophiloides sp.
Wormaldia sp.

FAMILY PHRYGANEIDAE—Giant Casemakers
Agrypnia vestita
Banksiola crotchi
Oligostomis sp.
Phryganea cinerea
Ptilostomis ocellifera
Ptilostomis sp.

FAMILY POLYCENTROPODIDAE—Tube-maker Caddisflies
Neureclipsis sp.
Nyctiophylax sp.
Polycentropus sp.

FAMILY PSYCHOMYIIDAE—Net Tube Caddisflies
Leucotrichia sp.
Lype sp.
Mayatrichis sp.
Orthotrichia sp.
Psychomyia sp.

FAMILY RHYACOPHILIDAE—Free-living Caddisflies
Rhyacophila sp.

FAMILY UENOIDAE—Stonecase Caddisflies
Neophylax sp.

ORDER MECOPTERA—Hanging Flies & Scorpionflies

Taxonomy based on Cheung, D.K.B., Marshall, S.A. and Webb, D.W. 2006. Mecoptera of Ontario. Canadian Journal of Arthropod Identification No. 1, 28 June 2006.

Family Bittacidae—Hanging Flies
Bittacus strigosus

Family Panorpidae--Scorpionflies
Panorpa mirabilis
Panorpa nebulosa
Panorpa subfurcata

SPIDER SPECIES

ORDER ARANEAE--Spiders

Family Linyphiidae—Sheet-web Weavers & Dwarf Spiders
Hypselistes florens

Family Araneidae—Orb Weavers
Acanthepeira stellata Star-bellied Orbweaver
Araneus marmoreus Marbled Orbweaver
Araneus trifolium Shamrock Orbweaver
Araniella displicata Six-spotted Orbweaver
Argiope aurantia Black-and-yellow Orbweaver
Argiope trifasciata Banded Orbweaver
Eustala anastera Hump-backed Orbweaver
Lariniodes cornutus Furrow Orbweaver
Mangora placida Tuft-legged Orbweaver
Neoscona arabesca Arabesque Orbweaver

Family Tetragnathidae—Long-jawed Orb Weavers
Leucauge venusta Orchard Orbweaver
Tetragnatha elongata
Tetragnatha sp.

Family Anyphaenidae—Ghost Spiders
Hibana gracilis Garden Ghost Spider

Family Agelenopsidae—Funnel Weavers
Agelenopsis sp.

Family Lycosidae—Wolf Spiders
Tigrosa helluo
Pardosa sp.
Schizocosa sp.
Pirata sp.

Family Pisauridae—Nursery Web Spiders
Dolomedes striatus
Dolomedes triton Six-spotted Fishing Spider
Pisaurina mira

Family Salticidae—Jumping Spiders
Sitticus floricola palustris
Synemosyna formica Ant-mimic Jumping Spider
Eris flava
Eris militaris Bronze Jumper
Pelegrina proterva Reckless Jumper
Phidippus clarus (Brilliant Jumper)
Tutelina harti
Maevia inclemens Dimorphic Jumper
Naphrys pulex
Habronattus decorus
Evarcha hoyi Hoy's Jumper

Family Dictyridae—Mesh Web Weavers
Dictyna sp.

Family Thomisidae—Crab Spiders
Bassaniana utahensis/versicolor
Mecaphesa asperata Northern Crab Spider
Misumena vatia Goldenrod Crab Spider
Tmarus angulatus Angled Crab Spider
Xysticus sp.

Family Philodromidae—Philodromid Spiders
Philodromus sp.
Thanatus formicinus Diamond Spider
Tibellus oblongu

MILLIPEDE SPECIES

ORDER DIPLODA—Millipedes

FAMILY SPIROBOLIDAE
Narceus americanus-annularis complex

FAMILY XYSTODESMIDAE
Apheloria sp.

CRUSTACEAN SPECIES

Taxonomy based on (1) Peckarsky, B.L., P.R. Fraissinet, M.A. Penton, and D.J. Conklin Jr. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press. 456 pp

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ORDER DECAPODA—Crabs, Crayfish, Lobster & Shrimp

FAMILY CAMBARIDAE

Cambarus robustus	Robust Crayfish
Orconectes immunis	Calico Crayfish
Orconectes obscures	Alleghany Crayfish
Orconectes propinquus	Northern Clearwater Crayfish

ORDER AMPHIPODA

FAMILY TALITRIDAE

Hyalella sp.

FAMILY CRANGONYCTIDAE

Stygonectes sp.

FAMILY GAMMARIDAE

Gammarus sp.

ORDER ISOPODA

FAMILY ASELLIDAE

Caeciodotea sp.
Lirceus sp.

FAMILY ARMADILLIDIIDAE—Pillbugs

Armadillidium nasatum

MOLLUSC SPECIES

Taxonomy based on (1) Peckarsky, B.L., P.R. Fraissinet, M.A. Penton, and D.J. Conklin Jr. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press. 456 pp.

CLASS BIVALVIA

ORDER VENEROIDAE

FAMILY SPHAERIIDAE—Fingernail & Pea Clams

Musculium sp.
Pisidium sp.
Sphaerium sp.

ORDER UNIONIDA

FAMILY UNIONIDA—River Mussels

Pyganodon cataracta	Eastern Floater
Lampsilis radiate	Eastern Lampmussel
Elliptio complanata	Eastern Elliptio

CLASS GASTROPODA

FAMILY ANCYLIDAE—Freshwater Limpets

Ferrissia parallela

FAMILY PHYSIDAE—Bladder Snails

Aplexa elongata
Physella sp.
Physinae sp.

FAMILY PLANORBIDAE—Ram's Horn Snails

Armiger crista
Gyraulus sp.
Helisoma sp.
Menetus sp.
Pisidium sp.

FAMILY LYMNAEIDAE—Freshwater Snails

Pseudosuccinea columella
Stagnicola sp.
Fossaria sp.

FAMILY VALVATIDAE—Valve Snails

Valvata lewisi

FAMILY VIVIPARIDAE—Mystery Snails

Viviparus georgianus

FAMILY POLYGYRIDAE—Land Snails

Neohelix albolabris

FISH SPECIES

Fish species included in this list are limited to those sampled and verified since 2008. Explanations for this decision are included in the Aquatic Species Management Plan. Additionally, because we do not actively manage fish in Lake Bonaparte or the Black River, fish species known only from those bodies of water (i.e. Cisco in Lake Bonaparte and Common Carp in the Black River) are not included in this list. Fish naming conventions (common and scientific) are based on names of fish listed in the New York State Fish Atlas as of January 1, 2017.

ORDER SALMONIFORMES

FAMILY SALMONIDAE – Trout & Salmon

Oncorhynchus mykiss (I)	Rainbow Trout
Salmo trutta (I)	Brown Trout
Savelinus fontinalis	Brook Trout

ORDER ESOCIFORMES

FAMILY UMBRIDAE – Mudminnows

Umbra limi	Central Mudminnow

FAMILY ESOCIDAE – Pikes

Esox americanus vermiculatus	Grass Pickerel
Esox Lucius	Northern Pike
Esox niger	Chain Pickerel

ORDER CYPRINIFORMES

FAMILY CYPRINIDAE – Minnows & Carp

Carassius auratus (I)	Goldfish
Chrosomus eos	Northern Redbelly Dace
Clinostomus elongates	Redside Dace
Exoglossum maxillingua	Cutlips Minnow
Hybognathus hankinsoni	Brassy Minnow
Hybognathus regius	Eastern Silvery Minnow
Luxilus cornutus	Common Shiner
Margariscus nachtriebi	Northern Pearl Dace
Nocomis biguttatus	Hornyhead Chub
Notemigonus crysoleucas	Golden Shiner
Notropis atherinoides	Emerald Shiner
Notropis heterolepis	Blacknose Shiner
Pimephales notatus	Bluntnose Minnow
Pimephales promelas	Fathead Minnow
Rhinichthys atratalus	Eastern Blacknose Dace
Rhinichthys cataractae	Longnose Dace
Scardinius erythrophthalmus **(I)**	Rudd
Semotilus atromaculatus	Creek Chub
Semotilus corporalis	Fallfish

FAMILY CATOSTOMIDAE – Suckers

Catostomus commersonii	White Sucker

ORDER SILURIFORMES

FAMILY ICTALURIDAE – Catfish

Ameiurus nebulosus	Brown Bullhead
Noturus flavus	Stonecat
Noturus insignis	Margined Madtom

ORDER CYPRINODONTIFORMES

FAMILY CYPRINODONTIDAE – Killifish

Fundulus diaphanus diaphanus	Banded Killifish

ORDER GASTEROSTEIFORMES

FAMILY GASTEROSTEIDAE – Sticklebacks

Culaea inconstans	Brook Stickleback

ORDER PERCIFORMES

FAMILY CENTRARCHIDAE – Sunfish & Bass

Ambloplites rupestris	Rock Bass
Lepomis gibbosus	Pumpkinseed
Lepomis macrochirus	Bluegill
Micropterus dolomieu	Smallmouth Bass
Micropterus salmoides	Largemouth Bass
Pomoxis nigromaculatus	Black Crappie

FAMILY PERCIDAE – Perch

Etheostoma exile	Iowa Darter
Etheostoma nigrum	Johnny Darter
Etheostoma olmstedi	Tessellated Darter
Perca flavscens	YellowPerch

AMPHIBIAN SPECIES

(Taxonomy based on Gibbs, J.P, A. R. Breisch, P.K. Ducey, G. Johnson, J. L. Behler, and R. C. Bothner. 2007. The Amphibians and Reptiles of New York State. Oxford University Press, New York, NY. 422 pp.)

ORDER ANURA – Frogs & Toads

FAMILY BUFONIDAE

Bufo americanus	American Toad

FAMILY HYLIDAE

Hyla versicolor	Gray Treefrog
Hyla chrysoscelis	Cope's Gray Treefrog
Pseudacris crucifer	Spring Peeper
Pseudacris maculata	Boreal (Western) Chorus Frog

FAMILY RANIDAE

Lithobates catesbeiana	Bullfrog
Lithobates clamitans	Green Frog
Lithobates palustris	Pickerel Frog
Lithobates pipiens	Northern Leopard Frog
Lithobates septentrionalis	Mink Frog
Lithobates sylvatica	Wood Frog

ORDER CAUDATA - Salamanders

FAMILY AMBYSTOMATIDAE

Ambystoma jeffersonium (SSC)	Jefferson Salamander
Ambystoma maculatum	Spotted Salamander
Ambystoma laterale	Blue-Spotted Salamander

FAMILY PLETHODONTIDAE

Desmognathus fuscus	Northern Dusky Salamander
Desmognathus ochrophaus	Alleghany Mountain Dusky Salamander
Eurycea bislineata	Northern Two-lined Salamander
Gyrinophilus porphyriticus	Northern Spring Salamander
Hemidactylium scutatum	Four-toed Salamander
Plethodon cinereus	Eastern Red-backed Salamander

FAMILY SALAMANDRIDAE

Notophthalmus viridenscens	Eastern Newt

FAMILY PROTEIDAE

Necturus maculosus	Common Mudpuppy

REPTILE SPECIES

(Taxonomy based on Gibbs, J.P, A. R. Breisch, P.K. Ducey, G. Johnson, J. L. Behler, and R. C. Bothner. 2007. The Amphibians and Reptiles of New York State. Oxford University Press, New York, NY. 422 pp.)

ORDER SQUAMATA – Snakes & Lizards

FAMILY COLUBRIDAE

Diadophis punctataus	Ring-necked Snake
Pantherophis alleghaniensis	Eastern Rat Snake
Lampropeltis triangulum	Milksnake
Nerodia sipedon	Northern Watersnake
Liochlorophis vernalis	Smooth Greensnake
Storeria dekayi	Dekay's Brownsnake
Storeria occipitomaculata	Red-bellied Snake
Thamnophis sauritus	Eastern Ribbonsnake
Thamnophis sirtalis	Common Gartersnake

ORDER TESTUDINES - Turtles

FAMILY CHELYDRIDAE

Chelydra serpentina	Common Snapping Turtle

FAMILY KINOSTERNIDAE

Sternotherus odoratus	Common Musk Turtle

FAMILY EMYDIDAE

Chrysemys picta	Painted Turtle
Clemmys guttata	Spotted Turtle (SSC)
Emydoidea blandingii	Blanding's Turtle (ST)
Glyptemys insculpta	Wood Turtle (SSC)

BIRD SPECIES

(Taxonomy based on The American Ornithologists' Union's 7th Edition Checklist of North American birds.)

ORDER ANSERIFORMES

FAMILY ANATIDAE - Ducks & Geese

Anser albifrons	Greater White-fronted Goose
Chen caerulescens	Snow Goose
Chen rossii	Ross's Goose
Branta bernicla	Brant
Branta hutchinsii	Cackling Goose
Branta canadensis	Canada Goose
Cygnus buccinators	Trumpeter Swan
Cygnus columbianus	Tundra Swan
Aix sponsa	Wood Duck
Anas strepera	Gadwall
Anas americana	American Wigeon
Anas rubripes	American Black Duck
Anas platyrhynchos	Mallard
Anas discors	Blue-winged Teal
Anas clypeata	Northern Shoveler
Anas acuta	Northern Pintail
Anas crecca	Green-winged Teal
Aythya valisineria	Canvasback
Aythya americana	Redhead
Aythya collaris	Ring-necked Duck
Aythya marila	Greater Scaup
Aythya affinis	Lesser Scaup
Melanitta perspicillata	Surf Scoter
Melanitta fusca	White-winged Scoter
Melanitta americana	Black Scoter
Clangula hyemalis	Long-tailed Duck
Bucephala albeola	Bufflehead
Bucephala clangula	Common Goldeneye
Lophodytes cucullatus	Hooded Merganser
Mergus merganser	Common Merganser
Mergus serrator	Red-breasted Merganser
Oxyura jamaicensis	Ruddy Duck

ORDER GALLIFORMES

FAMILY ODONTIPHORIDAE – Quail

Colinus virginianus	Northern Bobwhite (I)

FAMILY PHASIANIDAE – Grouse & Turkey

Phasianus colchicus	Ring-necked Pheasant (I)
Bonasa umbellus	Ruffed Grouse
Meleagris gallopavo	Wild Turkey

ORDER PODICEPEDIFORMES

FAMILY PODICIPEDIDAE - Grebes

Podilymbus podiceps	Pied-billed Grebe (ST)
Podiceps auritus	Horned Grebe

ORDER COLUMBIFORMES

FAMILY COLUMBIDAE – Pigeons & Doves

Columba livia	Rock Pigeon (I)
Zenaida macroura	Mourning Dove

ORDER CUCULIFORMES

FAMILY CUCULIDAE - Cuckoos

Coccyzus americanus	Yellow-billed Cuckoo
Coccyzus erthropthalmus	Black-billed Cuckoo

ORDER CAPRIMULGIFORMES

FAMILY CARPIMULGIDAE - Nightjars

Antrostomus carolinensis	Chuck-will's-widow
Caprimulgis vociferous	Eastern Whip-poor-will (SSC)
Chordeiles minor	Common Nighthawk (SSC)

ORDER APODIFORMES

FAMILY APODIDAE – Swifts

Chaetura pelagica	Chimney Swift

FAMILY TROCHILIDAE – Hummingbirds

Archilochus colubris	Ruby-throated Hummingbird

ORDER GRUIFORMES

FAMILY RALLIDAE – Rails

Rallus limicola	Virginia Rail
Porzana carolina	Sora
Gallinula galeata	Common Moorhen
Fulica americana	American Coot

FAMILY GRUIDAE – Cranes

Antigone canadensis	Sandhill Crane

ORDER CHARADRIIFORMES

FAMILY CHARADRIIDAE – Plovers

Pluvialis squatarola	Black-bellied Plover
Pluvialis dominica	American Golden-Plover
Charadrius semipalmatus	Semipalmated Plover
Charadrius vocifirus	Killdeer

FAMILY SCOLOPACIDAE – Sandpipers

Bartramia longicauda	Upland Sandpiper (ST)
Numenius phaeopus	Whimbrel
Calidris alpina	Dunlin
Calidris bairdii	Baird's Sandpiper
Calidris minutilla	Least Sandpiper
Calidris fuscicollis	White-rumped Sandpiper
Calidris melanotos	Pectoral Sandpiper
Calidris pusilla	Semipalmated Sandpiper
Limnodromus griseus	Short-billed Dowitcher
Gallinago delicata	Wilson's Snipe
Scolopax minor	American Woodcock
Actitis macularius	Spotted Sandpiper
Tringa solitaria	Solitary Sandpiper
Trihga melanoleuca	Greater Yellowlegs
Tringa semipalmata	Willet
Trihga flavipes	Lesser Yellowlegs

FAMILY LARIDAE – Gulls & Terns

Chroicocephalus philadelphia	Bonaparte's Gull
Larus delawarensis	Ring-billed Gull
Larus argentatus	Herring Gull
Larus hyperboreus	Glaucous Gull
Larus marinus	Great Black-backed Gull
Hydropogne caspia	Caspian Tern
Chlidonias niger	Black Tern
Sterna hirundo	Common Tern

ORDER GAVIIFORMES

FAMILY GAVIDAE - Loons

Gavia stellata	Red-throated Loon
Gavia immer	Common Loon (SSC)

ORDER SULIFORMES

FAMILY PHALACROCORACIDAE - Cormorants

Phalacrocorax auritus	Double Crested Cormorant

ORDER PELECANIFORMES

FAMILY ARDEIDAE - Herons

Botaurus lentiginosus	American Bittern (SSC)
Ixobrychus exilis	Least Bittern (ST)
Ardea herodias	Great Blue Heron
Ardea alba	Great Egret
Butorides virescens	Green Heron
Nycticorax nycticorax	Black-crowned Night-Heron

ORDER CATHARTIFORMES

FAMILY CATHARTIDAE – New World Vultures

Cathartes aura	Turkey Vulture

ORDER ACCIPITRIFORMES

FAMILY PANDIONIDAE – Osprey

Pandion haliaetus	Osprey (SSC)

FAMILY ACCIPITRIDAE – Hawks & Eagles

Haliaeetus leucocephalus	Bald Eagle (ST)
Circus cyaneus	Northern Harrier (ST)
Accipiter striatus	Sharp-shinned Hawk (SSC)
Accipiter cooperii	Cooper's Hawk (SSC)
Accipiter gentilis	Northern Goshawk (SSC)
Buteo lineatus	Red-shouldered Hawk (SSC)
Buteo platypterus	Broad-winged Hawk
Buteo jamaicensis	Red-tailed Hawk
Buteo lagopus	Rough-legged Hawk
Aquila chrysaetos	Golden Eagle (SE)

ORDER STRIGIFORMES

FAMILY STRIGIDAE - Owls

Megascops asio	Eastern Screech-Owl
Bubo virginianus	Great Horned Owl
Bubo scandiacus	Snowy Owl
Strix varia	Barred Owl
Asio otus	Long-eared Owl
Asio flammeus	Short-eared Owl (SE)
Aegolius acadicus	Northern Saw-whet Owl

ORDER CORACIIFORMES

FAMILY ALCEDINIDAE - Kingfishers

Megaceryle alcyon	Belted Kingfisher

ORDER PICIFORMES

FAMILY PICIDAE - Woodpeckers

Melanerpes lewis	Lewis's Woodpecker
Melanerpes erythrocephalus	Red-headed Woodpecker (SSC)
Melanerpes carolinus	Red-bellied Woodpecker
Sphyrapicus varius	Yellow-bellied Sapsucker
Picoides pubescens	Downy Woodpecker
Picoides villosus	Hairy Woodpecker
Picoides arcticus	Black-backed Woodpecker
Colaptes auratus	Northern Flicker
Dryocopus pileatus	Pileated Woodpecker

ORDER FALCONIFORMES

FAMILY FALCONIDAE - Falcons

Falco sparverius	American Kestrel
Falco columbarius	Merlin
Falco peregrinus	Peregrine Falcon (SE)

ORDER PASSERIFORMES

FAMILY TYRANNIDAE--Flycatchers

Contopus cooperi	Olive-sided Flycatcher
Contopus virens	Eastern Wood-Peewee
Empidonax flaviventris	Yellow-bellied Flycatcher
Empidonax alnorum	Alder Flycatcher
Empidonax traillii	Willow Flycatcher
Empidonax minimus	Least Flycatcher
Sayornis phoebe	Eastern Phoebe
Myiarchus crinitus	Great crested Flycatcher
Tyrannus verticalis	Western Kingbird
Tyrannus tyrannus	Eastern Kingbird

FAMILY LANIIDAE – Shrikes

Lanius excubitor	Northern Shrike

FAMILY VIREONIDAE – Vireos

Vireo griseus	White-eyed Vireo
Vireo flavifrons	Yellow-throated Vireo
Vireo solitarius	Blue-headed Vireo
Vireo philadelphicus	Philadelphia Vireo
Vireo gilvus	Warbling Vireo
Vireo olivaceus	Red-eyed Vireo

FAMILY CORVIDAE – Jays & Crows

Cyanocitta cristata	Blue Jay
Corvus brachyrhnchos	American Crow
Corvus ossifragus	Fish Crow
Corvux corvax	Common Raven

FAMILY ALAUDIDAE – Larks

Eremophila alpestris	Horned Lark (SSC)

FAMILY HIRUNDINIDAE – Swallows

Progne subis	Purple Martin
Tachycineta bicolor	Tree Swallow
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Riparia riparia	Bank Swallow
Petrochelidon pyrrhonota	Cliff Swallow
Hirundo rustica	Barn Swallow

FAMILY PARIDAE – Chickadees

Poecile atricapillus	Black-capped Chickadee
Poecile hudsonicus	Boreal Chickadee
Baelophus bicolor	Tufted Titmouse

FAMILY SITTIDAE – Nuthatches

Sitta canadensis	Red-breasted Nuthatch
Sitta carolinensis	White-breasted Nuthatch

FAMILY CERTHIIDAE – Brown Creeper

Certhia americana	Brown Creeper

FAMILY TROGLODYTIDAE – Wrens

Troglodytes aedon	House Wren
Troglodytes hiemalis	Winter Wren
Cistothorus platensis	Sedge Wren (ST)
Cistothorus paulstris	Marsh Wren
Thryothorus ludovicianus	Carolina Wren

FAMILY POLIOPTILIDAE – Gnatcatchers

Polioptila caerulea	Blue-gray Gnatcatcher

FAMILY REGULIDAE – Kinglets

Regulus satrapa	Golden-crowned Kinglet
Regulus calendula	Ruby-crowned Kinglet

FAMILY TURDIDAE – Thrushes

Sialia sialis	Eastern Bluebird
Catharus fuscescens	Veery
Catharus minimus	Gray-cheeked Thrush
Catharus ustulatus	Swainson's Thrush
Catharus guttatus	Hermit Thrush
Hylocichla mustelina	Wood Thrush

Turdus migratorius American Robin

FAMILY MIMIDAE – Catbirds & Mockingbirds
Dumetella carolinensis Gray Catbird
Toxostoma rufum Brown Thrasher
Mimus polyglottos Northern Mockingbird

FAMILY STURNIDAE – Starling
Sturnus vulgaris European Starling (I)

FAMILY BOMBYCILLIDAE –Waxwings
Bombycilla garrulus Bohemian Waxwing
Bombycilla cedrorum Cedar Waxwing

FAMILY PASSERIDAE – House Sparrow
Passer domesticus House Sparrow (I)

FAMILY MOTACILLIDAE – Pipets
Anthus rubescens American Pipit

FAMILY FRINGILLIDAE – Finches
Pinicola enucleator Pine Grosbeak
Carpodacus mexicanus House Finch (I)
Carpodacus purpureus Purple Finch
Loxia curvirostra Red Crossbill
Loxia leucoptera White-winged Crossbill
Acanthis flammea Common Redpoll
Acanthis hornemanni Hoary Redpoll
Spinus pinus Pine Siskin
Spinus tristis American Goldfinch
Coccothraustes vespertinus Evening Grosbeak

FAMILY CALCARIIDAE – Longspurs & Snow Buntings
Calcarius lapponicus Lapland Longspur
Plectrophenax nivalis Snow Bunting

FAMILY PARULIDAE – Wood-Warblers
Seiurus aurocapilla Ovenbird
Helmitheros vermivorum Worm-eating Warbler
Parkesia motacilla Louisiana Waterthrush
Parkesia noveboracensis Northern Waterthrush
Vermivora chrysoptera Golden-winged Warbler (SSC)
Vermivora cyanoptera Blue-winged Warbler
Mniotilta varia Black-and-white Warbler
Oreothlypis peregrina Tennessee Warbler
Oreothlypis celata Orange-crowned Warbler
Oreothlypis ruficapilla Nashville Warbler
Oporornis agilis Connecticut Warbler
Geothlypis philadelphia Mourning Warbler
Geothlypis trichas Common Yellowthroat
Setophaga citrina Hooded Warbler
Setophaga ruticilla American Redstart
Setophaga kirtlandii Kirtland's Warbler (FE)
Setophaga tigrina Cape May Warbler
Setophaga cerulea Cerulean Warbler (SSC)
Setophaga americana Northern Parula
Setophaga magnolia Magnolia Warbler
Setophaga castanea Bay-breasted Warbler
Setophaga fusca Blackburnian Warbler
Setophaga petechia Yellow Warbler
Setophaga pensylvanica Chestnut-sided Warbler
Setophaga striata Blackpoll Warbler
Setophaga caerulescens Black-throated Blue Warbler
Setophaga palmarum Palm Warbler
Setophaga pinus Pine Warbler
Setophaga coronata Yellow-rumped Warbler
Setophaga discolor Prairie Warbler
Setophaga virens Black-throated Green Warbler
Cardellina canadensis Canada Warbler
Cardellina pusilla Wilson's Warbler
Icteria virens Yellow-breasted Chat (SSC)

FAMILY EMBERIZIDAE – New World Sparrows
Pipilo erythrophthalmus Eastern Towhee
Spizelloides arborea American Tree Sparrow
Spizelloides passerina Chipping Sparrow
Spizelloides pallida Clay-colored Sparrow
Spizelloides pusilla Field Sparrow
Pooecetes gramineus Vesper Sparrow (SSC)
Chondestes grammacus Lark Sparrow
Passerculus sandwichensis Savannah Sparrow
Ammodramus savannarum Grasshopper Sparrow (SSC)
Ammodramus henslowii Henslow's Sparrow (ST)
Ammodramus leconteii Le Conte's Sparrow
Ammodramus nelsoni Nelson's Sparrow
Passerella iliaca Fox Sparrow
Melospiza melodia Song Sparrow
Melospiza lincolnii Lincoln's Sparrow
Melospiza georgiana Swamp Sparrow
Zonotrichia albicollis White-throated Sparrow
Zonotrichia leucophrys White-crowned Sparrow
Junco hyemalis Dark-eyed Junco

FAMILY CARDINALIDAE – Tanagers & Grosbeaks
Piranga olivacea Scarlet Tanager
Piranga rubra Summer Tanager
Cardinalis cardinalis Northern Cardinal
Pheucticus ludovicianus Rose-breasted Grosbeak
Passerina cyanea Indigo Bunting
Spiza americana Dickcissel

FAMILY ICTERIDAE – Blackbirds
Doliochonyx oryzivorus Bobolink
Agelaius phoeniceus Red-winged Blackbird
Sturnella magna Eastern Meadowlark
Euphagus carolinus Rusty Blackbird
Quiscalus quiscula Common Grackle
Molothus ater Brown-headed Cowbird
Icterus spurius Orchard Oriole
Icterus galbula Baltimore Oriole

MAMMAL SPECIES

(Taxonomy based on Whitaker, J.O., Jr., and W.J. Hamilton, Jr. 1998. Mammals of the Eastern United States. Cornell University Press, Ithaca, NY. 583 pp.)

ORDER DIDELPHIMORPHIA

FAMILY DIDELPHIDAE – Opossums

Didelphis virginiana	Virginia Opossum

ORDER INSECTIVORA

FAMILY SORICIDAE – Shrews

Blarina brevicauda	Northern Short-tailed Shrew
Sorex cinereus	Masked Shrew
Sorex fumeus	Smokey Shrew
Sorex hoyi	Pygmy Shrew

FAMILY TALPIDAE – Moles

Condylura cristata	Star-nosed Mole
Parascalops breweri	Hairy-tailed Mole

ORDER CHIROPTERA

FAMILY VESPTERTILIONIDAE – Bats

Eptesicus fuscus	Big Brown Bat
Lasionycteris noctivagans	Silver-haired Bat
Lasiurus borealis	Red Bat
Lasiurus cinereus	Hoary Bat
Myotis leibii	Eastern Small-footed Myotis
Myotis lucifugus	Little Brown Bat
Myotis septentrionalis	Northern Long-eared Bat (FE/SE)
Myotis sodalis	Indiana Bat (FE/SE)
Perimyotis subflavus	Tri-colored Bat

ORDER LAGOMORPHA

FAMILY LEPORIDAE – Rabbits & Hares

Lepus americanus	Snowshoe Hare
Sylvilagus floridanus	Eastern Cottontail

ORDER RODENTIA

FAMILY SCIURIDAE – Squirrels

Glaucomys sabrinus	Northern Flying Squirrel
Glaucomys volans	Southern Flying Squirrel
Marmota monax	Woodchuck
Sciurus carolinensis	Gray Squirrel
Tamiasciurus hudsonicus	Red Squirrel
Tamias striatus	Eastern Chipmunk

FAMILY CASTORIDAE – Beaver

Castor canadensis	Beaver

FAMILY ERETHIZONTIDAE – Porcupine

Erethizon dorsatum	Porcupine

FAMILY MURIDAE – Rats, Mice, & Voles

Clethrionomys gapperi	Southern Red-backed Vole
Microtus pennsylvanicus	Meadow Vole
Mus musculus	House Mouse
Ondatra zibethicus	Muskrat
Peromyscus leucopus	White-footed Mouse
Peromyscus maniculatus	Deer Mouse
Synaptomys cooperi	Southern Bog Lemming

FAMILY ZAPODIDAE – Jumping Mice

Napaeozapus insignis	Woodland Jumping Mouse
Zapus hudsonicus	Meadow Jumping Mouse

ORDER CARNIVORA

FAMILY CANIDAE – Dogs

Canis latrans	Coyote
Urocyon cinereoargenteus	Gray Fox
Vulpes vulpes	Red Fox

FAMILY URSIDAE – Bears

Ursus americanus	Black Bear

FAMILY PROCYONIDAE – Raccoons

Procyon lotor	Common Raccoon

FAMILY MUSTELIDAE – Weasels

Lutra canadensis	River Otter
Martes pennanti	Fisher
Mustela erminea	Ermine (Short-tailed Weasel)
Mustela frenata	Long-tailed Weasel
Mustela vison	Mink

FAMILY MEPHITIDAE – Skunks

Mephitis mephitis	Striped Skunk

FAMILY FELIDAE – Cats

Lynx rufus	Bobcat

ORDER ARTIODACTYLA

FAMILY CERVIDAE – Deer

Alces alces	Moose
Odocoileus virginianus	White-tailed Deer

Appendix 5: List of Special Status Species

These species are known to occur on Fort Drum and either listed through the Endangered Species Act (16 USC 1531-1544, 87 Stat. 884) and/or classified as endangered, threatened or special concern in NYS which meet one or both of the criteria specified in section 182.2(g), 182.2(h), or 182.2(i) of 6NYCRR Part 182, respectively.

COMMON NAME	SCIENTIFIC NAME	STATUS ON FORT DRUM
FEDERALLY ENDANGERED		
Indiana Bat	*Myotis sodalis*	Historic extensive maternity colony use—roosting and foraging—known within Cantonment Area, Training Areas 3 and 4, and areas off-post adjacent to Cantonment Area. Male use likely throughout much of the southern part of the Training Areas. No hibernacula are known on the installation. Populations have decreased due to WNS, and the current level of decline is unknown
Northern Long-eared Bat	*Myotis septentrionalis*	Historic maternity colony and male use-roosting and foraging-known throughout all of the installation. No hibernacula are known on the installation. Populations have decreased due to WNS, and the current level of decline is unknown
STATE ENDANGERED		
Indiana Bat	*Myotis sodalis*	See above.
Northern Long-eared Bat	*Myotis septentrionalis*	See above.
Golden Eagle	*Aquila chrysaetos*	Rare spring and fall migrant and very rare winter resident; summer status unclear, but never known to nest.
Peregrine Falcon	*Falco peregrinus*	Infrequent but increasing spring and fall migrant; occasional in summer.
Short-eared Owl	*Asio flammeus*	Rare to uncommon migrant and winter resident. Highly erratic breeder, nesting on average one out of every 2-4 years on the installation in TAs 12 and 13; at least 3 pairs have nested during the same year.
Black Tern	*Chlidonias niger*	Observed infrequently in Matoon Marsh in TA 17, nesting suspected three times but never confirmed
Trailing Clubmoss	*Diphasiastrum complanatum*	Recorded as a rare occurrence and sparse distribution in TA19C.
Three-seeded Mercury	*Acalypha virginica*	Found frequently on Fort Drum around roadsides and waste places.
Rock-cress	*Boechera stricta*	A sparsely inhabited and rare species found within Fort Drum's sandy grassland habitats.
Northern Wild Comfrey	*Cynoglossum virginianum* var. *boreale*	Found on rocky outcrops in TA19C near Indian Pond. Recorded as a rare occurrence with sparse distribution.
Common Mare's-tail	*Hippuris vulgaris*	Recorded in TA8C within Conservation Pond and TA19C within Mud Lake. Rare within Fort Drum and sparsely distributed where found.
STATE THREATENED		
Bald Eagle	*Haliaeetus leucocephalus*	Uncommon spring, fall, and winter; occasional in summer. First known nest documented in TA19 in 2020.

Henslow's Sparrow	*Ammodramus henslowii*	Rare breeder—20-25 territories 2009 and 2010 but fewer than 10 per year most years since 2010.
Least Bittern	*Ixobrychus exilis*	Rare breeder—1-3 males per year at Matoon marsh in TA 17B; isolated records from elsewhere.
Northern Harrier	*Circus cyaneus*	Uncommon breeder—5-10 pairs per year in TA 12 and 13 grasslands; 5-15 pairs per year elsewhere. Uncommon to common in spring, fall, and winter.
Pied-billed Grebe	*Podilymbus podiceps*	Limited breeder—15-25 breeding pairs most years.
Sedge Wren	*Cistothorus platensis*	Erratic breeder in grasslands—1-2 territories some years, 20-40 other years, but 10+ most years; rarely seen in migration.
Upland Sandpiper	*Bartramia longicauda*	Formerly common breeder, now rare with 5-8 breeding pairs annually in area of WSAAF, TA5 & TA8A; recently recolonized restored fields in TAs 7D & 7G.
Blanding's Turtle	*Emydoidea blandingii*	Two observations have been made—in TA14E in 1995 and TA13A in 2006.
Slim-stem Small-reedgrass	*Calamagrostis stricta inexpansa*	Documented in mitigation site within TA14G. Possibly planted but persisting.
Buxbaum's Sedge	*Carex buxbaumii*	Located on the shores of Indian Lake within TA19D. Sparsely populated and of rare occurrence.
Hitchcock's Sedge	*Carex hitchcockiana*	Documented in the rich woods of TA16B near range 33. Rare within Fort Drum but sparse to abundant distribution where found.
Houghton's Sedge	*Carex houghtoniana*	Found within Fort Drum's southwest TA's in disturbed sandy open grasslands. Infrequent within Fort Drum with sparse to abundant localized distribution where found.
Swamp Pink	*Arethusa bulbosa*	Only found in TA19C within the fens that surround Mud Lake. It is sparsely located within these fens.
Beck Water Marigold	*Bidens beckii*	Found within the Indian River in TA17 and Mud Lake within TA19C. An aquatic species that is abundant where found but rare across Fort Drum's landscape.
Prickly Hornwort	*Ceratophyllum echinatum*	Documented in TA13A in abundance. Rare within Fort Drum.
Lakecress	*Neobeckia aquatica*	Found abundantly within Indian River. It is only documented within the Indian River within Fort Drum's boundary.
Hornleaf Riverweed	*Podostemum ceratophyllum*	Found abundantly within Black Creek. It is only documented within Black Creek throughout Fort Drum's boundary.
Hill's Pondweed	*Potamogeton hillii*	Infrequently located in quiet waters with sparse to abundant distribution where found.
Small Bur-reed	*Sparganium natans*	Documented in TA14G in abundance but with rarity across the installation.
Boreal Aster	*Symphyotrichum boreale*	Found abundantly in TA19C within a medium fen located adjacent to Lake Bonaparte. Only documented area within the installation.
Lesser Bladderwort	*Utricularia minor*	An aquatic species found within quiet water with infrequency. Where found locally the population may be sparse to abundantly distributed.
Balsam Willow	*Salix pyrifolia*	Found infrequently in wet pockets within woods or at the edge of bogs. Sparse or abundantly populated where found locally.
Rock Elm	*Ulmus thomasii*	Found within Fort Drum's limey rich woods infrequently. Distributed sparsely too abundantly in these areas.

STATE SPECIES OF SPECIAL CONCERN		
Small-footed Bat	*Myotis leibii*	Not much is known about this species on Fort Drum. There is some limited historic use known in the northern rocky reaches of the Training Area. No hibernacula are known on the installation.
American Bittern	*Botaurus lentiginosus*	Uncommon to locally common breeder in wet or damp open areas.
Cerulean Warbler	*Dendroica cerulean*	Rare breeder—4-7 territorial males found in 2-3 locations annually
Common Loon	*Gavia immer*	Local breeder—2-5 pairs per year; uncommon spring and fall migrant.
Common Nighthawk	*Chordeiles minor*	Breeding – uncommon to locally common breeder; uncommon spring migrant, uncommon to occasionally very common early fall migrant.
Cooper's Hawk	*Accipiter cooperii*	Uncommon breeder—possibly increasing; uncommon in spring, fall, and winter.
Golden-winged Warbler	*Vermivora chrysoptera*	Uncommon breeder—possibly decreasing; rarely seen in migration.
Grasshopper Sparrow	*Ammodramus savannarum*	Locally common breeder on sandy grasslands near airfield; 30-60 found per year, but apparently decreasing because of development in airfield area.
Horned Lark	*Eremophila alpestris*	Local breeder in sandy grasslands near airfield, where apparently decreasing because of development; common winter visitor and migrant.
Northern Goshawk	*Accipiter gentilis*	1-3 pairs nest per year; rare to uncommon in spring, fall, and winter.
Osprey	*Pandion haliaetus*	1-2 pairs nest; uncommon spring and fall migrant.
Red-headed Woodpecker	*Melanerpes erythrocephal*	Ten to 12 pairs nest in TAs 5B and 5D near WSAAF per year, but apparently declining. Formerly nested in TA 4, where none have been found since 2007, but two were briefly seen in spring 2016
Red-shouldered Hawk	*Buteo lineatus*	10-15 nesting pairs documented annually prior to 2003, apparently decreasing since then.
Sharp-shinned Hawk	*Accipiter striatus*	Uncommon breeder--apparently increasing; uncommon in spring, fall, and winter.
Vesper Sparrow	*Pooecetes gramineus*	Locally common breeder in sandy grasslands and openings, with 100+ territories. Possibly decreasing in airfield area—where largest number occur--because of development. Uncommon spring and fall migrant.
Eastern Whip-poor-will	*Caprimulgus vociferous*	Common breeder; common to abundant spring migrant; rarely observed fall migrant.
Yellow-breasted Chat	*Icteria virens*	Rare in summer—6 records from May to July, including one of a presumed nesting pair.
Spotted Turtle	*Clemmys guttata*	Two adults detected in April 2012 west edge of Mud Lake. More than 20 found since then. Status and distribution not yet known.
Wood Turtle	*Clemmys insculpta*	Found infrequently throughout the installation. Survey efforts to date have identified that Black Creek and the West Branch of Black Creek are important areas. Adequate survey efforts for presence/probable absence have not been completed across the rest of Fort Drum.
Jefferson Salamander	*Ambystoma jeffersonianum*	Relatively common throughout the installation.

Appendix 6: Requirements/Guidelines to Minimize Environmental Impacts from Management Actions

6.1 Aquatic Resources Management Requirements/Guidelines

To benefit aquatic resources and/or minimize direct impacts to soil and water, Best Management Practices (BMPs) and guidelines for land management and other activities can be found in the following sections:

6.1.1 Forest Management Requirements/Guidelines

1. If possible, new log landings will be constructed at least 200 ft (61 m) from water bodies and wetlands.
2. Spill kits and oil absorbent mats will be present on log landings in case of fuel, lubricant or hydraulic fluid spills or leaks.
3. If necessary, soil will be stabilized by seeding and mulching at the end of the operation.
4. Where possible, skid trail grade will be maintained at less than 15%. Where higher grade is unavoidable, the grade will be broken, drainage structures will be installed, and soil stabilization practices will be used where needed to minimize runoff and erosion.
5. Debarking and other damage to residual trees will be minimized wherever possible.
6. Stream crossings will be used only when absolutely necessary.
7. Portable bridges will be used for stream crossings.
8. Streams will be crossed by the most direct route.
9. Ruts will be filled in, and water bars and erosion barriers will be installed to prevent or minimize erosion and sedimentation from roads, skid trails and log landings.
10. Erosion control measures will be inspected within 24 hours after a rain event and checked once per week. Erosion controls will be maintained or removed as needed.
11. No machinery will be operated in streams protected under Article 15 of the NYSDEC Environmental Conservation Law without first obtaining a permit.
12. Vegetative buffers shall be established along streams, extending upslope as far as necessary to prevent erosion, typically to observable slope breaks. Where slope breaks are not obvious, the default width of the buffer shall be 100 ft from each bank where / when conditions allow.

6.1.2 Vegetation Management Requirements/Guidelines

1. No deliberate penetration of the soil surface will take place during vegetation management activities, though incidental ground damage may occur during the operation and movement of equipment. Should incidental disturbance exceed 10% of a work area, the LRAM Coordinator will notify the Wetlands Program Manager of the disturbance location and severity. The LRAM Coordinator will divert resources to alternative locations and/or adjust activities to minimize impacts. Soil disturbance caused by vegetation management activities will be

repaired by LRAM using in-house resources. Typical actions include grading, compacting, seeding, as well as fertilizer, lime, and mulch application.
2. Heavy equipment operation will be avoided in obvious wetland areas. There will be no operation of machinery within 100 ft (30 m) of a state designated wetland without a permit.
3. Woody debris will be chipped using towed wood chippers and blown out of the wetland to avoid fill.
4. No vegetation cutting or herbicide application within 100 ft (30 m) of a NYSDEC regulated wetland without a permit.
5. During prescribed fire or fire training activities, water must be drawn from approved sources for use in fire suppression. Unused water must be disposed of within the same watershed as extracted.

6.1.3 Military Training Requirements/Guidelines

Standard military training activities have not historically required State or Federal wetlands permits. However, *Fort Drum Regulation 350-4 Range Regulation* provides for the protection of soil and water by requiring that:

1. Training activities be minimized in and around wetlands, streams, and other water bodies on Fort Drum.
2. Excavation or depositions of any fill material into wetlands may cause jurisdictional action by the USACE Regulatory Branch. A review by the Wetlands Management Program is required for all proposed actions that involve proposed filling of wetlands or other waters, or elimination of wetland vegetation.
3. Signs reading “Off Limits to Vehicular Traffic by Order of the Commander” posted around wetland mitigation areas must be obeyed. Besides prohibiting vehicular traffic, further restrictions apply to these areas: no clearing or cutting of vegetation; no earthmoving, grading, excavating, ditching, or filling activities; and no placement of refuse, wastes, sewage, other debris or any hazardous substances is allowed.
4. Water crossing or bridging operations are prohibited unless conducted at approved locations or by means of a portable bridge that does not result in wetland loss (i.e. no filling or putting materials into the wetland). Other proposed locations must be reviewed by the Wetlands Management Program to determine whether state and federal permits are required before any action occurs.
5. Vehicle washing in any open body of water (i.e., streams, ponds, lakes, and wetlands) is strictly prohibited.
6. Dumping Petroleum, Oil and Lubricant (POL) products or hazardous wastes along roads or in the field is a violation of Federal law. Criminal Investigation Department and the Federal Attorney’s Office actively investigate such cases.
7. All re-fueling operation locations (i.e., tank pump units, fuel tanks, bladders, 5 gal cans etc.) require a REC. Units shall have spill kits on site to include: clear plastic bags, shovels and absorbent pads/materials. Re-fueling points and fuel blivets shall be located at least 150 meters away from wells and surface waters of any type. These operations will not be authorized in TA4 on account of potable water well field locations and high water table. Ground storage for POLs (i.e., fuel tanks, bladders, etc.) requires a polyethylene lined earthen berm great enough to contain 110% of all fluids or installation approved containment device (REC required).

8. All POL spills are reportable no matter what size or volume. Drips and weeps are considered a spill and shall be reported immediately to the Fire Department or through Range Control. POL spills entering a water source will be reported immediately to the Fire Department or via Range Control and Environmental Division.

6.1.4 Construction Requirements/Guidelines

Under CWA Section 404 regulations, Fort Drum must adhere to the following CWA Section 402 requirements for construction activities:

1. A Stormwater Pollution Discharge Elimination System (SPDES) permit must be obtained for all projects per NYSDEC requirements. At a minimum, projects covered by SPDES will require a Storm Water Pollution Prevention Plan (SWPPP) that addresses sediment and erosion control plan with appropriate Best Management Practices (BMPs).
2. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark, must be permanently stabilized at the earliest practicable date. Adequate sedimentation and erosion control management measures, practices and devices, such as phased construction, vegetated filter strips, geotextile silt fences or other devices, shall be installed and properly maintained to reduce erosion and retain sediment on-site during and after construction.
3. BMPs shall be capable of preventing erosion, of collecting sediment, suspended and floating materials, and of filtering fine sediment, and shall be removed upon completion of work, and the disturbed areas stabilized. The sediment collected by these devices shall be removed and placed at an upland location, in a manner that will prevent its later erosion into a waterway or wetland. All exposed soil and other fills shall be permanently stabilized at the earliest practicable date. Work within open waters of the United States shall also be performed during periods of low-flow or no-flow.
4. A more detailed analysis is required within project areas requiring SPDES permits, typically following the TR-55 methodology (USDA 1986) and standardized guidelines and facilities designed per the NYS Stormwater Design Manual (NYSDEC 2003). These analyses range from detailed site-specific BMPs incorporated into drawings and a narrative for a Sediment and Erosion Control Plan (SECP) for relatively simple projects, to even more detailed Stormwater Pollution Prevention Plans (SWPPPs) with full engineered designs and calculations for sizing of culverts, retention basins, swales, and other stormwater facilities.

A SWPPP for a proposed project typically addresses the conversion or elimination of land cover (i.e. the increase in imperviousness); the effect of this increase on the timing and duration of flows, especially at peak discharge; the erosive effects and resultant water quality at peak discharge; and the pre-treatment or treatment necessary to minimize pollution through sediment or contaminants.

Upland practices are most commonly carried out on Fort Drum. These practices capture sediment and slow down potential erosive forces of runoff before they enter channels, wetlands, or retention areas. Examples include: an earth dike, silt fence, seeding (often mulched afterwards), vegetation protection, hay or straw bales, stabilized construction

entrance, modular block porous pavement, or filter strips (vegetated with grass, shrubs, or trees).

6.1.5 Bridge and Culvert Construction or Other In-Stream Activity Requirements/Guidelines

Under CWA Section 404 regulations, Fort Drum must adhere to the following CWA Section 402 requirements for construction activities: *"Temporary bridges, culverts, cofferdams, access ramps or construction pads shall be used for equipment access within intermittent and perennial streams that contain flowing water at any time that construction work is occurring. Must include a description of these temporary impacts, as well as a proposed restoration plan as required under NWP 33".*

Culverts have historically been improperly placed, so that they have become an obstruction to passage of aquatic organisms.

As discussed in *Section 4.1.4.6,* Fort Drum has been replacing culverts under NWP3 and New York District's Regional Conditions. Regional Conditions require that replacement crossings, typically culverts, be at least 1.25 x the field-identified bankfull width, correctly set the inlet and outlet elevations, and result in the culvert bottom being buried 20% or more. Achieving these requirements through some up-front informal design work by NR Branch personnel alleviates Fort Drum from formally applying for NWP # 3 through a Preconstruction Notice (PCN), which saves time, effort, and cost (which otherwise could be in the tens of thousands of dollars per culvert). Additionally, the Branch applies this on-the-ground through cooperation with other Public Works Personnel (Roads and Grounds), in an internal partnership to actually construct the culvert replacement project in-house, on our own timeline.

Where Regional Conditions are not addressed by an in-house process, or on streams a higher than NYSDEC class D the formal Section 404 wetland permitting process is undertaken. This includes PCNs and contracts for fully engineered design and construction, all on permitting timelines. Funding for these contracted projects is pursued as Sustainment-Restoration-Modernization (SRM) projects with in-house Natural Resources personnel responsible for the permitting workload.

6.1.6 Invasive Species Treatment Requirements/Guidelines

- Follow REC process for environmental review regarding treatment of invasive plant species
- Implement IPM techniques by deploying any types of non-chemical treatment
- Determine if any 25B exempt pesticides could be used
- Ensure appropriate chemical is used for species & site specific conditions All areas were water or saturated soils are present must be treated with aquatic chemical formulations
- Obtain any permits regarding the discharge of pesticides into Waters of the State if watered area is larger than one acre. Ensure area being treated doesn't fall within state regulated wetland. If so, request appropriate permit.

6.2 Land Resources Management Requirements/Guidelines

6.2.1 Aquatic Resources & Water Quality Requirements/Guidelines for Forest Management Activities

The following are BMPs for water quality on Fort Drum:

- If possible, new log landings will be constructed at least 200 ft (61 m) from water bodies and wetlands.
- Spill kits and oil absorbent mats will be present on log landings in case of fuel, lubricant or hydraulic fluid spills or leaks.
- If necessary, soil will be stabilized by seeding and mulching at the end of the operation.
- Where possible, skid trail grade will be maintained at less than 15%. Where higher grade is unavoidable, the grade will be broken, drainage structures will be installed, and soil stabilization practices will be used where needed to minimize runoff and erosion.
- Debarking and other damage to residual trees will be minimized wherever possible.
- Stream crossings will be used only when absolutely necessary.
- Portable steel bridges will be used for stream crossings.
- Streams will be crossed by the most direct route.
- Ruts will be filled in, and water bars and erosion barriers will be installed to prevent or minimize erosion and sedimentation from roads, skid trails and log landings.
- Erosion control measures will be inspected within 24 hours after a rain event and checked once per week. Erosion controls will be maintained or removed as needed.
- No machinery will be operated in streams protected under Article 15 of the NYSDEC Environmental Conservation Law without first obtaining a permit.

6.2.2 Aquatic Resources & Water Quality Requirements/Guidelines for Non-forest Management Activities

- No deliberate penetration of the soil surface will take place during vegetation management activities, though incidental ground damage may occur during the operation and movement of equipment. Should incidental disturbance exceed 10% of a work area, the LRAM Coordinator will notify the Wetlands Program Manager of the disturbance location and severity. The LRAM Coordinator will divert resources to alternative locations and/or adjust activities to minimize impacts. Soil disturbance caused by vegetation management activities will be repaired by LRAM using in-house resources. Typical actions include grading, compacting, seeding, as well as fertilizer, lime, and mulch application.
- Heavy equipment operation will be avoided in obvious wetland areas. There will be no operation of machinery within 100 ft (30 m) of a state designated wetland without a permit.
- Woody debris will be chipped in place using towed wood chippers to avoid fill of any wetlands.

- No vegetation cutting or herbicide application within 100 ft (30 m) of a NYSDEC regulated wetland without a permit.
- During prescribed fire activities, water must be drawn from approved sources for use in fire suppression. Unused water must be disposed of within the same watershed as extracted.
- During prescribed fire activities, potable water is not used for fire suppression to avoid the release of chlorinated water into natural ecosystems.

6.2.3 Non-Forest Management Requirements/Guidelines

No woody vegetation > 2 in/5 cm (diameter breast height) will be removed without prior coordination with the Forest Management Program.

6.2.4 Erosion Management Requirements/Guidelines

Soil disturbance caused by vegetation management activities will be repaired by LRAM using in-house resources through the use of standard soil and water conservation techniques. Typical actions may involve grading rutted or bermed areas, reestablishing vegetation of exposed soils, and hardening high traffic locations, as well as fertilizer, lime, and mulch application. These efforts ensure that high-use areas are maintained to offset future adverse impacts for sustained training.

6.2.5 Fish & Wildlife Resources Requirements/Guidelines for Forest Management Activities

- Tree disturbance activities (e.g., logging) will generally take place after October 15 and before April 15 to meet the spirit and intent of the Migratory Bird Treaty Act and the Endangered Species Act. Some actions may proceed after August 1 and prior to April 15 after review by the Fish & Wildlife Management Program.
- Snags will be retained whenever possible/practicable. Long lived hardwood species > 12-15" inches (diameter breast height) that have the potential to develop exfoliating bark or cavities will be left in areas that normally would be completely harvested (e.g., clearcuts, salvage operations). Targeted trees will be left in areas that experience large amounts of solar exposure (i.e. on the forest edge or within a forest opening or protruding above the canopy
- Suitable live trees will be retained near wetlands or streams whenever possible/practicable. A percentage of suitable live trees (i.e., trees that have potential to develop into future snags) will be retained, for future snag recruitment and cavity development. Suitable trees will be long lived hardwoods >15 inches (diameter breast height) and have the greatest potential to develop cavities or have exfoliating bark. In wetland areas 10 ac (4 ha) or larger with open water and shorelines greater than 30 m apart, 20 suitable trees will be left for every 50 ac (20 ha) harvested within 0.5 mi (0.8 km) of wetlands. Although this measure was originally developed to benefit cavity nesting waterfowl species (e.g., wood ducks and hooded mergansers); it can also benefit other wildlife. By retaining trees near wetlands that have the potential to develop into snags, future potential Indiana Bat roosts may develop and be located near water sources and potential foraging areas.

- Unique forest openings (e.g., patch cuts of aspen varying from 1-10 ac (0.4 - 4 ha) in size removed from the stand) will be provided whenever possible/practicable in varying silvicultural actions. This action will promote use by early successional species such as Ruffed Grouse and some migratory birds, as well as create openings in wooded habitat that can provide foraging opportunities for Indiana Bats (Brack 2006).
- Specific management actions to regenerate aspen will be performed whenever possible/practicable. Areas that have begun to lose aspen as a dominant component in the stand will be targeted to be harvested through 3 - 5 ac (1 – 2 ha) clearcut blocks juxtaposed throughout the stand. Approximately 1000 - 2000 ac (405 – 809 ha) that meet criteria (i.e., stands that contain aspen/birch/alder and have limited training use) will be identified across the installation.
- Mature "seed trees" will be left whenever possible/practicable in areas that normally would have been removed from the stand. This will allow specific mature trees to remain and provide food and/or cover components for certain wildlife, while also allowing the tree to function as a seed source for regeneration of other trees.

Other site specific management actions have and will continue to be programmed in for specific habitat requirements.

6.2.6 Endangered Species / Migratory Bird Management Requirements/Guidelines for Non-forest Mechanical Removal

- No woody vegetation > 3 in/8 cm inches (diameter breast height) will be removed without prior coordination with the Fish & Wildlife Management Program for the site to be evaluated and possibly conduct a Section 7 consultation with the USFWS.
- Other large-scale vegetation management activities should be conducted before April 15 or after August 1 to minimize taking/killing migratory birds.
- Mowing/ vegetation removal by machinery will not occur within 100 ft of known roost trees to avoid disturbing roosting bats and maintaining cover around the roosts. However, individual or clusters of invasive plants close to known roosts (< 3 in DBH) may be removed by hand-clipping or cutting or with brush saws between 15 August-15 April. This clarifies the process to remove invasive species from within the roosting areas, yet still minimizes disturbance around the potential roosts during the primary roosting season.
- No more than 300 ac per year (and no more than 50 ac in a contiguous block) will be mechanically removed within the BCA annually.
- High Risk Hazard Trees. For hazard trees that are determined to be high or critical classified between April 16 – October 15, Fort Drum's Fish and Wildlife Management Program personnel will be notified in advance, so they may assess the hazard tree. If appropriate, an emergence survey will be conducted and if no bats are observed, then the roost tree will be promptly removed. This will reduce the risk of removing an undiscovered roost tree. If bats are observed, then further consultation with the USFWS is needed.

6.2.7 Endangered Species Management Requirements/Guidelines for Herbicide Application

- Only pesticides registered by the Environmental Protection Agency and New York State may be applied, and only in accordance with their label.
- Aerial application of pesticides in the Bat Conservation Area (BCA) is prohibited. The BCA GIS layer or map is available from the Public Works GIS offices (315-772-5709 or 315-772-1502).
- Other pesticide application within the BCA will be limited to 50 ac per year (no more than 25 ac in a contiguous block) for tow behind power blowers, 300 ac per year (no more than 50 ac in a contiguous block) for other ground machine mounted pesticide spraying equipment (e.g., ATVs, tractors, Skid Steers). There will be no limit to the amount of acreage where individual spot application, slash and squirt hand application, individual stem injection, or other ground application done directly by hand is completed.
- Tow behind power blowers will not be utilized until after August 15 in all forested areas to allow pups to reach volancy and exit an area if disturbed by this activity. Deviations from this conservation measure will require further consultation with the USFWS.
- Pesticides applied from tow-behind power blowers will use drift control additives and will be applied using low pressure to reduce drift and potential swirling motion from the blower. All efforts will be made to not spray more than 10 feet above ground level.
- Whenever possible, herbicides that have low toxicity to mammals will be utilized with the tow behind power blowers. Herbicides that may be somewhat toxic to mammals will be mixed and applied at the lowest allowable rate per the label to help minimize any potential exposure concerns.
- Aerial application of pesticides outside the BCA must occur between the hours of sunrise and 1 hour before sunset.
- Application of pesticides from ground mounted vehicles (i.e., ATVs, tractors) that spray chemicals directly onto the vegetation or ground and do not result in broad dispersal will be conducted at least 100 ft (30 m) from known roost trees (including roosts identified in the future) and 250 ft (76 m) from known primary roosts. Coordinate with Fort Drum's Fish and Wildlife Management Program to determine known roost locations. Pesticides applied from ground mounted vehicles will use drift control additives and droplet sizes appropriate for reducing drift.
- Application of pesticides that result in broad dispersal (e.g., tow behind power blowers) will be conducted at least 250 ft (76 m) away from known roost trees (including roosts identified in the future) and 500 ft (152 m) from known primary roosts. Pesticides will be applied between sunrise and one hour before sunset.
- Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 500 ft (30-76 m) of known roosts.
- Pesticides will not be applied outdoors when the wind speed exceeds 10 mi/hr for all ground applications except power mist blowers. Pesticides applied via power mist blower will only be applied with wind speeds 8 mi/hr or less. Pesticides applied aerially will only be applied with wind speed 8 mi/hr or less. This is to reduce the risk of pesticide drift, which could impact water quality or

non-target areas. Care will be taken to make sure that any spray drift is kept away from non-target areas and individuals. Additionally, aerial application will utilize helicopters and employ large droplet technology through special nozzles on drop tubes to ensure the herbicide stays on target.

- Areas where herbicide will be applied aerially must be delineated by painted boundaries or other markers on the ground.
- Pesticides will not be applied to any protected wetlands, streams, or other waters of NY State without obtaining the appropriate permits.
- If a bat colony is found roosting in a building, then insecticides are to be used sparingly and no foggers are to be used.
- For each pesticide application, Applicators will utilize the Pesticide Usage Database that is available through the Natural Resources Branch or the Pest Control office to report applicable information about: who applied the pesticide; what and how much was applied; where it was applied; why it was applied; and when it was applied. Maps of the treated areas may also be required for annual reporting purposes to the USFWS. For pesticides applied indoors or immediately along the exterior of the building, no map would be required.

6.2.8 Endangered Species Requirements/Guidelines

- An approximately 2,200 ac (890 ha) Bat Conservation Area (BCA) has been established and will protect Indiana and Northern Long-eared Bat roosting and foraging areas from permanent development and habitat loss within the Cantonment Area and Training Areas 3A and 4A. No timber harvests will occur within the BCA until an appropriate management plan has been developed and consulted on with the US Fish and Wildlife Service. If there is a bona fide need for timber harvesting in the BCA, consultation will have to be reinitiated.
- All female roosts, including roosts identified in the future, will be protected from construction for the lifespan of the roost tree. Additionally, a buffer will be placed around all female roosts to protect the roost from disturbance and to maintain a semblance of a natural environment for Indiana and Northern Long-eared Bats. The size and shape of a buffer will be determined on a case by case basis by Fort Drum's Fish and Wildlife Management Program in consultation with the USFWS. Factors that will be considered will include surrounding landscape, habitat connectivity, distance to other roosts, distance to known foraging areas, and any other issue important to target species. Coordinate with Fort Drum's Fish and Wildlife Management Program (315-772-4999 or 315-778-6348) to determine roost locations.
- Clearcutting and overstory roost tree removal will not occur within 0.75 mi (1.2 km) of known maternity roost trees located outside the BCA without further consultation with the USFWS. An exception to this requirement is a small number of small forested patches (ranging from ~5-15 acres) that will be clearcut at or near WSAAF to meet federal regulations for air safety. The majority of these patches contain trees primarily less than 4 in dbh. They will be maintained as forest, but will be clearcut approximately every 5-10 years to keep them at the appropriate height. Selective thinning will not occur within one tree height of the known roost trees to minimize the risk of accidentally felling a known maternity roost during the non-hibernation season. Tree height is based

on the average height of the stand (~80 ft (24 m)) surrounding the roost tree. For selective thinning harvests within 0.75 mi of a known maternity roost, all snags will be retained, and live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be favored as residuals. Further consultation will be needed with the USFWS for timber harvests that do not follow this conservation measure.

- Timber Stand Improvement (TSI) actions will be performed at least 250 ft (76 m) away from known roost trees (including roosts identified in the future) and 500 ft (152 m) from known primary roosts (including roosts identified in the future). Pesticides used for TSI actions will be applied between sunrise and one hour before sunset. Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 500 ft (30-76 m) of known roosts. This measure minimizes the risk of exposure to bats and potential effects from pesticides.
- Clearing of natural vegetation (e.g., shrubs and trees) less than 3 inches (diameter breast height) should typically occur between August 1 - April 15 to minimize the impact to migratory birds and to maintain foraging areas for bats. The project proponent must ensure coordination with the Fish and Wildlife Management Program, via the REC process or direct contact, prior to clearing any natural vegetation less than 3 inches (diameter breast height)
- Felling of trees greater than 3 inches (diameter breast height) must occur between October 16 - April 15, unless there a high risk hazard tree has been identified by the Forest Management Program. All potential hazard trees must be assessed by the Forest Management Program. If a hazard tree is determined to be of high risk, is greater than 3 inches (diameter breast height), and needs to be removed between April 16 – October 15, the Fort Drum Fish and Wildlife Management Program must be notified in advance so they may also assess the tree. If appropriate, an emergence survey will be conducted and if no bats are observed, then the hazard tree must be promptly removed.
- Felling of standing trees for firewood harvest must occur between October 15 - April 15. All of the Cantonment Area (which includes the known primary Indiana Bat roosting areas) is off limits to any/all firewood cutting. This restriction will help avoid any associated noise or disturbance in the wooded roosting areas from chainsaws and/or tractors used in the harvest of the wood.
- All snags will be left in silvicultural treatments unless there is a safety concern for the contractor or the military units training in the stands (e.g., maneuver corridors), or unless the treatment is a salvage harvest or clearcut. Snags should be distributed and retained throughout the landscape.
- No trees are to be cut within or along the bed or bank of streams protected under Article 15 of the New York State Environmental Conservation Law unless required to meet specific management goals and only after obtaining a permit from New York State Department of Environmental Conservation (NYSDEC).
- Vegetation management activities should typically avoid delineated water bodies/wetlands. Although there is no formal buffer requirement around wetlands, a 20-30 ft (6-9 m) buffer is typically maintained around identified wetlands as a best management practice. This leads to less impacts to water quality and protects water sources for Indiana and Northern Long-eared Bats.

- A minimum of 70 sq ft of residual basal area, all snags, and all live trees greater than 16 inches (diameter breast height) that have noticeable cracks, crevices, or exfoliating bark must be retained around all perennial streams and open waterbodies (2 ac or greater in size) on Fort Drum. A perennial stream is defined as having flowing water year-round during a typical year.
- Whenever possible, new log landings should be constructed at least 200 ft (61 m) from water bodies and wetlands.
- Spill kits and oil absorbent mats must be present on log landings in case of fuel, lubricant or hydraulic fluid spills or leaks.
- If soils are impacted by vegetation clearing, degraded areas should be repaired via actions that may include grading, compacting, seeding, and application of fertilizer, lime, and mulch.
- Where possible, skid trail grade needs to be maintained at less than 15%. Where higher grade is unavoidable, the grade should be broken, drainage structures should be installed, and soil stabilization practices should be used where needed to minimize runoff and erosion.
- Debarking and other damage to residual trees should be minimized wherever possible.
- Stream crossings should only be used when absolutely necessary.
- Streams should be crossed by the most direct route.
- Ruts should be filled in, and water bars and erosion barriers should be installed to prevent or minimize erosion and sedimentation from roads, skid trails and log landings.
- Erosion control measures need to be inspected within 24 hours after a rain event and checked once per week. Erosion controls should be maintained or removed as needed.
- No machinery is to be operated in streams protected under Article 15 of the New York State Environmental Conservation Law without first obtaining a permit from NYSDEC.
- During hardwood removals, dead or dying oak trees that may have been typically removed from the stand should be left in the targeted units. This is limited to areas that receive large amounts of sunlight during the day (e.g. the edge of the stand, near an opening within the stand, etc.) to provide roost trees for Indiana Bats and other wildlife.
- Whenever possible, a percentage of suitable live trees (i.e., trees that look as if they have the potential to develop into future snags) should be retained, so cavities appropriate for wildlife may develop and for future snag recruitment. Suitable trees should be long lived hardwoods >15 inches (diameter breast height) and have the greatest potential to develop cavities. In wetland areas 10 ac (4 ha) or larger with open water and shorelines greater than 30 m apart, 20 suitable trees should be left for every 50 ac (20 ha) harvested within 0.5 mi (0.8 km) of wetlands.
- When possible, unique forest openings (e.g. patch cuts of aspen varying from 1-10 ac in size removed from the stand) should be provided.
- For all projects, Fort Drum will evaluate the use of outdoor lighting and seek to minimize light pollution by angling lights downward or via other light minimization measures.

Other requirements may also exist for the protection of Endangered Species.

6.2.9 Cultural Resources Requirements/Guidelines

Archeological surveys are conducted prior to all ground disturbing forest management activities for consultation with the NYS Historic Preservation Office (SHPO) and the tribes. When forest management is conducted in cooperation with another program as the proponent of the action, coordination with the Cultural Resources Section and associated archeological surveys are the responsibility of the proponent.
Fire suppression techniques are used around historic cemeteries and the LeRay Mansion Historic District. For protected archaeological sites, the Cultural Resources Program recommends spraying water on adjacent vegetation to elevate the fuel moisture content above combustible levels.

6.2.10 Invasive Species Requirements/Guidelines

- Follow the REC process. Coordination with all programs will facilitate review of any actions. Managers will be able to assist in limiting the spread of known invasive species populations.
- Apply clean equipment protocol to all vehicles identified to potentially carry infested soil and seed material. Identify all stakeholders and ensure all parties are aware of impacts.
- Identify, locate and research all flora invasive populations.
- Research biological processes of each species.
- Apply IPM techniques towards control.
- Identify potential hazards.
- Identify any possible permits necessary for the discharge of pesticides.
- Ensure label application is followed for site conditions.
- Re-vegetate area with native herbaceous mixes.
- Monitor yearly per biological process of particular species.
-

6.2.11 Unique Communities and Rare Plants Requirements/Guidelines

- Follow the REC process. Coordinate all actions with environmental programs to limit potential impacts to the natural resources.
- Periodically check RFMSS to determine if any sites are in danger of negative impacts.
- Avoid any sites containing rare plants if possible.
- Minimize impacts if training occurs within these locations.
- Mitigate any negative impacts to the populations or communities.

6.3 Fish & Wildlife Management Requirements/Guidelines

The following are guidelines to conserve fish and wildlife resources on Fort Drum. Many of these guidelines are predicated on laws, regulations, and agreements outlined in *Section 4.3.1 Fish & Wildlife Resources Regulations & Guidance Documents*.

6.3.1 Land Clearing for Construction Requirements/Guidelines

Projects involving any habitat modification must be addressed by the Fort Drum Fish & Wildlife Management Program. All efforts should be made to minimize the loss of natural habitat during building design and construction and all personnel responsible for land clearing will be notified via environmental protection plans to follow design plans, to stay within flagging, and to minimize impacts to wildlife and the environment.

1. No new trails may be constructed within the Bat Conservation Area (BCA) without prior coordination with Fort Drum's Fish and Wildlife Management Program (315-778-6348 or 315-772-9636) and consultation with the US Fish and Wildlife Service.
2. Felling of trees greater than 3 inches (diameter breast height) must occur between October 16- April 15.
3. For bona fide military training emergencies/ immediate construction needs occurring north and east of US Military Highway in the Training Area, no more than 10 forested ac (4 ha; with no more than 5 ac (2.02 ha) per project) may be removed between August 16 - October 15. Prior to tree clearing for training emergencies in August- October, project sites must be surveyed for potential northern long-eared bat habitat. Coordinate with Fort Drum's Fish and Wildlife Management Program (315-778-6348 or 315-772-9636) prior to initiating this type of project.
4. All roost trees used by female bats, including roosts identified in the future, will be protected from construction for the lifespan of the roost tree. Additionally, a buffer will be placed around all of these roosts to protect the roost from disturbance and to maintain a semblance of a natural environment for Indiana and Northern Long-eared Bats. The size and shape of a buffer will be determined on a case by case basis by Fort Drum's Fish and Wildlife Management Program in consultation with the US Fish and Wildlife Service. Coordinate with Fort Drum's Fish and Wildlife Management Program (315-778-6348 or 315-772-9636) to determine roost locations.
5. Clearing of natural vegetation (e.g., shrubs and trees) less than 3 inches (diameter breast height) should typically occur between August 1 - April 15 to minimize the impact to migratory birds and to maintain foraging areas for bats. The project proponent must ensure coordination with the Fish and Wildlife Management Program, via the REC process or direct contact, prior to clearing of any natural vegetation less than 3 inches (diameter breast height).
6. If any vegetation or tree clearing is required for a given construction project, flagging or signs must be used to demarcate construction limits prior to any construction activities. Flagging must be removed upon completion of the project.
7. All construction projects over an acre are required to prepare a sediment and erosion control plan or a storm water pollution prevention plan (SWPPP), which details all erosion and sediment control practices and, when necessary, post-construction storm water management practices.

8. Stormwater management plans should be reviewed with the objective of moving towards integrated infrastructure to reduce the number or completely eliminate the need for stormwater retention ponds and the excessive land use required.
9. All personnel responsible for construction activities will be informed about the need to follow design plans, stay within flagging, minimize impacts to wildlife, and other environmental concerns. This may be done through training, Environmental Protection Plans and/or other contract language.
10. The project proponent must ensure coordination with the Forest Management Program and the Fish and Wildlife Management Program prior to felling trees greater than 3 inches (diameter breast height).

6.3.2 Demolition Requirements/Guidelines

In general, demolition activities must take place after August 1 or before April 15 in accordance with the Migratory Bird Treaty Act. The demolition of structures has the potential to take/kill migratory birds (i.e. nests with eggs or hatchlings). Demolition of these structures would not be considered "military readiness" and are therefore not exempt from the Migratory Bird Treaty Act IAW Bob Stump National Defense Authorization Act for Fiscal Year 2003. For demolition activities from April 15 - August 1, Fish & Wildlife Management Program personnel can assess structures to be demolished on a case-by-case basis to ensure no known nests are destroyed or identify nesting birds that are not protected by the MBTA (i.e. Rock Pigeons, House Sparrows, and European Starlings). Once a building is destroyed, the removal of debris would generally not be subject to time of year restrictions if the work is done within the same timeframe.

If any bats are discovered during the demolition or repair of buildings (to include work such as complete and partial building demo, removal/replacement of roofs, siding, etc.), all work must cease and Fort Drum's Fish and Wildlife Management Program must be immediately contacted. If the building has pre-existing known bat colonies, then Fort Drum's Fish and Wildlife Management Program must be contacted before work is to occur. (Currently, only buildings within Fort Drum's historic LeRay Area are known to contain bat colonies).

6.3.3 In-Stream Construction Requirements/Guidelines

Draining of ponds should occur in the non-nesting or non-spawning season. Similar to the requirements for culverts and other in-stream construction (see *Appendix Section 6.1.5*), any in-stream work, including that done to benefit aquatic resources in streams rated by DEC as C(t) or higher, must be permitted for, or at least deferred from Article 15 requirements by NYSDEC personnel. Additionally, these projects could also trigger CWA Section 404 requirements. According to the NYSDEC, official warm water and cold water spawning seasons are from March 15 to July 15, and September 15 to June 1, respectively. NYSDEC can request that some construction activities be restricted in water bodies during these periods. As with activities in Section 11.1.5, Fort Drum personnel would need to acquire the appropriate permit(s).

6.3.4 Forest Management Requirements/Guidelines

See *Appendix Section 6.2.5 Fish &Wildlife Resources for Forest Management.*

6.3.5 Vegetation Management Requirements/Guidelines

See *Appendix Section 6.2.6. Endangered Species / Migratory Bird Management for Non-forest Mechanical Removal.*

Vegetation management, including control of woody stems, grassland mowing, prescribed fire, and other management activities, has the potential to affect populations of birds and other wildlife both negatively and positively. Most individual management actions that occur on Fort Drum are unlikely to cause substantial impacts to populations given the small size or infrequency of individual actions, however many actions over time and space can have substantial cumulative impacts. It is therefore important for the Fish & Wildlife Management Program to identify areas where sensitive species occur and to assess the pros and cons of vegetation management in these areas both spatially and temporally. These analyses may suggest that vegetation management activities should avoid certain areas, occur during a particular time of year, specific mitigation measures should be applied, and/or methods of vegetation management be modified. These analyses will ensure management for sensitive species is proactive rather than reactive.

6.3.6 Military Training Requirements/Guidelines

The potential of the direct impact of military training to wildlife is possible, but probably negligible at this time. There is the potential for military training to have interactions with wildlife as well. The below is meant to minimize potential interactions and provide protections for wildlife species.

- It is illegal to pursue, shoot, hunt, kill, capture, trap or take protected fish and wildlife or engage in lesser acts that disturb or harass fish and wildlife. Protected fish and wildlife may be taken only during an open season or as permitted by law and regulation (NYS Environmental Conservation Laws, Fort Drum Regulation 420-3, Fort Drum Regulation 420-7, Endangered Species Act, and Migratory Bird Treaty Act).
- There are two federally-listed species on Fort Drum—the Indiana bat (endangered) and the Northern Long-eared Bat (endangered). All persons, including Soldiers training in the field, are responsible for ensuring no harm occurs to Indiana or Northern Long-eared Bats. The following are restrictions relevant to bat management and military training:
    - No vegetation shall be removed without prior coordination and approval from the Fort Drum Fish and Wildlife Management and NEPA Programs. There are legal mandates regarding both federally-listed species protected under the Endangered Species Act and migratory birds covered under the Migratory Bird Treaty Act that govern the removal of vegetation.
    - No smoke operation will be conducted within 1,000 m of the installation boundary, public roads, Cantonment Area, ammunition supply point or WSAAF in accordance with *Fort Drum Regulation 350-4 Range Regulation, Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas (LTAs),* and the Fort Drum Biological Opinion on the Proposed Activities on the Fort Drum Military Installation (2021-2023) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*).
    - No colored smoke, smoke grenades, smoke pots, or other smoke emitting pyrotechnics may be used within 100 m of any forested areas in the LTAs

within the Cantonment Area between April 16 – October 15. The infrequent use of colored smoke at the mobile MOUTs within the LTAs may be allowed. Prior coordination and approval from the Fort Drum Fish and Wildlife and NEPA Programs is required.

- No colored smoke, smoke grenades, smoke pots, or other smoke emitting pyrotechnics may be used within 100 m of any known Indiana or Northern Long-eared Bat roost areas between April 16 – October 15.
- In the LTAs, in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas*, *Fort Drum Regulation 420-7,* and the Fort Drum Biological Opinion on the Proposed Activities on the Fort Drum Military Installation (2021-2023) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*)—vehicular traffic is restricted to open grassy areas within easy access of the road. Vehicles are not permitted to cross streams, ditches, wetlands, wooded areas or other areas of dense vegetation in order to reach grassy areas without prior NEPA review, thus minimizing impacts to natural habitats.
- In the LTAs, in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Area* and the Fort Drum Biological Opinion on the Proposed Activities on the Fort Drum Military Installation (2021-2023) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*) - Petroleum, Oils, and Lubricants operations are prohibited which minimizes the risk of accidental water/ground contamination.
- ALL wildlife are opportunistic feeders and will go where food is easiest to obtain. Once an animal obtains food easily at a bivouac site or other food source, they will return expecting to obtain food again and will become a nuisance and possibly aggressive. The most likely wildlife to encounter in Fort Drum training areas that may cause a conflict are Black Bears and Raccoons. There are several ways to minimize the chances of a dangerous or damaging wildlife encounter:
  - Soldiers are advised to not feed bears, raccoons, or other wildlife.
  - Keep food and cooking utensils in closed containers, preferably in sealed plastic, to prevent the scent of food from escaping. Bears, raccoons, coyotes and other wildlife are attracted by smells. With the exception of ammonia, camphor and a few other strong chemicals, EVERYTHING smells like potential food. THIS INCLUDES MRE PACKAGING.
  - Do not cook near or have food inside tents or vehicles. When setting up at a site, the cooking area and food storage area should be at least 300 feet from sleeping quarters.
  - Do not dump fat drippings or food scraps on ground or into wastewater pits. Put food scraps in closed containers such as screw-lid jars before placing in garbage container.

- Remove all garbage from the site at least once each day and before nightfall. Camphor disks, mothballs, or ammonia-soaked rags can be placed in garbage cans to mask food orders until the garbage is removed from the site. Police the area thoroughly and remove all garbage from the site before departing so future units do not encounter problems.
- Do not sleep in the clothes used while cooking food. If you need to store materials that are likely to attracted bears, do so by hanging them from tree branches at least 10 feet away from the main trunk and 12 feet off the ground.

- Raccoons and skunks are known carriers of rabies in the North Country. If you see a raccoon (or skunk or other animal) behaving abnormally, do not approach it as it may be rabid and contact the federal police (315-772-5156).
- There are no known venomous snakes that occur on Fort Drum. If a suspected venomous snake is found, contact the Fort Drum Fish and Wildlife Management Program.

6.3.7 Fish & Wildlife Management Requirements/Guidelines – Bat Encounters and Removal

All bats found must be immediately reported to Fort Drum's Fish and Wildlife Management Program (315-778-6348 or 315-772-9636). Do not attempt to handle any live bats, regardless of condition. If a live bat is found in a building contact 315-772-2072 (Pest Control) or 315-778-6348 (Fort Drum Fish and Wildlife Management) to have it humanely removed.

It will be determined if any human or pet has come into contact or is known to have been bitten by the bat. If either has come into contact, the encounter will be treated as a potential rabies exposure.

If it is determined that the bat may have been in a room where someone was sleeping, there were any young or special needs children or adults within the facility, or there was a dog or cat that came into contact with the bat, the bat will be captured (if possible) and submitted for rabies testing. The individuals that may have been exposed will be given appropriate recommendations on seeking medical advice.

If there has been no potential encounter with humans or pets and the bat can be safely captured and removed from the facility, Natural Resources or Pest Control personnel will do so. The bat will then be taken to a wooded area outside and released.

6.3.8 Fish & Wildlife Management Requirements/Guidelines – Vertebrate Pest Control

Vertebrate pest (e.g., woodchucks, raccoons, squirrels, etc.) should only be trapped if other means are not feasible such as deterrence or exclusion (e.g. eliminating potential food/nesting sources, plugging openings into buildings, etc.). If deterrence/exclusion efforts are ineffective, then it may be necessary to live trap and relocate animals or use lethal control methods. If any wildlife species shows signs of ill health, it should be humanely euthanized. Lethal control methods and euthanasia shall be in accordance with the most current Animal Welfare guidelines (http://awic.nal.usda.gov). If wildlife species must be live-trapped and show no signs of ill health, they should be released within the Cantonment Area or Training Areas 3 or 4. Under no circumstances should animals be released off of Fort Drum or be given to any individual unless the animal is hurt or orphaned and then it should only be given directly to a NYSDEC licensed wildlife rehabilitator.

6.4 Human-Wildlife Conflict Management Requirements/Guidelines

Pest management practices are accomplished with the coordination of other programs to be in compliance with environmental regulations and best management practices.

6.4.1 Endangered Species Management Requirements/Guidelines – Vertebrate Pest Control

- All bats found must be immediately reported to Fort Drum's Fish and Wildlife Management Program (315-778-6348 or 315-772-9636).
- If any colonies of bats are found in structures and there is a requirement to remove/exclude them, any actions should only be done through a systematic process and after prior coordination with Fort Drum's Fish and Wildlife Management.
- No lethal control methods are permitted for bats unless there is a suspected human health risk for exposure to rabies or other disease. If individual bats are in buildings and there is no evidence of maternity use, then all efforts must be made to safely capture and release individual bats. Or, bats may be excluded by establishing one-way valves over the roost's exit (if feasible). Exclusions may only be done from August - early May.
- Sealing cracks and crevices in buildings must also be done during the late fall, winter, or early spring.
- No adhesive traps used for rodents or insects are to be placed in such a manner that they could capture bats—glue traps are not to be placed in any crawl space or attic compartment within buildings or in areas where bats are known to occur.

6.4.2 Endangered Species Management Requirements/Guidelines – Pesticide Use

- Only pesticides registered by the Environmental Protection Agency and New York State may be applied, and only in accordance with their label.
- Aerial application of pesticides in the Bat Conservation Area (BCA) is prohibited. The BCA GIS layer or map is available from the Public Works GIS offices (315-772-5709 or 315-772-1502).
- Other pesticide application within the BCA will be limited to 50 ac per year (no more than 25 ac in a contiguous block) for tow behind power blowers, 300 ac per year (no more than 50 ac in a contiguous block) for other ground machine mounted pesticide spraying equipment (e.g., ATVs, tractors, Skid Steers). There will be no limit to the amount of acreage where individual spot application, slash and squirt hand application, individual stem injection, or other ground application done directly by hand is completed.
- Tow behind power blowers will not be utilized until after August 15 in all forested areas to allow pups to reach volancy and exit an area if disturbed by this activity. Deviations from this conservation measure will require further consultation with the USFWS.
- Pesticides applied from tow-behind power blowers will use drift control additives and will be applied using low pressure to reduce drift and potential

swirling motion from the blower. All efforts will be made to not spray more than 10 feet above ground level.

- Whenever possible, herbicides that have low toxicity to mammals will be utilized with the tow behind power blowers. Herbicides that may be somewhat toxic to mammals will be mixed and applied at the lowest allowable rate per the label to help minimize any potential exposure concerns.
- Aerial application of pesticides outside the BCA must occur between the hours of sunrise and 1 hour before sunset.
- Application of pesticides from ground mounted vehicles (i.e., ATVs, tractors) that spray chemicals directly onto the vegetation or ground and do not result in broad dispersal will be conducted at least 100 ft (30 m) from known roost trees (including roosts identified in the future) and 250 ft (76 m) from known primary roosts. Coordinate with Fort Drum's Fish and Wildlife Management Program to determine known roost locations. Pesticides applied from ground mounted vehicles will use drift control additives and droplet sizes appropriate for reducing drift.
- Application of pesticides that result in broad dispersal (e.g., tow behind power blowers) will be conducted at least 250 ft (76 m) away from known roost trees (including roosts identified in the future) and 500 ft (152 m) from known primary roosts. Pesticides will be applied between sunrise and one hour before sunset.
- Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 500 ft (30-76 m) of known roosts.
- Pesticides will not be applied outdoors when the wind speed exceeds 10 mi/hr for all ground applications except power mist blowers. Pesticides applied via power mist blower will only be applied with wind speeds 8 mi/hr or less. Pesticides applied aerially will only be applied with wind speed 8 mi/hr or less. This is to reduce the risk of pesticide drift, which could impact water quality or non-target areas. Care will be taken to make sure that any spray drift is kept away from non-target areas and individuals. Additionally, aerial application will utilize helicopters and employ large droplet technology through special nozzles on drop tubes to ensure the herbicide stays on target.
- Areas where herbicide will be applied aerially must be delineated by painted boundaries or other markers on the ground.
- Pesticides will not be applied to any protected wetlands, streams, or other waters of NY State without obtaining the appropriate permits.
- If a bat colony is found roosting in a building, then insecticides are to be used sparingly and no foggers are to be used.
- For each pesticide application, Applicators will utilize the Pesticide Usage Database that is available through the Natural Resources Branch or the Pest Control office to report applicable information about: who applied the pesticide; what and how much was applied; where it was applied; why it was applied; and when it was applied. Maps of the treated areas may also be required for annual reporting purposes to the USFWS. For pesticides applied indoors or immediately along the exterior of the building, no map would be required.

Appendix 7: Guidelines for Minimizing Incidental Take/Killing of Migratory Birds

7.1 Background

Until recently, long-standing interpretation of the Migratory Bird Treaty Act (MBTA; 16 U.S.C. §§703-711) was that it prohibited intentional and incidental take/killing of migratory birds, including active bird nests. This interpretation of MBTA, supported by Executive Order 13186 (Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, 66 FR 3853, 10 January 2001), required that federal agencies not intentionally kill birds without a permit, and do everything practicable to minimize the incidental take/killing of migratory birds. This interpretation changed in 2017 when the Department of Interior released Solicitor's Opinion M-37050 (The Migratory Bird Treaty Act Does Not Prohibit Incidental Take, U.S. Department of the Interior, Solicitor's Opinion M-37050, 22 December 2017), stating that MBTA only prohibited intentional take/killing, and that birds could be legally killed during the course of any otherwise legal activity so long as the purpose of the activity was not to kill birds, even if the proponent knows that the action will kill birds. During the fall of 2020 a federal court in the Southern District of New York vacated the M-Opinion, but this ruling only applied to that district. The final regulation codifying the M-Opinion was published on 5 January 2021, at which time the stated date of implementation was 4 February 2021.

Shortly after the M-Opinion was released, OSD provided guidance (Incidental Take of Migratory Birds Memorandum, Office of the Assistant Secretary of Defense, 6 February 2018) that the military services should continue to minimize incidental take/killing of migratory birds. The rationale for this guidance was that Executive Order 13186 was still in effect; that this EO resulted in the MOU to Promote the Conservation of Migratory Birds so is not impacted by the M-Opinion; that the Migratory Bird Readiness Rule is based on the 2013 National Defense Reauthorization Act, which remains in effect; and that the courts have not definitively ruled whether MBTA applies to incidental take/killing, with different District Courts making conflicting decisions. USFWS issued guidance on 11 April 2018 (Guidance on the recent M-Opinion affecting the Migratory Bird Treaty Act. U.S. Fish and Wildlife Service memorandum, 11 April 2018) stating that DoD should continue to follow the requirements of the Migratory Bird Readiness Rule by taking reasonable and prudent measures to minimize incidental take/killing for readiness and non-readiness activities, although incidental take/killing would not be a violation of MBTA. After consulting with OSD counsel, the DoD Natural Resources Program confirmed that the following remains OSD guidance to the Services: "to the extent practicable and without diminishing the effectiveness of military readiness activities, installations should minimize the incidental take/killing of migratory birds. This does not mean no incidental take/killing can occur." Brian Moyer from HQDA has confirmed that Army is following this guidance from OSD.

On President Biden's first day in office he issued an Executive Order calling for the review of this rule and many other Trump Administration environmental regulations, and then on 4 February 2021 delayed implementation of the MBTA rule by one month. On 9 February 2021, USFWS issued a correction stating that the date for implementation of the MBTA rule should properly have been 8 March 2021, and also requested public comments about whether "the rule should be amended, rescinded, delayed pending

further review by the agency, or allowed to go into effect." On 8 March 2021, the day the new rule went into effect, the Biden Administration revoked the M-Opinion on which the rule was based and announced that USFWS was beginning the rule-making process to replace the Trump Administration rule with one strengthening MBTA protections. In the meantime, OSD guidance to continue to minimize incidental take/killing remains in effect. On 04 October 2021, the USFWS revoked the regulation.

The primary means by which incidental take/killing is minimized is through restrictions on vegetation clearing during the nesting season. The 15 April to 1 August period when vegetation management is restricted on Fort Drum is designed to minimize the potential for inadvertently destroying bird nests and killing birds at nests. However, while this period captures the peak season for nesting birds, some nests are active before and after this period. In effect this restricted period is a compromise designed to capture the majority of the nesting season while allowing time for land management and other work to be done. Although few active nests are likely before April and after August, a few species nest as early as January and as late as October. Instituting a no-clearing window that captured the entire period when an active nest is possible would not allow vegetation clearing during the entire warm season, potentially leading to Mission impacts. So while the April to August window will generally be in effect, there are potential exceptions when some activities may be restricted because of known nesting birds at other times of year. For instance, Great Horned Owls nest as early as January, so a project that may affect a known owl nest may include conditions to avoid the area around the nest outside the 15 April to 1 August period. More broadly, large scale grassland maintenance mows should be conducted after 15 August, as the large amount of habitat involved in these actions virtually guarantees that multiple late nests will be destroyed. Also, in specific cases when known nests are active at a site, Natural Resources Branch may require a project proponent to hold off on a management action in a specific location until that nest completes.

Ultimately, every action should be conducted in a manner that minimizes the likelihood of unintentionally taking birds or bird nests. To this end, all management actions that involve habitat management or removal must be conducted outside the April to August restricted period unless there is an absolute requirement for them to be conducted during this period. If a bona fide need exists, every effort must be made to minimize incidental take/killing. This requirement for vegetation removal to be conducted in the restricted period must be justifiable and not simply a reflection of a project proponent's unwillingness to wait. Examples of potentially justifiable summer vegetation removal include invasive species management that must be conducted during the growing season to be successful, especially for species that constitute a potential threat to health or safety. Additionally, habitat management that includes some level of incidental take/killing but ultimately improves bird habitat quality for species of conservation concern (i.e., long-term benefit for short-term impact) may be viewed more favorably than projects that degrade or eliminate bird habitat for these species.

Threats to human life, health or safety represent another example of justifiable exceptions to the vegetation removal restrictions. In non-emergency situations, Natural Resources personnel could assist to design required actions in such a manner as to minimize the potential to take/killing birds or bird nests. However, in emergency situations, it is understood that vegetation may need to be removed or destroyed to accomplish the needed actions.

These restrictions do not apply to landscaped lawns, yards, Range facilities that are regularly mowed, or other manicured areas. Note that this general exception assumes that these areas receive regular maintenance so that they do not become overgrown and attractive to nesting birds. Occasionally Killdeer or other birds will nest on a lawn, driveway, or other heavily human-altered site. In such cases every effort should be made to avoid destroying the nest, such as by not mowing a portion of the yard until after the young leave the nest. Mowing or other management can and should resume immediately after the birds leave the nest, as long as they do not result in harm to any birds present.

Not all actions requiring vegetation removal are the same, occurring on a spectrum from small actions with limited potential for take/killing to large actions certain to destroy many nests. The ends of this spectrum are easily assessed, but projects in between may require more evaluation. Enough information should be included in a REC to allow Natural Resources Branch reviewers to determine generally where on this spectrum a project it likely to fall. For instance, treatment of a few square yards of a monoculture invasive species or repair of a similarly sized patch of ground that has been largely stripped of vegetation is likely to have minimal potential for nest losses, and has a reasonable chance of approval. Conversely, a request to mow 1000 acres of grassland during June has such obvious potential for the destruction of large numbers of active bird nests that postponement until after the restricted period is the only reasonable alternative. For projects in between, the initial step will be to work with the proponent to determine how necessary vegetation management really is during the nesting season, and to determine if there are ways to limit the size or scope of the area to be treated. If it is determined that actions must occur within the restricted period, a site visit by Natural Resources Branch personnel may be required to determine how best to minimize take/killing.

In those cases where vegetation removal or management during the nesting season is required and is likely to take/kill birds or bird nests, a standard procedure will be followed to document the management actions and seek ways to minimize or mitigate take/killing. Fully documenting the action in NEPA is the first step, and should include what bird species or habitats are likely to be impacted, and especially if any birds of conservation concern might be impacted. The next step is to evaluate potential alternatives to minimize bird take/killing, including conducting at least part of the work outside the nesting season, reducing the area treated, or finding methods to achieve project goals that remove the least amount of vegetation. For example, if mowing grass another potential method to reduce take/killing is to ensure that the mower deck is as high as possible, and that the mower doesn't run over any given spot more than once. In all cases, regardless of time of year, when an active nest is observed all vegetation removal in the area of the nest must stop immediately and the project proponent or personnel conducting the management must consult with Natural Resources staff

In recent years Fort Drum has had a policy of allowing maintenance mowing of some locations during the restricted period as long as vegetation is initially cleared prior to 15 April and the site is mowed again or extensively disturbed at least once every 7 days until the end of the restricted period or the site is no longer needed. The theory was that this repeated disturbance would prevent birds from nesting at the site, but in practice this has not been the case. Instead, while it is true that most species abandon these areas, a few grassland species seem particularly attracted to these locations, which look like the best actual grasslands on Fort Drum, and repeatedly try nesting through the summer.

For these species, it is likely that the weekly mowing is actually destroying nests of some of these birds repeatedly. The numbers of grassland birds attracted to such actively mowed fields seems to be proportional to the extent of open, herbaceous habitat, so that a vast area of open grassland will have many Savannah Sparrows and Bobolinks attempting to nest in it, while small grassy fields surrounded by forest will have few to no grassland birds in it. Weekly mowing of fields is only likely to keep birds from nesting in them if disturbance is extremely frequent (i.e., daily) and intense, or if vegetation is maintained at an extremely short height, which in turn would require very frequent mowing. In the former case the disturbance would end up being so significant it would likely cause too much damage to the site, and in the latter there would still be the potential for nesting by a handful of species that prefer sparsely vegetated landscapes (e.g., Killdeer, Horned Lark). This method may still be of some use in limited circumstances, but generally when the amount of habitat to be disturbed is relatively small. So for instance it would be potentially useful for a 5-10 acre construction site where woody vegetation has already been cleared, but not for a 500-acre expanse of grassland. The presence of woody vegetation also precludes this approach.

It is understood that fields at Wheeler-Sack Army Airfield adjacent to or near runways and taxiways must be mowed according to FAA guidance, and the vegetation management guidelines in this document do not apply to such areas. However, fields within the WSAAF fence but distant from runways, taxiways, and other airfield infrastructure should be mowed once annually after mid-August and not during the restricted period.

7.2 Management Guidelines

7.2.1 General Vegetation Management

These guidelines are generally applicable to a wide variety of situations on Fort Drum, and are in addition to Endangered Species restrictions on the removal of trees > 3-inches dbh between 15 April and 15 October. See below for additional guidelines for specific actions.

1. Conduct vegetation management activities after 01 August and before 15 April to avoid destroying bird nests. Vegetation management that is to be conducted on contiguous areas **larger than 50 acres** should not be conducted until **after 15 August** because of the increased likelihood that large-scale actions will impact multiple active nests.

2. In limited cases some vegetation management actions may be permissible during the nesting season (i.e., between 15 April and 01 August), as long as there is a low likelihood of killing birds or destroying active nests. Exceptions to vegetation restrictions will be evaluated using the REC process, and will require detailed information about the exact location and amount of habitat to be managed, the dominant plant species or community to be affected, and the reason why the management must be conducted during the nesting season. Conditions that may allow approval of vegetation management during the nest season include (projects that meet two or more of the following criteria are more likely to be approved):
    a. Small size—projects that impact a few square meters to 1-2 acres.

b. Sparse vegetation—sites with extensive bare ground, just a few plants, lacking trees and shrubs.
c. Poor-quality nesting habitat—especially monoculture stands of some invasive species where birds rarely nest.
d. Disturbed sites—sites where disturbance is frequent or has recently been intense.
e. Generally small, well-defined patches of herbaceous vegetation that have been traditionally maintained at recreation or cultural sites. Examples include angling access trails, campsites, and historic foundations.
f. Roadsides—within 10 feet of roads in areas where woody vegetation is absent. This applies to maintained roads that vehicles regularly use and not on unmaintained or poorly maintained dirt roads.
g. Managing sites to eliminate bona fide threats to human health or safety.

3. In all cases where vegetation management is conducted during the 15 April to 01 August restricted period, every effort must be made to minimize nest losses. For example, if an old hayfield grassland is mowed, only the minimum area possible should be mowed, the mower deck should be raised as high as possible so that ground nests might be missed by mower blades, the mower should only pass over any given location once, and the same field should be mowed at most once in a season. This last point is a departure from the recent past, but evaluation of the policy of repeatedly mowing fields to discourage birds from nesting in them found that while many species were dissuaded from nesting, a few species actually seemed to be attracted to these locations.

4. Exceptions to the 15 April to 01 August restricted period should be rare and justifiable. It will be difficult to argue that Fort Drum is making a good-faith effort to minimize incidental take/killing if more than a few projects that include vegetation removal are allowed to occur during the nesting season.

5. Nesting season vegetation management is more likely to be approved if it ultimately results in improving habitat quality for birds of conservation concern rather than degrading habitat quality for these birds.

6. All actions that have the potential to take/kill birds or destroy bird nests require a REC, including all projects that include removal of natural vegetation, construction, and building demolition. Each activity will be evaluated with respect to incidental take/killing through the REC process. For actions where an individual REC is not required, such as mowing landscape yards, typically an annual REC would be on file detailing the types of activities occurring during routine maintenance. Contact Natural Resources Branch if there are any questions about potentially disturbing active nests during activities such as pruning, beautification (e.g., removing aesthetically unappealing trees/shrubs) or other similar actions. See Section 7.2.7 below for more information.

7.2.2 Forest Management

1. Tree disturbance activities (e.g., forest management actions) will generally take place after 15 October and before 15 April to meet the spirit and intent of the Migratory Bird Treaty Act and the Endangered Species Act. Some actions may

proceed after 01 August depending on Endangered Species Act considerations and review by the Natural Resources Branch.

2. Snags will be retained whenever possible/practicable. Long lived hardwood species > 12-15" inches (diameter breast height) that have the potential to develop exfoliating bark or cavities will be left in areas that normally would be completely harvested (e.g., clearcuts, salvage operations). Targeted trees will be left in areas that experience large amounts of solar exposure (i.e. on the forest edge or within a forest opening or protruding above the canopy).

3. Suitable live trees will be retained near wetlands or streams whenever possible/practicable. A percentage of suitable live trees (i.e., trees that have potential to develop into future snags) will be retained for future snag recruitment and cavity development. Suitable trees will be long lived hardwoods >15 inches (diameter breast height) and have the greatest potential to develop cavities or have exfoliating bark. In wetland areas 10 ac (4 ha) or larger with open water and shorelines greater than 30 m apart, 20 suitable trees will be left for every 50 ac (20 ha) harvested within 0.5 mi (0.8 km) of wetlands. Although this measure was originally developed to benefit cavity nesting waterfowl species (e.g., wood ducks and hooded mergansers); it can also benefit other wildlife. By retaining trees near wetlands that have the potential to develop into snags, future potential Indiana Bat roosts may develop and be located near water sources and potential foraging areas.

4. Unique forest openings (e.g., patch cuts of aspen varying from 1-10 ac (0.4 - 4 ha) in size removed from the stand) will be provided whenever possible/practicable in varying silvicultural actions. This action will promote use by early successional species such as ruffed grouse and some migratory birds, as well as create openings in wooded habitat that can provide foraging opportunities for Indiana Bats (Brack 2006).

5. Specific management actions to regenerate aspen will be performed whenever possible/practicable. Areas that have begun to lose aspen as a dominant component in the stand will be targeted to be harvested through 3 - 5 ac (1 – 2 ha) clearcut blocks juxtaposed throughout the stand. Approximately 1000 - 2000 ac (405 – 809 ha) that meet criteria (i.e., stands that contain aspen/birch/alder and have limited training use) will be identified across the installation.

6. Mature "seed trees" will be left whenever possible/practicable in areas that normally would have been removed from the stand. This will allow specific mature trees to remain and provide food and/or cover components for certain wildlife, while also allowing the tree to function as a seed source for regeneration of other trees.

7. Other site specific management actions have and will continue to be programmed in for specific habitat requirements.

8. Skidding of trees cut before 15 April can continue until 15 May provided that trees are moved along skid trails and not dragged through the interior of the forest.

9. Limited hand thinning of saplings < 3-inches dbh may be allowable 15 April to 1 August in stands where the likelihood of destroying nests is low, for instance because sparse foliage provides little opportunity for nests to be hidden from view or bird density if very low. The timing of such thinning will be determined during the REC review process.

7.2.3 Military Training

1. The Readiness Rule authorizes the incidental take/killing of migratory birds during military training and testing. The definition of military training is explicit and does not include land management or other installation support functions.

2. As with other actions, intentionally killing birds or destroying active bird nests during military training activities is prohibited.

3. Under the Readiness Rule, if it is determined that any readiness activity will result in significant adverse effects on a population of migratory birds, then DoD must confer and cooperate with USFWS to minimize or mitigate the significant adverse impacts. Determination of the potential for such impacts is made through the NEPA process, typically through REC review. In general, populations of most bird species are sufficiently large and extensive that any actions that occur on one installation are unlikely to have a population impact. However, a small number of species that nest on Fort Drum are very rare in New York and the northeastern United States, and for these species an argument could be made that a significant impact on Fort Drum could constitute an effect on a regional population.

4. Mowing grasslands during the nesting season for units to use is inconsistent with DoD guidance to minimize incidental take/killing of migratory birds and should be strongly discouraged. The Natural Resources Branch can work with individual units to provide alternative areas for mission completion or determine appropriate areas within the provided footprint for allowable clearing to occur that would have negligible impacts to nesting birds.

7.2.4 Construction

1. Initial vegetation clearing for construction must be conducted after 01 August and before 15 April for <3 inch dbh trees and vegetation and after 15 October and before 15 April for >3 inch dbh trees.

2. Once vegetation is cleared at a site, if construction does not commence before 1 May but is expected to begin during the nesting season, the site must be managed in a manner that prevents extensive regrowth of vegetation that will attract nesting birds. All standing woody vegetation must be removed prior to 15 April, and cut brush and trees removed from site by 30 April. Any herbaceous vegetation that remains must be maintained at a height of 6-inches or less until final site preparation. Ideally, vegetation clearing should be promptly followed by sufficient preparation to leave the site effectively devoid of vegetation. These conditions do not apply if site preparation or construction do not occur during the 15 April to 01 August period.

3. In some circumstances it may be permissible to remove vegetation for construction during the 15 April to 01 August restricted period. Such vegetation removal is more likely to be approved for small areas with sparse vegetation than larger areas or those with dense vegetation. Exceptions to vegetation removal restrictions must be approved by Fort Drum's Natural Resources Branch through the REC process.

4. Prepared sites where construction has not yet begun may be attractive to a small number of ground-nesting birds, especially Killdeer. In general once these species have active nests the area around the nest must be avoided to prevent unintentionally destroying nests. Regular disturbance of such sites is recommended to prevent birds from nesting, and can be accomplished by regularly driving over the entire site. Such disturbance must be frequent (i.e., daily) to have a reasonable chance of deterring birds from nesting. If an active nest is found on a construction site, and avoidance or waiting until the nest completes is not possible, the project proponents must contact Fort Drum's Natural Resources Branch.

7.2.5 Vegetation Management on Range Facilities

1. The vegetation clearing restrictions from 15 April to 01 August do not apply to those portions of Range Facilities that are regularly maintained by mowing or other means. Lawns and other manicured areas can be mowed during the nesting season as long as maintenance is regular and the site does not become so overgrown as to be attractive to nesting birds. If grass or herbaceous vegetation is greater than 12 inches, the site should not be mowed until after 01 August.

2. Landing zones and firing points should be clearly identified and regularly maintained as Range Facilities, preferably in grass maintained at a height of not more than 12 inches. As with other facilities, if allowed to become overgrown and attractive to birds during the nesting season they should not subsequently be mowed until after 01 August.

3. The Chute Drop Zones will be managed to stay in grassland, including the removal of woody vegetation (Figure 9). Areas currently in grassland will be maintained by mowing between 15 August and 15 September. Fields dominated by forbs will be converted to grassland by mowing or by disking and planting with a diverse mix of cool season grasses. Areas with extensive woody vegetation will be cleared of trees and shrubs, then disked and planted. Once the entire managed area within the Chute DZ boundary are converted to grassland, approximately one-third of the DZ will be mowed annually for maintenance on a rotation where any given point in the DZ is mowed once every three years. Wet areas, including the Hunter Creek riparian strip, the area around Belvedere Pond, and two small drainages that pass through the DZ will be excluded from grassland management.

4. Those portions of Range Facilities that are in natural vegetation, such as shrublands, woodland, or unmaintained old fields with grass and other herbaceous vegetation taller than 12 inches, are subject to the 15 April to

01 August vegetation clearing restrictions for land management and construction purposes.

5. Vegetation management restrictions on Range Facilities do not apply to military training and testing and are not intended in any way to interfere with the training and testing mission.

7.2.6 Vegetation Management at Wheeler-Sack Army Airfield

1. The 15 April to 01 August restricted period for vegetation removal does not apply to areas at Wheeler-Sack Army Airfield near runways, taxiways, or other airfield infrastructure with specific vegetation management guidelines for air operations safety.

2. Fields within the Wheeler-Sack Army Airfield fence but distant from airfield infrastructure (see Figure 10) should be mowed once annually after 15 August because of high densities of several bird species of conservation concern.

7.2.7 Improved Grounds Maintenance & Management

1. Vegetation management restrictions during the nesting season (15 April to 01 August) do not apply to the mowing of grass in lawns, yards, compounds, or other manicured or regularly maintained areas in the Cantonment or around buildings elsewhere on Fort Drum. This exception applies to areas receiving regular maintenance, but large areas of grass that are not maintained and allowed to become overgrown (i.e., taller than 12 inches) and attractive to nesting birds should not be mowed until after 01 August.

2. Limited removal of woody vegetation may be allowed between 15 April and 01 August for a variety of reasons, including hazard tree removal, vegetation removal for unexpected or emergency repairs to water or sewer lines or other infrastructure, or other situations where the need for vegetation removal could not be foreseen. In all cases except true emergencies, Natural Resources Branch personnel must be consulted before any actions are taken.

3. Regardless of location, active nests found anywhere on Fort Drum should be left alone and allowed to complete. If the nest is deemed a potential threat to health or safety, or must be removed for any other reason, the Fort Drum Natural Resources Branch must be consulted. Intentional destruction or removal of an active bird nest without a permit is a violation of the Migratory Bird Treaty Act. In limited circumstances, when the goal is to save or protect a nest or young birds that would otherwise be destroyed, the Good Samaritan clause of MBTA allows individuals to transport eggs or young to a wildlife rehabilitator. When possible the handling and transport of birds under the Good Samaritan rule should be done by wildlife biologists.

4. When pruning trees or shrubs in the Cantonment Area, if an active nest is found in a shrub or on a tree branch, the nest should be left undisturbed and the branches around it left alone. These branches can be trimmed later in the season when the nest is no longer active (i.e., after the young leave the nest).

5. Belted Kingfishers, Bank Swallows, and Northern Rough-winged Swallows frequently nest in borrow pits, large sand piles, and other sandy sites with steep slopes. Such sites where sand will be removed for construction and other purposes during the nesting season should be maintained in a manner to preclude these birds from nesting in them, either by altering the slope so that it is at less than a 45% angle, or covering the slope with fabric or another materiel that will prevent nesting. Once these species are actively using nest holes, the portion of the site with active nests must be avoided until 01 August or when nesting is complete. Proponents wishing to pull sand from a site with actively nesting birds must contact the Natural Resources Branch. Belted Kingfisher nest are typically active from mid-April to mid-July. Bank and Rough-winged Swallow nests are typically active from early May through early August.

7.2.8. Birds Nesting in Buildings & Other Structures

1. A variety of birds nest in buildings, including under eaves, in chimneys, under loose siding, in attics accessed through holes in soffits or elsewhere, in scaffolding, and other sites. When not a threat to human health or safety, active nests should be allowed to complete and then be removed once young are out of the nest.

2. By definition, nests are active when they contain eggs or young birds, and it is a violation of the Migratory Bird Treaty Act to remove or destroy the active bird nests of any protected species without a permit. Anybody wanting to remove an active bird nest must contact the Fort Drum Natural Resources Branch rather than removing the nest themselves.

3. Three of the most common species that nest in buildings—Rock Pigeon, European Starling, and House Sparrow—are not protected by the Migratory Bird Treaty Act. Nests of these species may be removed, but only if the identity of the species is known with certainty.

4. The protected species that most frequently nest in or on structures are Chimney Swift, Eastern Phoebe, Common Raven, Barn Swallow, and American Robin, although other species are possible.

5. Chimney Swifts nest in chimneys from early May through early August. Chimney repair, maintenance or removal should be avoided from 05 May to 10 August to avoid destroying swift nests. Boiler repairs that incorporate the need to modify, destroy, replace, or otherwise utilize a chimney where birds could be nesting should be avoided during this time as well.

6. Common Ravens frequently nest in or on structures throughout the Training Area, (including towers, bleacher enclosures, and other open-sided buildings) and on water towers in the Cantonment. Most nests are active from March through May, although a few nests may be active until August. Enclosing such buildings would be the most effective way to discourage raven nesting. If impractical, repeatedly removing nests may also discourage nesting, but must be done when the nest is not active, either before the first egg is laid or after young leave the nest.

7. Proactive efforts to prevent birds from nesting in buildings can eliminate many conflicts. European Starlings and House Sparrows frequently use holes in soffits, gaps in siding, and other entry points to build nests in buildings. Open scaffolding or latticework with overhead cover often attracts nesting Rock Pigeons. Sealing up holes and gaps or enclosing latticework will often prevent these species from nesting in buildings.

7.2.9 Demolition

1. If any active bird nest, a bat, or in fact any animal is found in a building slated for demolition or is being demolished, all work must stop and Fort Drum Natural Resources Branch must be consulted.

2. One of the primary concerns with building demolition from a Migratory Bird perspective is Chimney Swifts nesting in chimneys. If a Chimney Swift is known or suspected to nest in a chimney, or any bird is seen flying into or out of a chimney, the building where that chimney is located should not be demolished until after 10 August. Any work on that building should immediately cease and Natural Resources Branch should be contacted.

7.2.10 Invasive Species Management

1. To the maximum extent possible, invasive species management should be conducted outside the 15 April to 01 August restricted period.

2. Many invasive species treatments are most effective when performed at a specific time of year based on the biology of that particular species, often occurring during the bird nesting season. Such control efforts may be approved if they are carefully executed to minimize incidental take/killing of birds, especially if areas to be treated are small, unlikely to have nesting birds, or are in heavily disturbed sites. Invasive species management conducted during the nesting season must be approved through the REC process.

3. The use of herbicides for invasive species control should be carefully evaluated and employed. Herbicide treatments conducted during the nesting season should be conducted at the smallest scale possible (e.g., spot-spraying individual plants rather than broadcasting herbicide over a large area). The potential for incidental take/killing from both directly spraying herbicides on birds and bird nests as well as indirectly exposing nests through reduced concealment by foliage should be evaluated and minimized.

4. Mechanical removal of vegetation should be conducted at the smallest scale possible. When feasible, hand pulling or digging is preferred, as it is the least destructive to habitat and provides the greatest likelihood for the detection of any active nests that are present. Removal by means of brush saws, mowers, and other equipment may be approved on a case-by-case basis if the likelihood of killing birds or destroying bird nests is deemed low. For instance, small monoculture stands of some invasive species infrequently host bird nests resulting in a low likelihood for nest losses. Other potential exceptions include

heavily disturbed sites and roadsides where traffic discourages birds from nesting, generally within 5 meters of roads but perhaps as much as 8-10 meters depending on vegetation and disturbance. Such potential exceptions will be evaluated through the REC process.

5. When an active bird nest is found during the course of invasive species management, the treatment in the vicinity of the nest must stop immediately and the vegetation in the area surrounding the nest must remain undisturbed to avoid nest losses. In such cases the Fort Drum Natural Resources Branch should be consulted to determine how much habitat to leave undisturbed.

7.2.11 Life, Health, & Safety Exceptions

1. In emergency situations (e.g., creating a fire break to fight a wildfire or constructing an emergency access road to reach a downed aircraft) vegetation may need to be cleared. To the extent possible, in emergency situations that occur during the nesting season the minimum amount of vegetation necessary should be cleared, but it is understood that dealing with immediate threats to life and/or safety take precedence.

2. Non-emergency management actions designed to address potential threats to life, health, and safety should be conducted in a manner that will minimize the incidental take/killing of birds. For example, a plan to spray for mosquitoes in response to the detection of mosquito-borne pathogens should give some consideration to reducing the potential impact to nesting birds.

Appendix 8: MBTA In-Season Vegetation Management

Although conservation measures to minimize the take of migratory birds are implemented on Fort Drum as discussed in Appendix 7, there are some vegetation management actions that are proposed to be conducted during the prime nesting period of 15 April - 01 August.

Although we anticipate these actions will result in the take/loss of nests/eggs of migratory birds, we conclude that the overall benefit to other rare and protected species (including declining grassland birds) by completing these management actions outweigh those losses. Additionally, in all three management scenarios, impacts should be temporary and short term. Once initial management actions are completed, invasive, or undesirable vegetation is removed, and habitat is converted to a desired state, only general maintenance mowing will be required.

8.1 Wild Parsnip Control & Management

Fort Drum proposes to manage specific areas of primarily herbaceous vegetation that have wild parsnip infestation throughout with the goal of removing Wild Parsnip in favor of herbaceous nonnative vegetation.

Wild Parsnip is an invasive species quickly dominating open areas across the landscape in northern New York. Wild parsnip can inflict phytophotodermatitis much like Giant Hogweed, but typically on a lesser scale. This can create a human health/safety impact for some people that come in contact with it.

Wild Parsnip is a biennial plant--the first year it grows as a basal rosette low to the ground, and the following year there is a prominent aerial shoot (or bolt) that produces a yellow umbel flower and seeds. During the first year of growth the plant is difficult to locate due to the low growing rosette. It is really only readily visible during the second year when the flower shoot is up above adjacent vegetation. This flower shoot growth happens during the early part of the growing season (May-June). Various management scenarios were attempted to remove/reduce parsnip; however, success was only achieved when we experimented with mowing in May-June. Therefore, in order to be most efficient and effective, management must be timed during the main nesting period in order to treat and kill the plant before seeds become viable.

Repetitive mowing during the growing season effectively removes the plant's ability to produce and drop viable seeds. While repetitive mowing could eventually kill the plant, parsnip is robust and usually resprouts multiple times and will begin to re-flower at a lower height. Therefore, mowing height will need to be adjusted accordingly to effectively suppress seed production and viability. It is believed that seeds are able to germinate successfully within approximately three weeks. Therefore, flowering heads will need to be cut every week or two during the growing season to ensure variable growth is accounted for. Additionally, this mowing regime will be needed for at least 5 years to exhaust the seed bed in the soil. Mowing must be completed before seed viability to prevent further spread locally and dispersal to areas where parsnip does not currently exist. While continual mowing could eventually kill the plant, it is more likely that it will be mainly successful for seed suppression. The use of herbicide or the natural shading or competition from other plants resulting from mowing (parsnip is shade

intolerant) would be better for causing the actual death of the plant. And while the use of herbicides is a viable management option, the sheer abundance and distribution of the plants makes solely using chemical treatment challenging, expensive, and inefficient. It is likely that a combination of management actions during the growing season will be needed to achieve goals.

Up to 500 acres in Training Areas 11, 12, 13, 16, 17, and 18 (Figure 11) may be treated annually under this management scenario. Primarily these areas are within footprints of historic grassland habitat; however, now are mostly composed of a mix of native and invasive woody and herbaceous species with a prominent wild parsnip component. Treatment will consist of repeated mechanical mowing (using tractors with mowing decks, side boom mowers, brush saws, chainsaws, skid steers/ASVs, and/or other equipment) and/or herbicide application (e.g., spot spraying, broadscale boom spraying, mist blowing, etc). throughout the growing season. Plowing, disking, dragging, (and/or other farming type practices) and planting may be needed to establish desired herbaceous species.

The focus of Wild Parsnip control is in open areas and not forests and shrublands. Typically natural shading from shrubs/trees in the overstory minimizes Wild Parsnip infestation—if there are infestations within wooded areas, spot spaying of chemicals will likely be used. Overall, the type of management (i.e., mowing, herbicide use, and/or planting) will be determined on a case-by-case basis and will be dependent on the local site conditions and flora community/species present.

Although the intent is to remove a potentially medically important invasive species from areas where training occurs, a consequence may be re-establishing quality grasslands that will benefit migratory birds.

Maintenance mowing in the wild parsnip areas will be determined on a case-by-case basis and conducted outside of the bird nesting window.

8.2 Roadside Habitat Management & Conversion

Fort Drum proposes to convert the strip of non-forested vegetation directly adjacent to main Training Area roads to grass.

The main intent of converting these non-grass areas to grass is to remove potential pollinator habitat directly adjacent to the roadsides and thus reducing adverse impacts to pollinators from vehicles and dust. At the same time, Wild Parsnip will also be removed/reduced which will benefit training.

Up to 900 acres may be managed annually adjacent to roadsides under this scenario (Figure 12). The target width of the strip is approximately 6 meters (or approximately 20 feet); however, the width of the strip in any given area will be determined by local site conditions, topography, ditch configurations, and distance to permanent forest or shrub habitat. Forested areas and shrublands will not be mowed and converted to a grass strip unless the main component is invasive species. However, sparse shrubs would be removed.

Management would occur through repeated mechanical mowing (using tractors with mowing decks, side boom mowers, brush saws, chainsaws, skid steers/ASVs, and/or other equipment) and/or herbicide application (e.g., spot spraying, broadscale boom spraying, mist blowing, etc). Plowing, disking, dragging, (and/or other farming type practices) and planting may also be needed to establish desired grass species in the strip if it is currently not present. In areas where there is already an established grass component, with other non-grass species present, repeated mowing or mowing with spot-spraying of individual non-grass plants will likely be the most effective way to reduce or eliminate unwanted vegetation. In other areas where there is mostly non-grass vegetation, differing management actions throughout the growing season may be needed to convert the strips to grass. Where there is no grass component, repeated mowing, and/or extensive disturbance of the soil with planting may be needed to establish grass. The use of herbicides will be conducted at the smallest scale possible; however, broadcast spraying over sections may be needed in certain management scenarios. Type of management and seed mixes will be determined based on the local habitat and site conditions. Vegetation to be managed will likely include a mix of native and invasive woody and herbaceous species (i.e., non-grass).

Mowing to maintain grass along roadsides would happen approximately weekly with the goal of keeping grass under 6-8 inches and approximating a landscaped yard.

8.3 St. Lawrence Valley Grassland Habitat Management

The St. Lawrence Valley grassland is one of two distinct grassland bird communities that occurs on Fort Drum which consists of old hayfields in Training Areas 12 and 13 and adjacent areas. During the 1990s, the suite of grassland birds breeding in here included Upland Sandpiper, Northern Harrier, Short-eared Owl (erratically—nesting on average one out of every 2-5 years), American Kestrel, Sedge Wren, Savannah Sparrow, Henslow's Sparrow, and Bobolink. Although not generally considered a grassland bird, American Bittern is a surprisingly common breeder in these fields, nesting in damp patches of grass and sedge as well as dry, upland areas. Between about 2000 and 2005 Upland Sandpiper rapidly declined then disappeared as a breeding species from these fields, and during this same period Eastern Meadowlark went from being a regular component of the avifauna here to scarce and erratic in occurrence. Significant numbers of Henslow's Sparrow formerly nested in these fields, with 40 or more singing adults annually in the 1990s, and at least 24 as late as 2010, but fewer than five individuals have been found most years since 2018, and for the first time none were detected in 2020 and again in 2023, with just a single singing adult during the intervening two years. The remaining species of obligate grassland nesting birds present in the 1990s still breed in these fields, although they are getting squeezed into progressively fewer and smaller patches of habitat.

Several obvious changes to these fields likely are driving grassland bird declines. During the 1990s most of these fields consisted of a diverse mix of hayfield grasses, but since the early 2000s have become dominated by forbs (especially *Solidago*) and invasive species (such as meadow knapweed). Most patches that remain in grass now are dominated by invasive reed canary grass, which seems to be shunned by many grassland birds. Regardless of the herbaceous makeup, woody vegetation is encroaching in all but the most heavily managed fields. This will eventually result in conversion of these grasslands to shrubland and young forest without aggressive intervention. Fort Drum already supports thousands of acres of early successional

shrublands and woodlands, therefore additional recruitment of this habitat type is unwanted. Retaining and/or restoring grasslands is vital to maintaining a diverse landscape and supporting these declining bird communities.

Initially we are focusing our grassland management efforts in a core area of approximately 488 acres in Training Area 12C (Figure 13). This patch, minus two small drainages that pass through it, has been divided into three units comprised of 123, 143, and 170 acres, respectively. Management will focus on one unit each year. In each unit all woody vegetation will be removed via various methods (as described above in the other categories), then portions of the field may be plowed and planted with grass (depending on local conditions and existing vegetative composition). Areas within each unit that are already dominated by grasses other than reed canary grass and have little woody vegetation will not be plowed, rather managed through maintenance mowing as described below.

The seed mix we are using is meant to restore hayfield vegetation that dominated these fields prior to 2000, and includes timothy, orchard grass, Kentucky bluegrass, creeping red fescue, and redtop. A small legume component includes white clover and bird's foot trefoil. While these grass species are not native, they have no invasive qualities like reed canary grass.
Additionally, research has shown in NY that these non-native cool season grasses provide much better habitat quality and are better for grassland bird management than the native warm season grasses that could have historically been found here.

Once grasslands are successfully restored, they will be maintained by mowing on a three-year rotation to provide structural diversity. Mowing just one of these three units annually should leave sufficient habitat for Henslow's Sparrow, which requires large fields with standing dead vegetation, along with the remaining species in this suite of breeding birds. Once this area is fully restored, other patches of habitat in Training Areas 12B, 12C, 12D, and 13A will be considered for additional restoration efforts.

While work may need to be performed during the nesting season, we will attempt to perform as much work as possible outside this time as local conditions allow. We anticipate being able to remove woody vegetation between August and April, thus minimizing direct adverse impacts to nests/eggs. Eliminating woody vegetation during the non-breeding season may still cause temporary indirect impacts by removing habitat for species such as Alder Flycatcher, Willow Flycatcher, Gray Catbird, Brown Thrasher, Clay-colored Sparrow, Field Sparrow, Song Sparrow, Swamp Sparrow, Eastern Towhee, Common Yellowthroat, and Yellow Warbler. However, we do not anticipate long-term adverse impacts to these species, as there is ample habitat in adjacent areas for these birds to move into and utilize.

When possible, plowing and other preparation for planting will also occur before birds begin nesting, but this may not be possible because of extremely wet soil. In such cases plowing and planting will begin as early in the season as possible; however, species such as Savannah Sparrow, Killdeer, and American Bittern will likely be impacted if work during the breeding season is needed. These impacts should be short-term and temporary in a given season, and ultimately benefit these species in the long-term. If the nest of a particularly sensitive species such as Northern Harrier or Short-eared Owl area is found within a management unit, work around the nest will be postponed until after the

nest completes. Once grass is established, additional maintenance work to retain the area as grassland will occur outside the bird nesting season.

Maintenance mowing in the grassland management areas will be determined on a case-by-case basis and conducted outside of the bird nesting window.

8.4 Monitoring

In order to determine the effectiveness of the proposed Wild Parsnip treatments Fort Drum will monitor vegetative response. Simple qualitative and/or quantitative sample plots for wild parsnip may be utilized within the management areas to determine if proposed treatments are reducing the spatial distribution and density of the plant. We would also use these to determine if annual management of 5 years is needed to exhaust the seed bank (as the literature suggests), or if more or less may be appropriate.

The response of birds to these management actions will be monitored using standard point counts as sites reach their desired end states. The focus of bird monitoring in the grassland restoration units will be to document the occurrence and abundance of obligate grassland bird species following restoration. Similarly, we will conduct additional point counts in parsnip control areas following the end of the expected five-year management cycle, or when management is deemed complete, to determine whether the resulting habitat supports grassland birds. We anticipate that few birds will attempt to breed in the roadside management units following intensive management, so after some initial monitoring to document bird use during conversion we do not anticipate monitoring bird use of roadsides once they are in a maintenance status.

Appendix 9: Figures

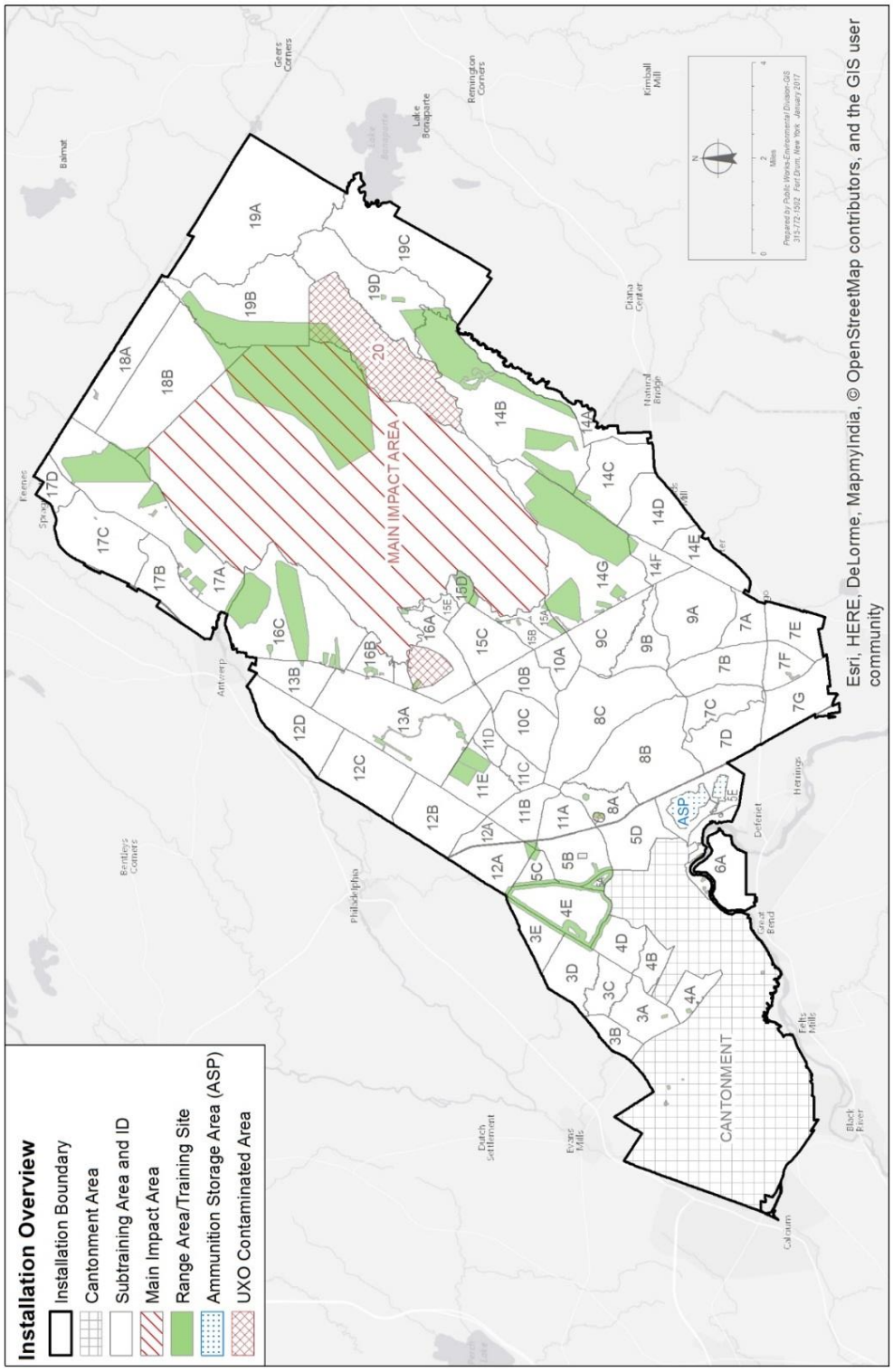

Figure 1. Current map of Fort Drum Military Installation.

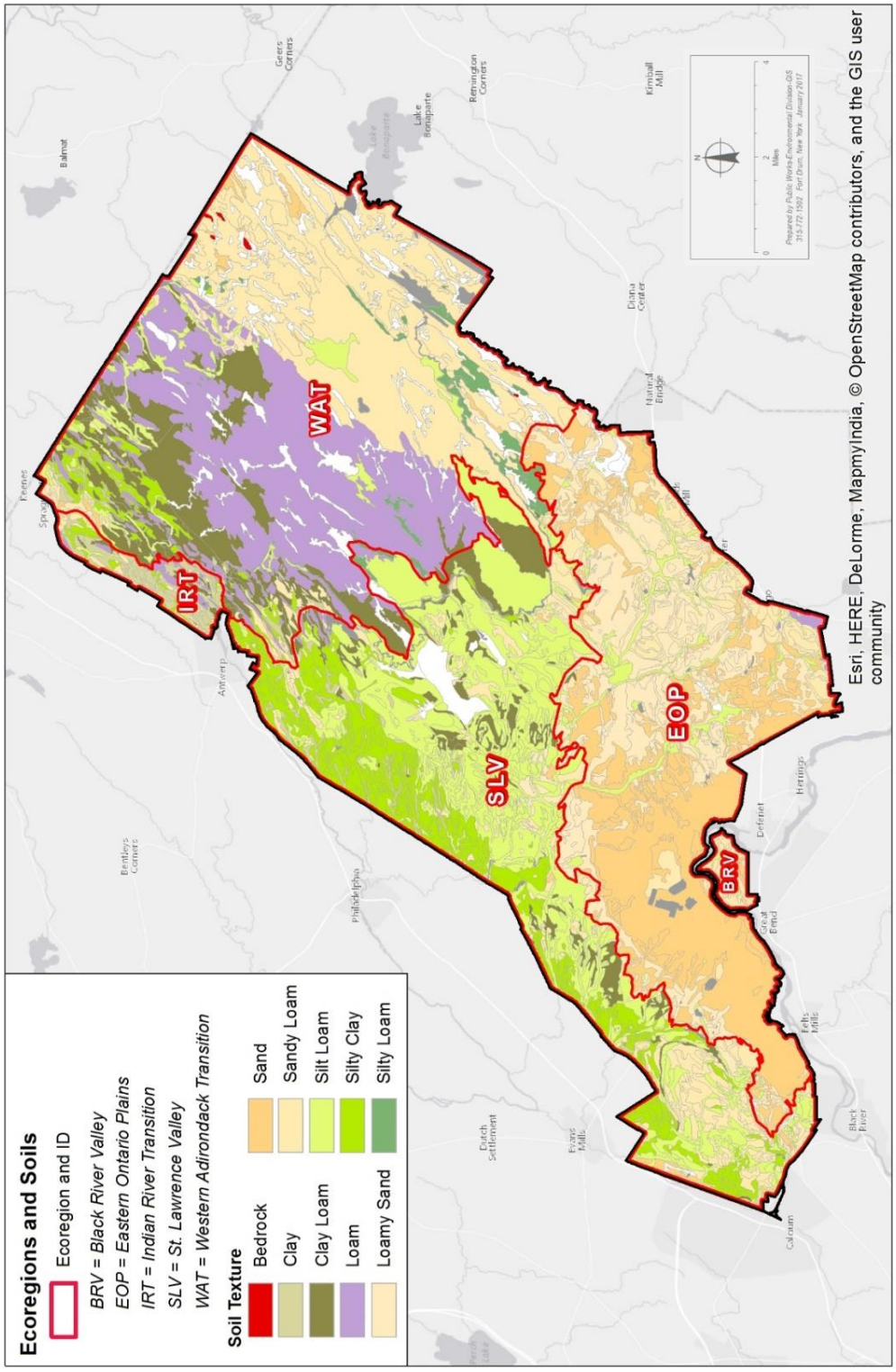

Figure 2. Ecoregions on Fort Drum Military Installation.

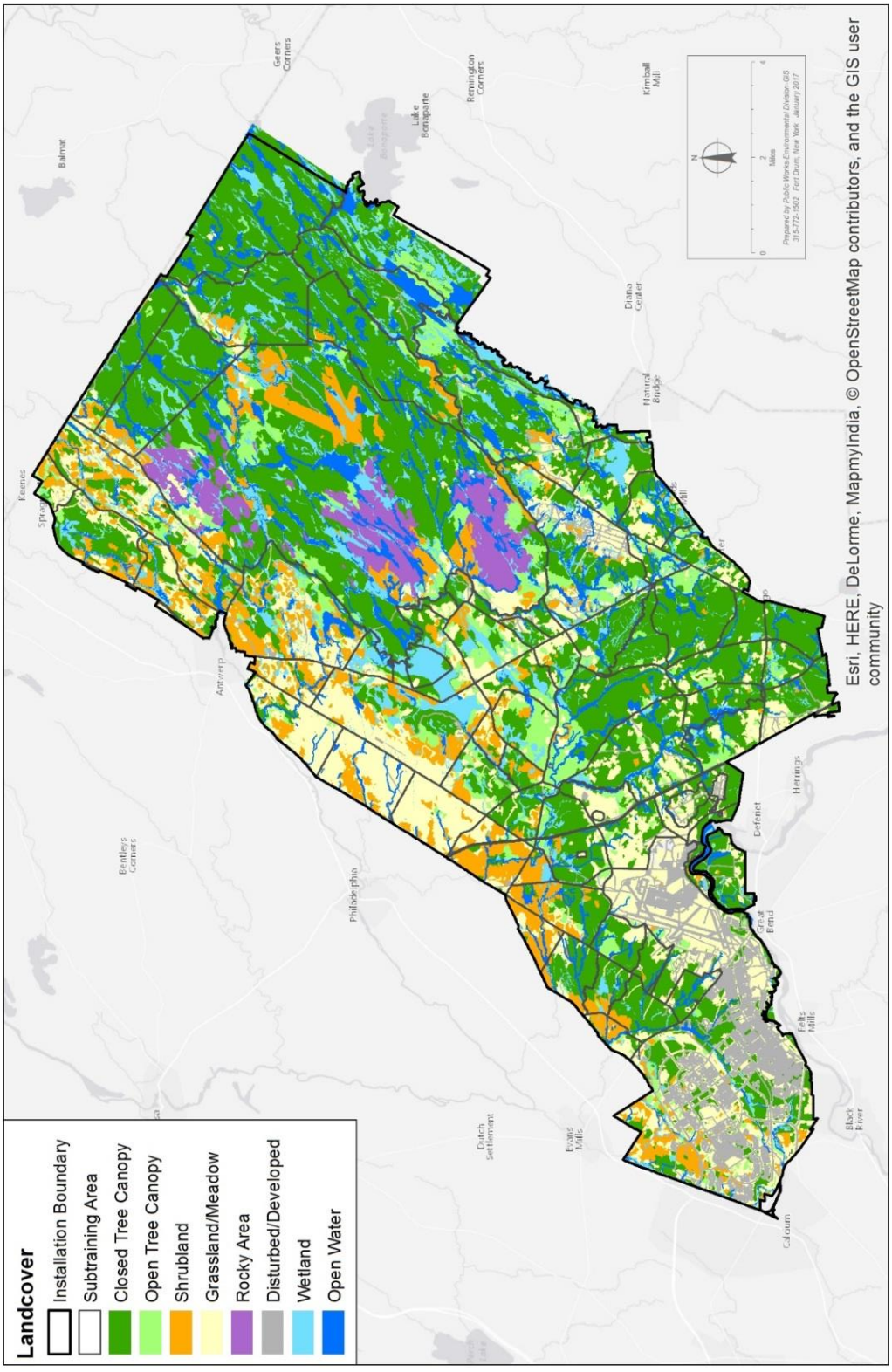

Figure 3. Landcover map of Fort Drum Military Installation based on 2006 survey data.

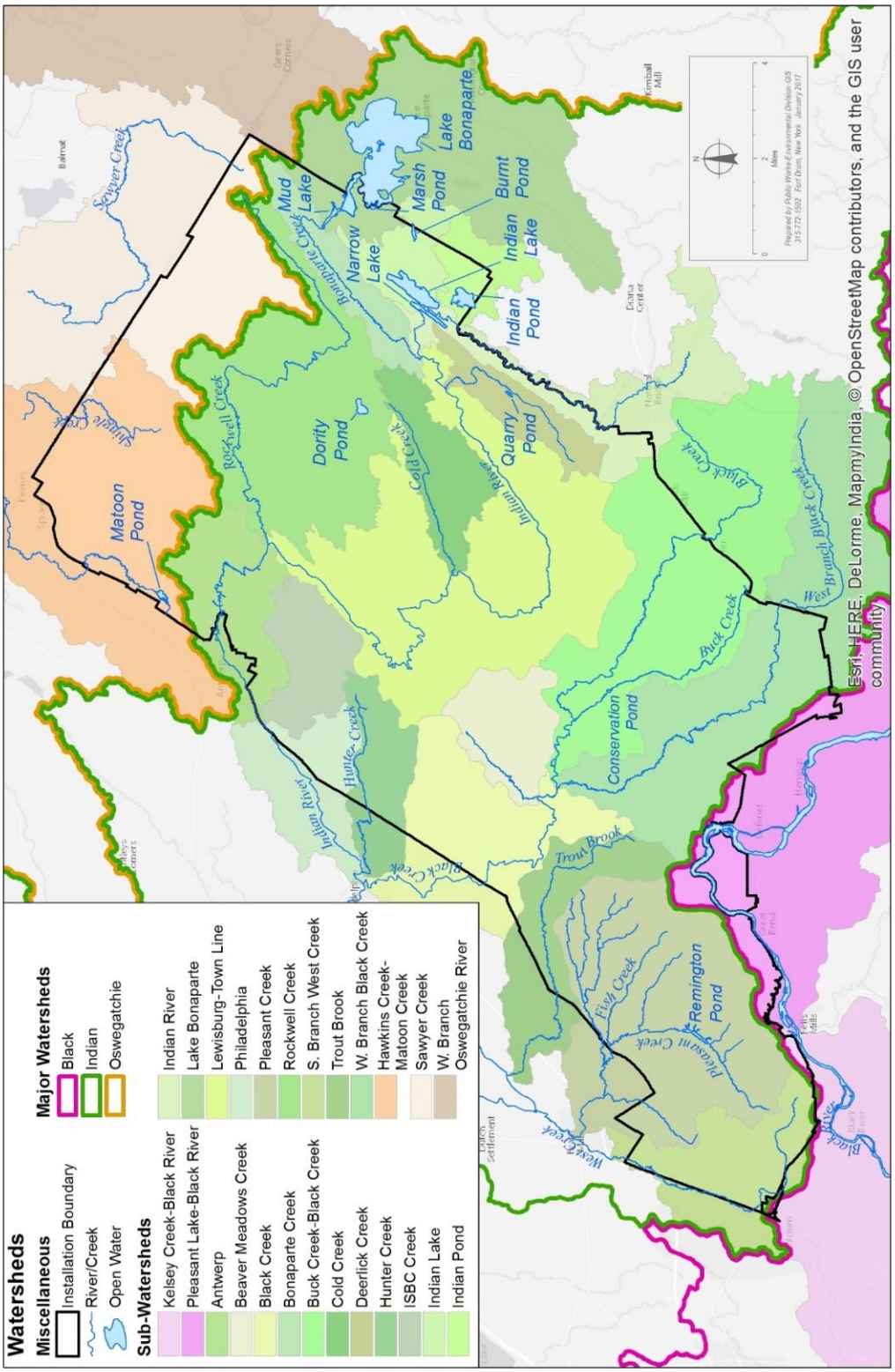

Figure 4. Watershed map of Fort Drum Military Installation.

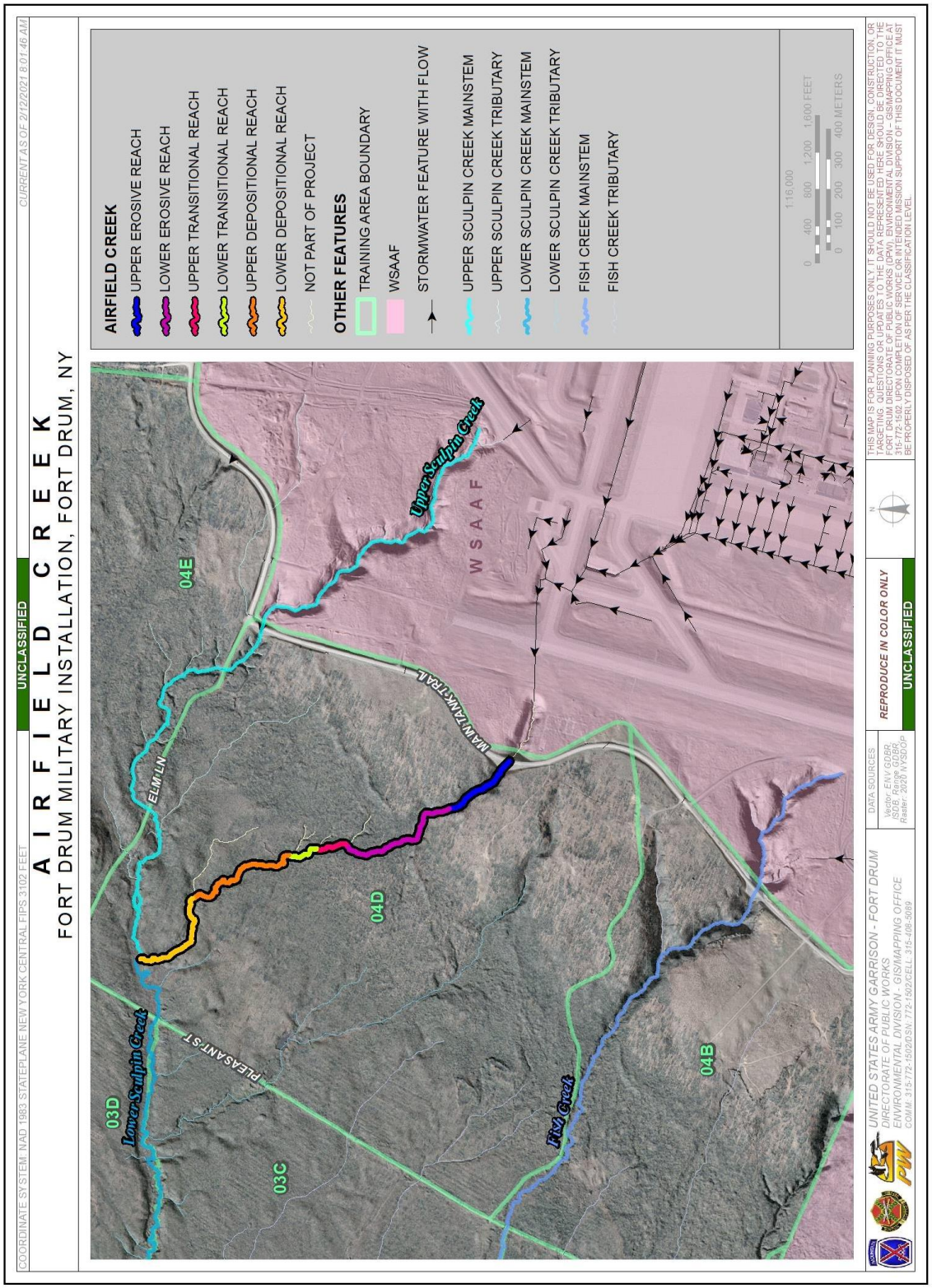

Figure 5. Airfield Creek as described in Section 4.1.4.2 Controlling Erosion, Transport, and Deposition of Sediment.

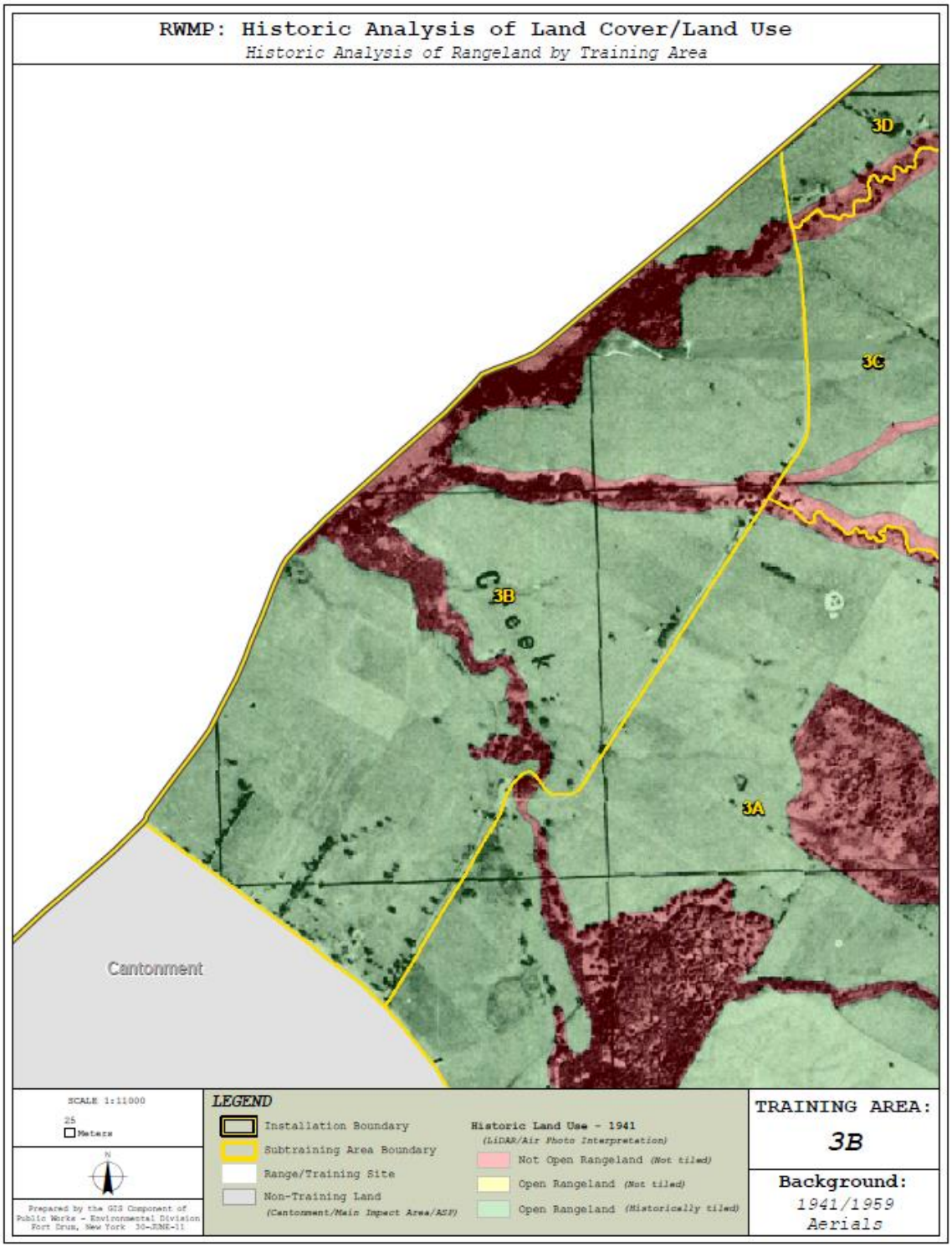

Figure 6. Open grassland/rangeland in Training Area 3B based on GIS analysis of 1941/1959 aerial photos (in Appendix 3.2 Historic Analysis of Range Land by Training Area in the Range-Wetland Management Plan (2011)).

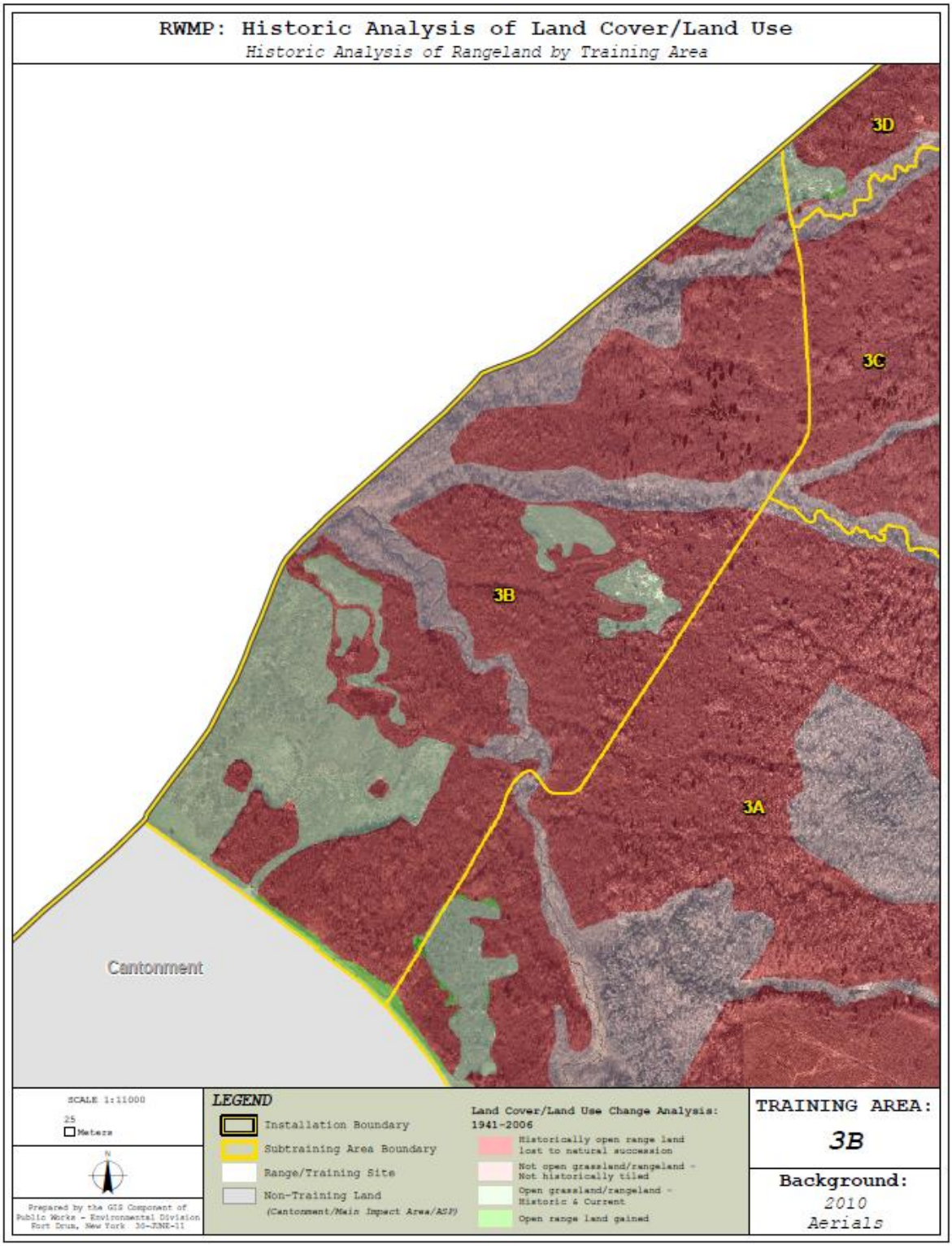

Figure 7. Open grassland/rangeland in Training Area 3B based on GIS analysis of 2010 aerial photos (in Appendix 3.2 Historic Analysis of Range Land by Training Area in the Range-Wetland Management Plan (2011)).

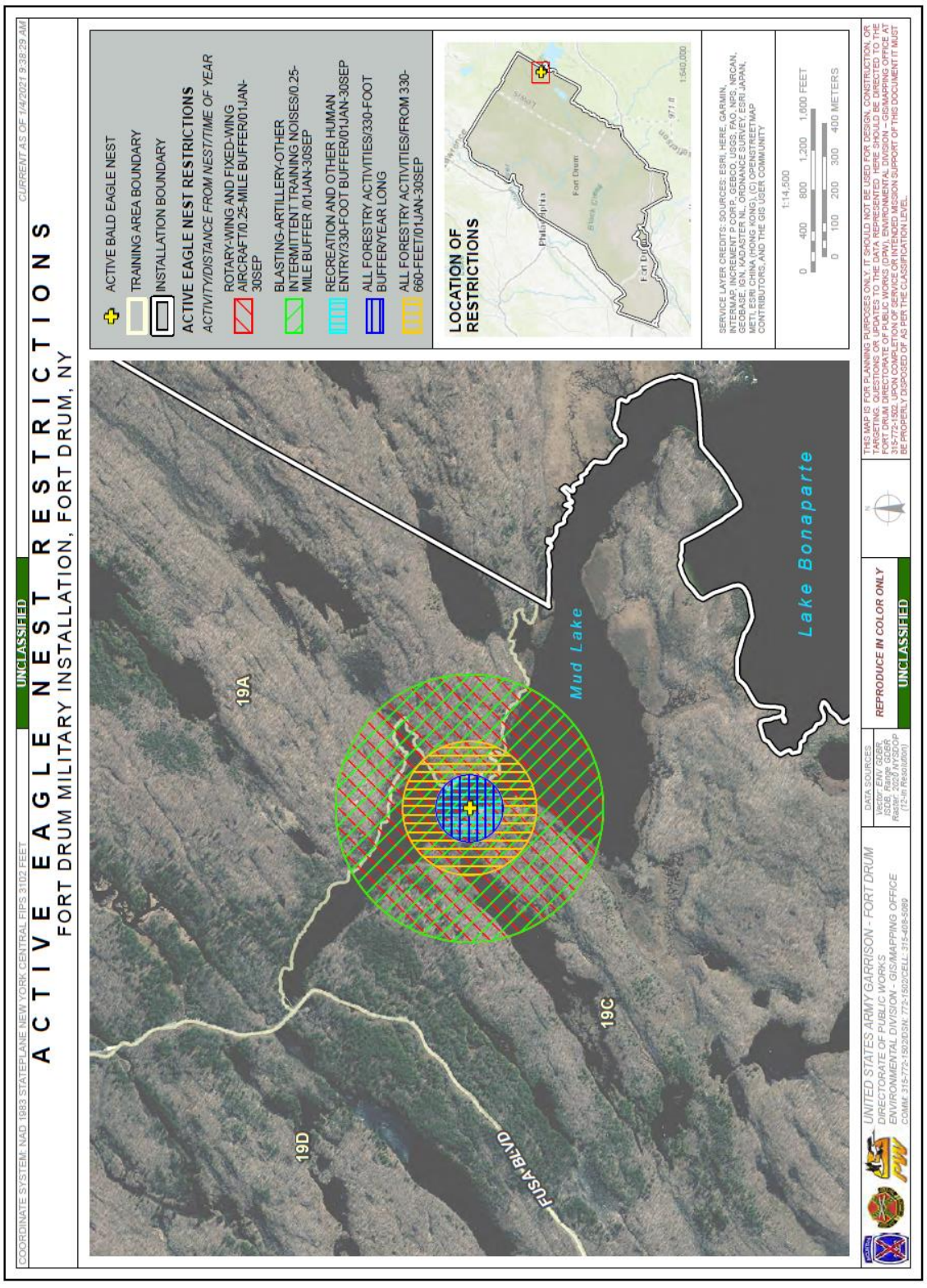

Figure 8. Conservation Restrictions around Active Bald Eagle Nest in Training Area 19 and Mud Lake on Fort Drum.

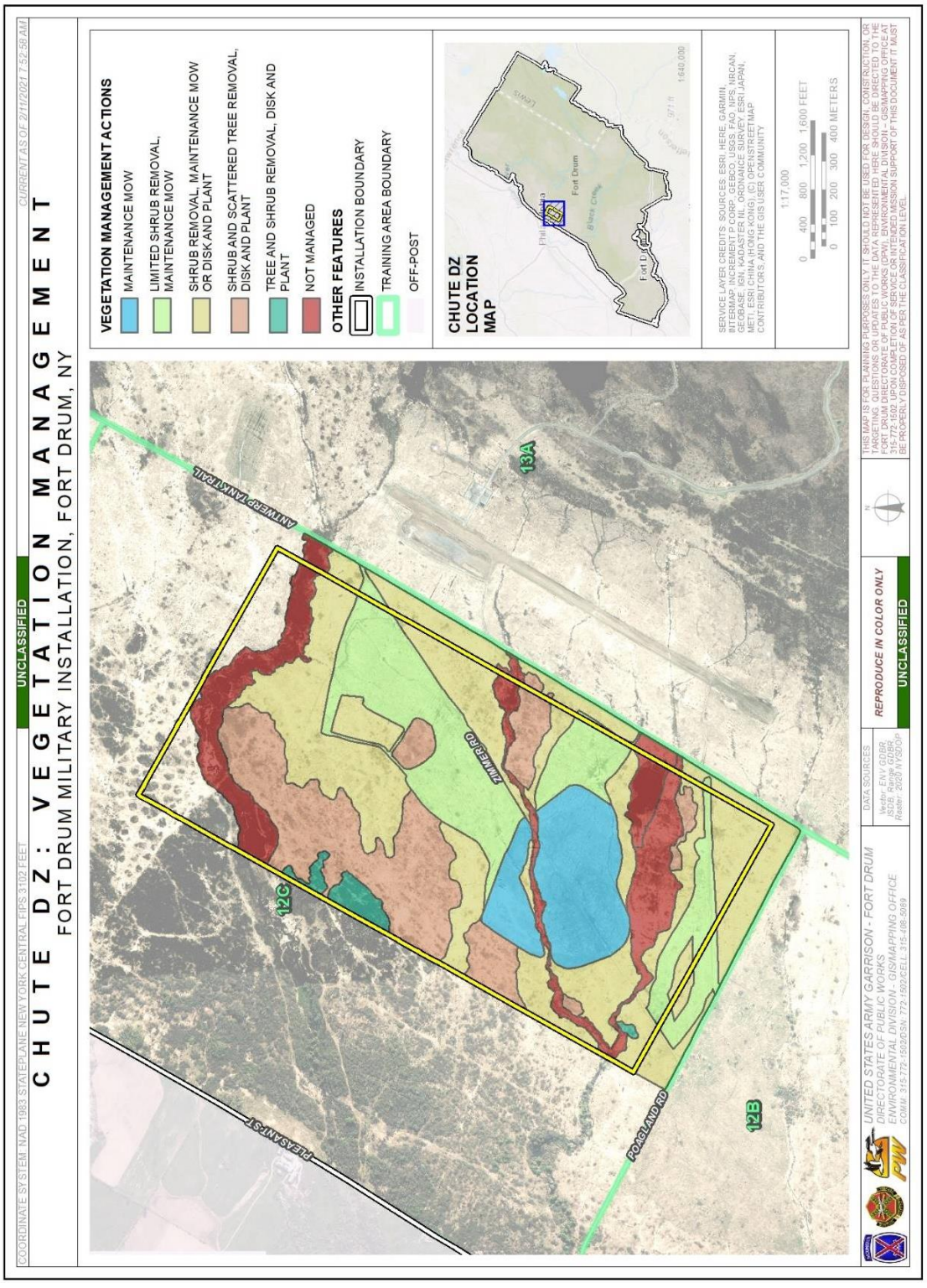

Figure 9. **Management *actions needed to restore grassland habitat in Chute DZ*.**

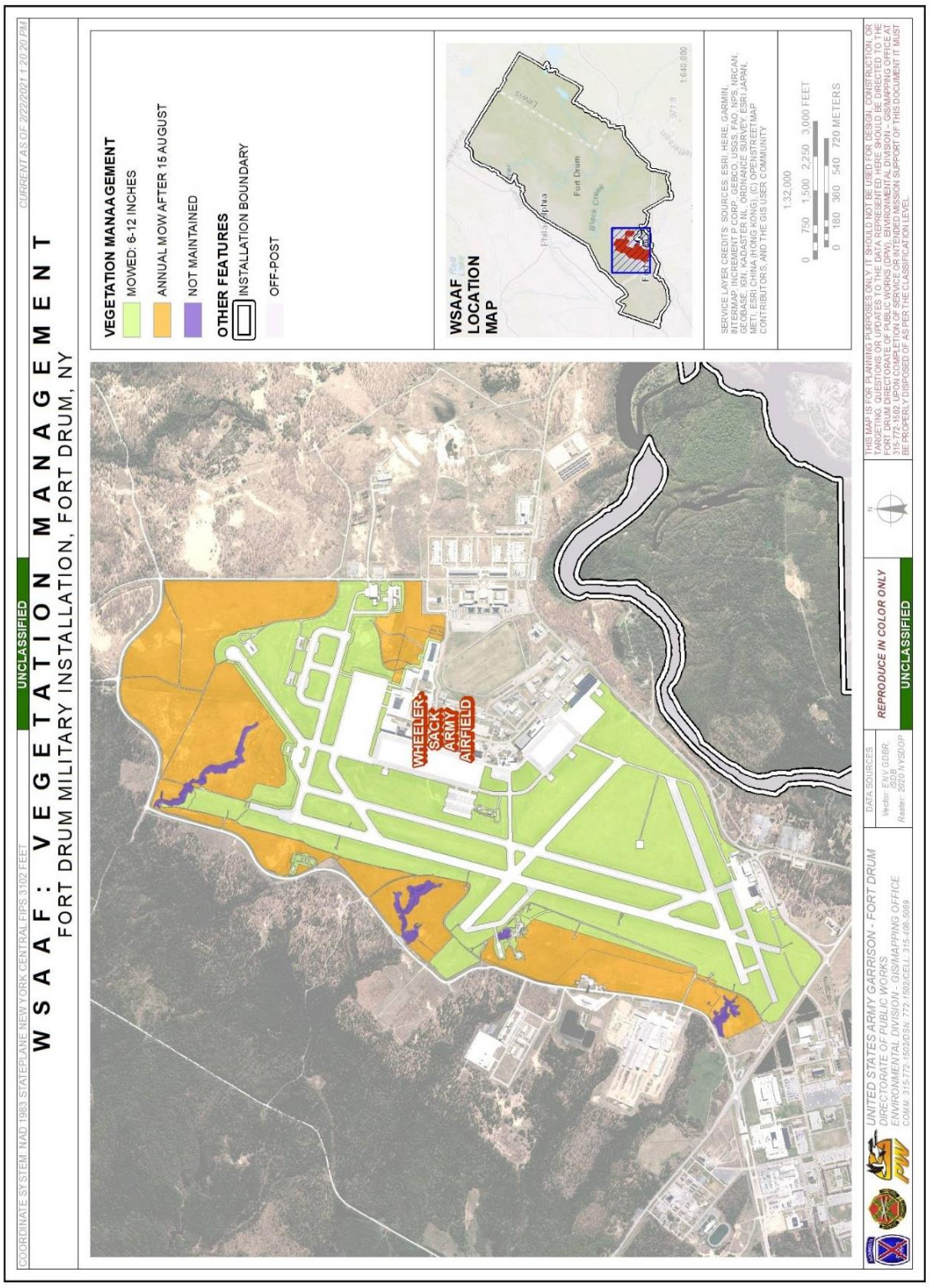

Figure 10. Grasslands distant from runways, taxiways, and other airfield infrastructure require a single annual mow after 15 August.

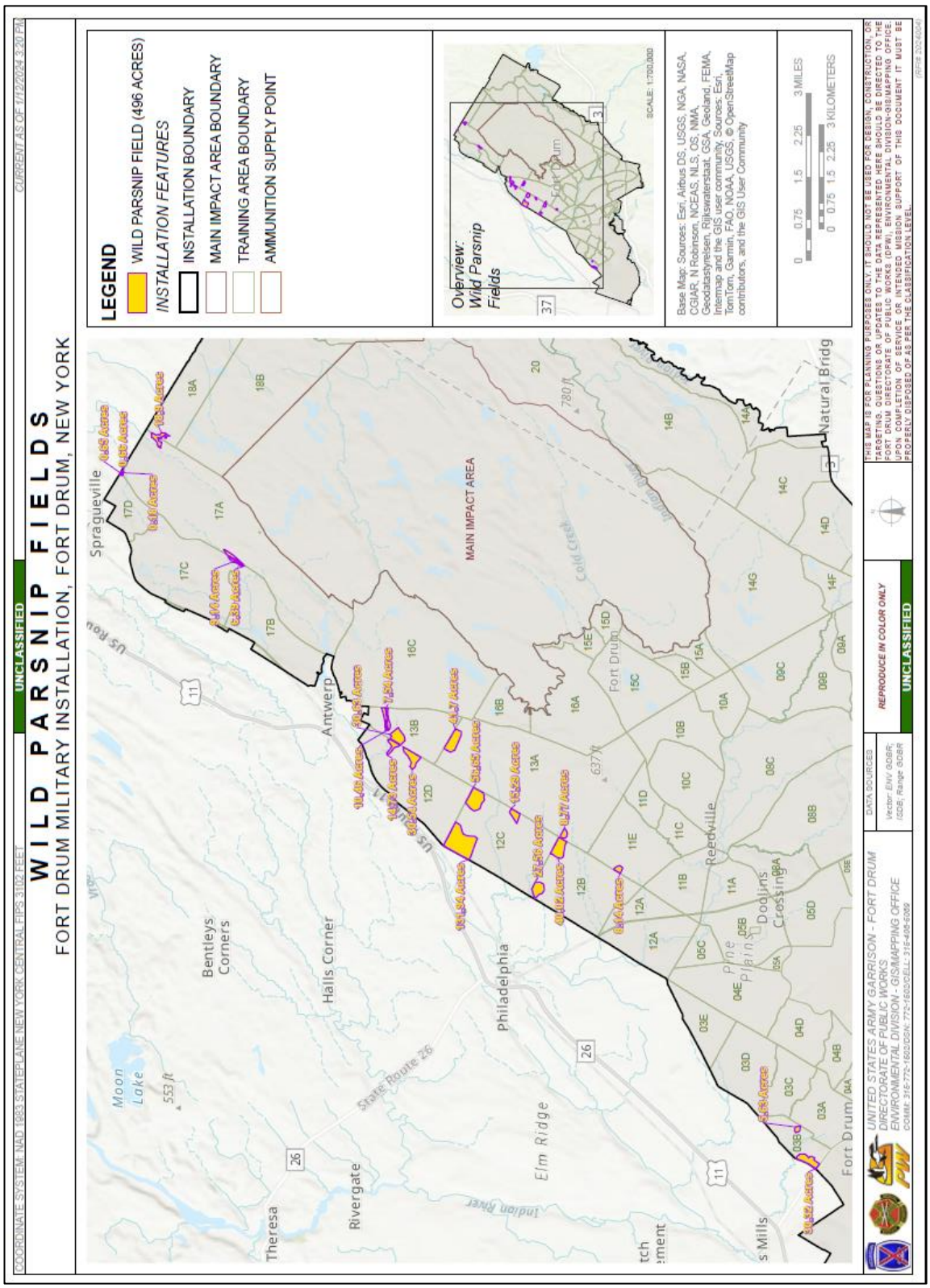

Figure 11. Wild Parsnip Fields proposed for management during the 16 April – 31 July migratory bird nesting window.

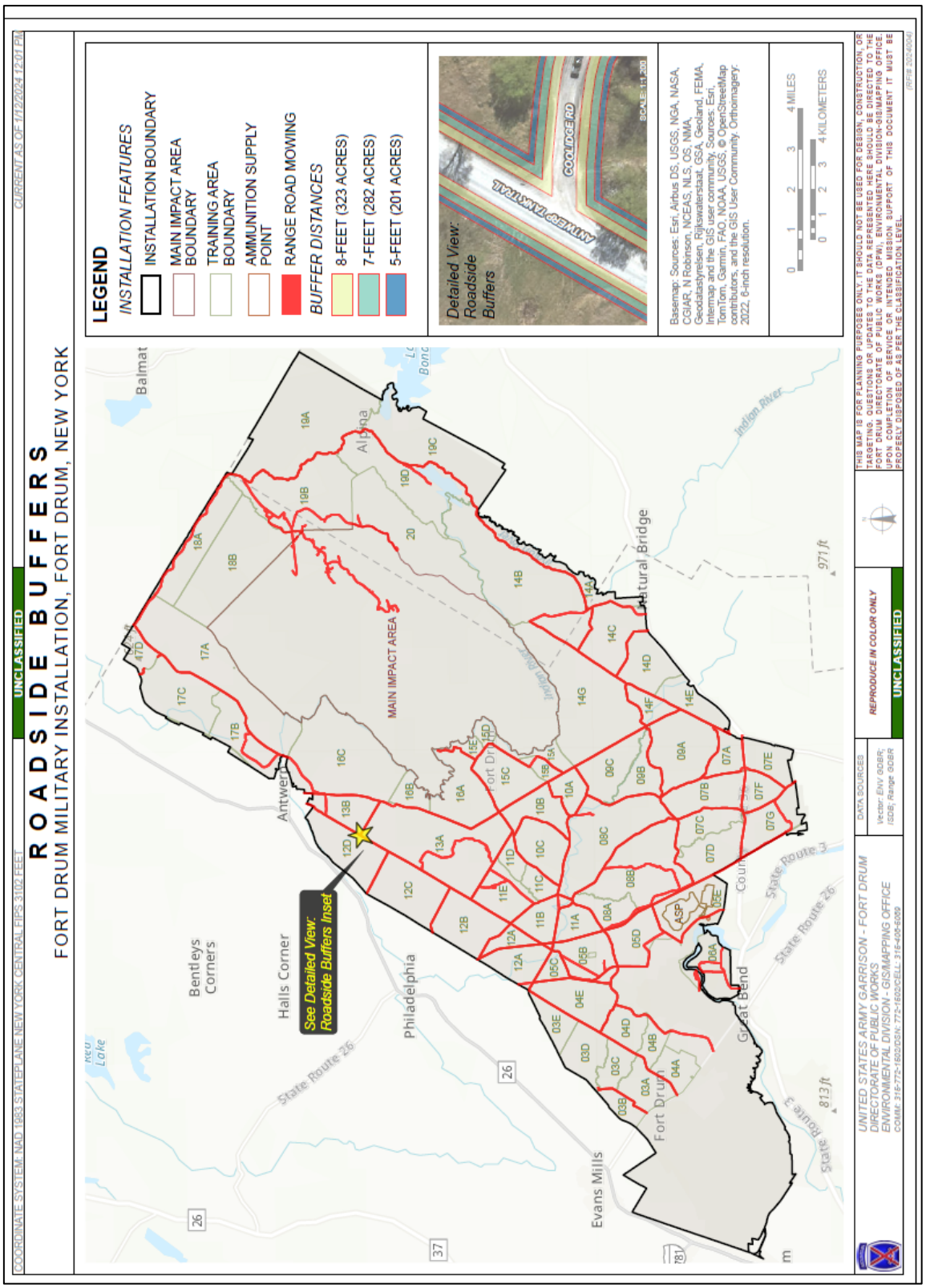

Figure 12. Roadside vegetation proposed for management during the 16 April – 31 July migratory bird nesting window.

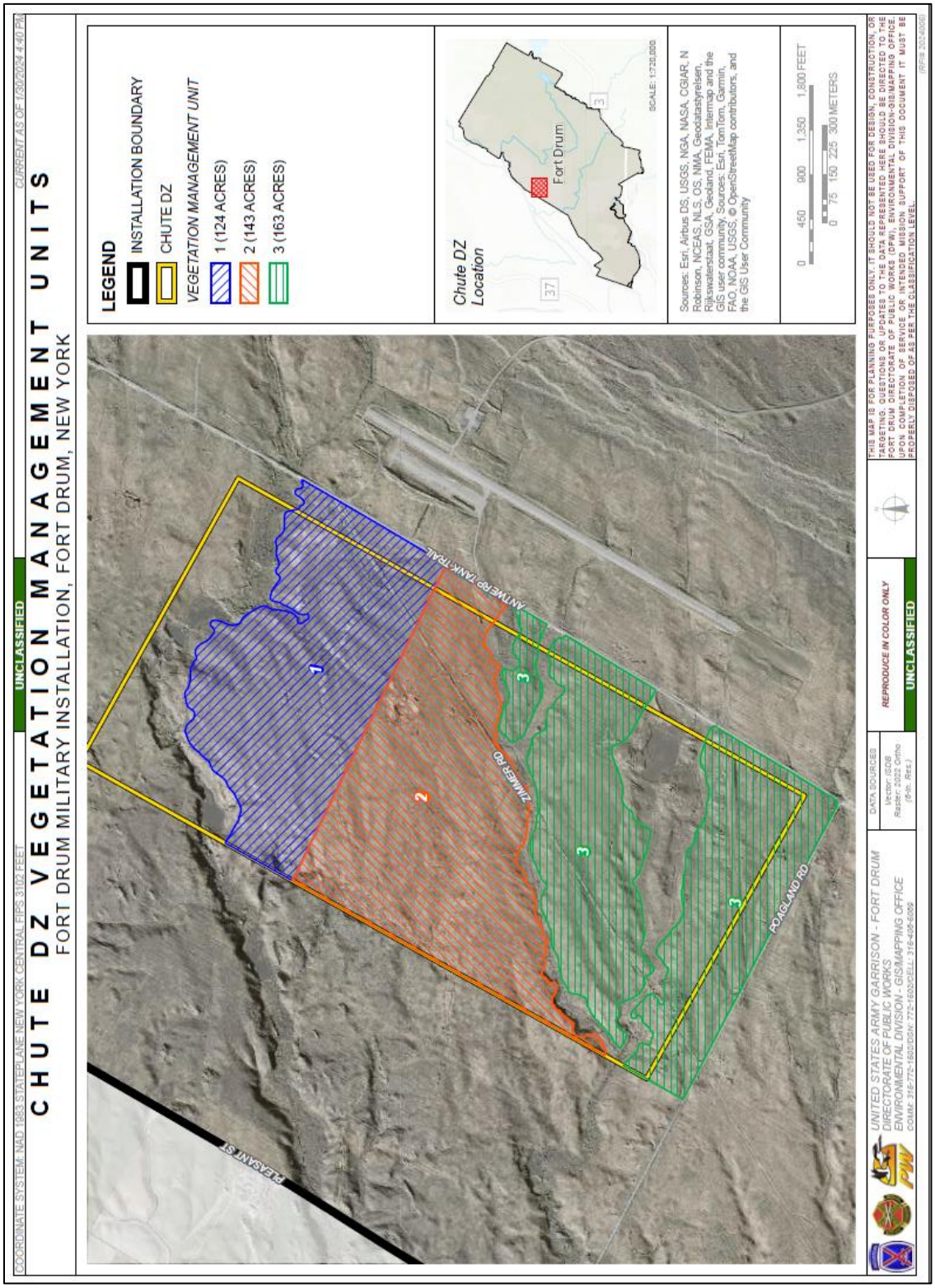

Figure 13. Chute DZ vegetation management zones proposed for the 16 April – 31 July migratory bird nesting window.

Literature Cited

Abbott, A. and S. D. Jackson. 2019. NAACC Stream Crossing Instruction Manual for Aquatic Passability Assessments in Non-tidal Stream and Rivers. North Atlantic Aquatic Connectivity Collaborative (NAACC), University of Massachusetts, Amherst, MA. 33 pp.

Augustine, D.J. and L.E. Frelich. 1998. Effects of White-tailed Deer on Populations of an Understory Forb in Fragmented Deciduous Forests. Conservation Biology 12(5): 995-1004.

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. EPA 841-B-99-002. US Environmental Protection Agency, Washington, D.C. 340 pp.

Berger, L., R. Speare, P. Daszak, D.E. Green, A.A. Cunningham, C.L. Goggin, R. Slocombe, M.A. Ragan, A.D. Hyatt, K.R. McDonald, H.B. Hines, K.R. Lips, G. Marantelli, and H. Parkers. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. Proceedings of the National Academy of Sciences of the United States of America 95:9031–9036

Berl, J.L., J.W. Edwards, and J.S. Bolsinger. 2015. Scale-dependent and multi-metric nest habitat thresholds for Red-headed Woodpeckers at the northern periphery of their range. The Condor, Vol 117: 203-216.

Berti, A. A. 1975. Paleobotany of Wisconsinan interstadials, eastern Great Lakes region, North America. Quaternary Research 5: 591-619.

Blehert, D.S., A. C. Hicks, M. Behr, C. U. Meteyer, B. M. Berlowski-Zier, E. L. Buckles, J. T. H. Coleman, S. R. Darling, A. Gargas, R. Niver, J. C. Okonkiewski, R. J. Rudd, and W. B. Stone. 2009. Bat White-Nose Syndrome: An Emerging Fungal Pathogen? Science 323(5911):227.

Brack, V., Jr. 2006. Autumn activity of *Myotis sodalis* (Indiana Bat) in Bland County, Virginia. Northeastern Naturalist 13:421-434.

Buhlmann, K. A. and C. P. Osborn. 2011. Use of an Artificial Nesting Mound by Wood Turtles (*Glyptemys insculpta*): A Tool for Turtle Conservation. Northeastern Naturalist 18(3): 315-334.

CBC. 2012. Petition to List 53 Amphibians and Reptiles in the United States as Threatened or Endangered Species Under the Endangered Species Act. Center for Biological Diversity, Tucson, AZ. 454 pp.

CBC. 2014. Petition to Protect the Monarch Butterfly (*Danaus plexippus plexippus*) Under the Endangered Species Act. Center for Biological Diversity, Tucson, AZ. 159 pp.

CBC and Defenders. 2016. Petition to list the Tricolored Bat *Perimyotis subflavus* as Threatened or Endangered under the Endangered Species Act. Center for Biological Diversity, Tucson, AZ and Defenders of Wildlife, Denver, CO. 76 pp.

CBC. 2021. Petition to list the American Bumble Bee *Bombus pensylvanicus* (DeGeer, 1773) as an Endangered Species under the U.S. Endangered Species Act. Center for Biological Diversity and Bombus Pollinators Association of Law Students, Tucson, AZ. 72 pp.

Claypoole, K., D. Schwender, and K. Karwowski. 1994. Fort Drum waterfowl management plan implementation. US Fish and Wildlife Service, New York Field Office, Cortland, New York. 137+ pp.

Clean Air-Cool Planet and C. P. Wake. 2005. Indicators of Climate Change in the Northeast 2005. Clean Air-Cool Planet, Portsmouth, NH and The Climate Change Research Center, University of New Hampshire, Durham, NH. 40 pp.

CNA. 2007. National Security and the Threat of Climate Change. The CNA Corporation, Alexandria, VA. 63 pp.

Cowger, L. 2020. Consumption Advisories for Fish from Fort Drum Waters. Fort Drum, NY. 32 pp.

Dalsimer, A. 2002. Why DoD is interested in invasive species. Federal Facilitiies Environmental Journal 13(3): 41-54.

DANC. 2018. Fort Drum Joint Land Use Study. Prepared by Matrix Design Group for Development Authority of the North Country, Watertown, NY. (The study includes the JLUS Report, JLUS Supporting Information Document, Executive Summary Brochure, and Appendix.)

Daszak, P., L. Berger, A.A. Cunningham, A.D. Hyatt, D.E. Green, and R. Speare. 1999. Emerging Infectious Diseases and Amphibian Population Declines. Emerging Infectious Diseases 5(6):735-748.

Dawe, K.L., and S. Boutin. 2016. Climate Change is the Primary Driver of White-tailed Deer (*Odocoileus virginianus*) Range Expansion at the Northern Extent of its Range; Land Use is Secondary. Ecology and Evolution 6(18): 6435-6451.

DNI. 2021. Annual Threat Assessment of the US Intelligence Community. Office of the Director of National Intelligence, Washington, D.C. 27 pp.

Dobony, C. A., A.C. Hicks, K.E. Langwig, R.I. von Linden, J.C. Okoniewski, and R.E. Rainbolt. 2011. Little brown myotis persist despite exposure to White-nose Syndrome. Journal of Fish and Wildlife Management, 2(2), 190-195. https://doi.org/10.3996/022011-JFWM-014

Dobony, C. A. and J.B. Johnson. 2018. Observed resiliency of little brown myotis to long-term White-nose Syndrome exposure. Journal of Fish and Wildlife Management. https://doi.org/10.3996/102017-JFWM-080

DoD. 2010. Quadrennial Defense Review. Department of Defense, Washington, DC. 88 pp.

DoD. 2014. Quadrennial Defense Review. Department of Defense, Washington, DC. 88 pp.

DoD. 2019. *Report on Effects of a Changing Climate to the Department of Defense.* Department of Defense, Washington, DC. 22 pp.

DoD. 2021. *Department of Defense Climate Risk Analysis – Report submitted to National Security Council*. Department of Defense, Office of the Undersecretary for Policy (Strategy, Plans, and Capabilities), Washington, DC. 18 pp.

Dodds, K.J., R.R. Cooke, and R.P. Hanavan. 2014. The Effects of Silvicultural Treatment on *Sirex noctilio* Attacks and Tree Health in Northeastern United States. Forests 5:2810-2824.

Dupigny-Giroux, L.A., E.L. Mecray, M.D. Lemcke-Stampone, G.A. Hodgkins, E.E. Lentz, K.E. Mills, E.D. Lane, R. Miller, D.Y. Hollinger, W.D. Solecki, G.A. Wellenius, P.E. Sheffield, A.B. MacDonald, and C. Caldwell, 2018: Northeast. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II (Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart, eds.). US Global Change Research Program, Washington, DC, USA.

Felley, D. R. 1967. Summary of Camp Drum DDT Study and Evaluation of Present Pesticide Program. 16 pp.

FGDC. 1997. Vegetation Classification Standard (VCS) of 1997. Federal Geographic Data Committee, Vegetation Subcommittee. FGDC-STD-005. 58 pp.

Fort Drum. 2001. Integrated Natural Resources Management Plan 2001-2005. Prepared by: Universe Technologies, Inc., Frederick, MD and Gene Stout and Associates, Loveland, CO. 204 pp.

Fort Drum. 2003. Fort Drum Wetlands Mitigation Banking Instrument Wetlands Management Program, Natural Resources Branch, Environmental Division, Directorate of Public Works, Fort Drum, NY. 20 pp.

Fort Drum 2011. Integrated Natural Resources Management Plan. Natural Resources Branch, Environmental Division, DPW, ITAM, Range Branch, Training Division, DPTMS, Fort Drum, NY. 386 pp.

Fort Drum. 2012. Long Range Component (Real Property Master Plan). Directorate of Public Works, Fort Drum, NY. 158 pp.

Fort Drum. 2016. Integrated Pest Management Plan. Directorate of Public Works, Fort Drum, NY. 78 pp.

Fort Drum. 2017. Installation Planning Standards, Fort Drum, New York. 87 pp.

Fort Drum. 2019. Wheeler-Sack Army Airfield Wildlife Hazard Management Plan. Aviation Division, Directorate of Plans, Training, Mobilization and Security, Fort Drum, NY. 30 pp.

Fort Drum. 2020a. Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum, New York (2021-2023) for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*). 82 pp.

Fort Drum. 2020b. Integrated Cultural Resources Management Plan Fiscal Years 2021-2025. Cultural Resources Program, Environmental Division, Directorate of Public Works, Fort Drum, NY. 241 pp

Fort Drum. 2021. Integrated Natural Resources Management Plan. Natural Resources Branch, Environmental Division, Directorate of Public Works, Fort Drum, NY. 335 pp.

Fort Drum. 2023a. Integrated Wildland Fire Management Plan, Fort Drum, New York. Directorate of Emergency Services, Fort Drum, NY. 55 pp.

Fort Drum. 2023b. Biological Assessment on the Proposed Activities on Fort Drum Military Installation, Fort Drum, New York (2024-2026) for the Indiana Bat (*Myotis sodalis*), Northern Long-eared Bat (*Myotis septentrionalis*), and Tricolored Bat (*Perimyotis subflavus*). 85 pp.

Fort Drum. 2023c. Wildlife Hazard Assessment for Wheeler-Sack Army Airfield, Fort Drum, New York. Natural Resources Branch, Environmental Division, Directorate of Public Works, Fort Drum, NY. 59 pp.

Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions.* Synthesis report of the Northeast Climate Impacts Assessment, Union of Concerned Scientists, Cambridge, MA. 160 pp.

Gibbs J.P. A.R. Breisch, P.K. Ducey, G. Johnson, J.L. Behler, R.C. Bothner. 2007. The Amphibians and Reptiles of New York State. Oxford University Press. New York.

Gordon, W. 1987. Quarry Pond nutrient enhancement special study: Progress report. NYSDEC, Watertown, NY.

Grabarkiewicz, J. and W. Davis. 2008. An introduction to freshwater fishes as biological indicators. EPA-260-R-08-016. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC.

Harper, C. A. 2003. Quality Deer Management: Guidelines for Implementation. PB 1643-2M-8/03. Agricultural Extension Service, University of Tennessee, Knoxville, TN. 28 pp.

Horsely, S.B., S.L. Stout, ad D.S. DeCalesta. 2003. White-tailed Deer Impact on the Vegetation Dynamics of a Northern Hardwood Forest. Ecological Applications 13(1): 98-118.

Hough, F.B. 1976. History of Jefferson County in the State of New York from the Earliest Period to the Present Time. W.E. Morrison & Co., Ovid, NY. 601 pp.

Jachowski, D.S., C.A. Dobony, L.S. Coleman, W.M. Ford, E.R. Britzke and J.L.Rodrigue. 2014. Disease and community structure: white-nose syndrome alters spatial and temporal niche partition in sympatric bat species. Biodiversity and Distributions, 20:1002-1015.

Johnson, A.M. 2003. Flora of Fort Drum, NY. Colorado State University, Fort Collins, CO. 72 pp.

Karl, T.R., J.M. Melillo, and T.C. Peterson, eds. 2009. Global Climate Change Impacts in the United States: A State of Knowledge Report from the U.S. Global Change Research Program. Cambridge University Press, Cambridge, NY. 196 pp.

Knutson, T., J.P. Kossin, C. Mears, J. Perlwitz, and M.F. Wehner, 2017: Detection and attribution of climate change. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I (Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock, eds.). US Global Change Research Program, Washington, DC, USA, pp. 114-132.

Kunz, T.H. and J.D. Reichard. 2010. Status review of the little brown myotis (*Myotis lucifugus*) and determination that immediate listing under the Endangered Species Act is scientifically and legally warranted. Boston University's Center for Ecological and Conservation Biology, Boston, MA. 30 pp.

Kurczewski, F.E. 1998. Comparison of Sand Nesting Wasps (Hymenoptera) From Two Pine Barrens in Upstate New York. American Entomological Society. Entomological News.109(4):247-251.

Larson, G. and R. Schaetzl. 2001. Origin and Evolution of the Great Lakes. J. Great Lakes Res. 27(4):518-546.

Lorch, J.M., S. Knowles, J.S. Lankton, K. Michell, J.L. Edwards, J.M. Kapfer, R.A. Staffen, E.R. Wild, K.Z. Schmidt, A.E. Ballmann, D. Blodgett, T.M. Farrell8, B.M. Glorioso, L.A. Last, S.J. Price, K.L. Schuler, C.E. Smith, J.F. X. Wellehan, Jr., and D.S. Blehert. 2016. Snake fungal disease: an emerging threat to wild snakes. Phil. Trans. R. Soc. B 371:20150457.

Malcolm Pirnie 2005. Analysis of Fish Fillets from Remington Pond, Fort Drum, New York. Army Corps of Engineers Contract No. DACA31-94-D-0017. Baltimore, MD.

McCosh, M.L. and C.E. Lowie. 1996. Report on the Results of 1994-1995 Fishery Resource Surveys, Fort Drum, New York (Part I). Administrative Report 96-04. USDI, US Fish and Wildlife Service, Lower Great Lakes Fishery Resources Office, Amherst, NY. 63 pp.

McHargue, G. 1998. In the North Country: The Archeology and History of Twelve Thousand Years at Fort Drum. Puritan Press, Hollis, NH. 93 pp.

Monaghan, A.J., S.M. Moore, K.M. Sampson, C.B. Beard, and R.J. Eisen. 2016. Climate change influences on the annual onset of Lyme disease in the United States. Ticks and Tick-borne Diseases 6:615-622.

NYNHP. 2013. Rare Species and Significant Natural Communities of Fort Drum Military Installation. New York Natural Heritage Program, Albany, NY. 160 pp.

NYSDEC. 2003. New York State Stormwater Management Design Manual. Prepared by Center for Watershed Protection, Ellicott City, MD. 50 pp.

NYSDEC. 2006. New York State Comprehensive Wildlife Conservation Strategy: A Strategy for Conserving New York's Fish and Wildlife Resources. New York State Department of Environmental Conservation, Albany, NY. 574 pp.

NYSDEC. 2015. New York State Wildlife Action Plan. New York State Department of Environmental Conservation, Albany, NY. 102 pp.

NYSDEC. 2016. Conservation Plan for Bald Eagles in New York State. New York State Department of Environmental Conservation, Albany, NY. 56pp.

NYSDOH. 2023. Health Advice on Eating Sportfish and Game. New York State Department of Health, Albany, NY. 44 pp.

Page, N.A., R.E. Wall, S. J. Darbyshire, and G. A. Mulligan. 2005. The Biology of Invasive Alien Plants in Canada. 4. *Heracleum mantegazzianum* Sommier & Levier. Canadian Journal of Plant Science 86:569-589.

Petersen, K.K. 2002. Drummed Out: A History of Sterlingville and Environs. Benjamin Press, Watertown, NY. 139 pp.

Pokorny, J.; J. O'Brien, R. Hauer, G. Johnson, J. Albers, P. Bedker, and M. Mielke. 2003. Urban Tree Risk Management: A Community Guide to Program Design and Implementation. USDA Forest Service Northeastern Area State and Private Forestry, St. Paul, MN. 194 pp.

Rainbolt, R.E., M.T. Wegan, C.A. Dobony and P.D. Curtis. 2011. Black Bear Project on Fort Drum Military Installation Oct 2004-Apr 2007. U.S. Army, Environmental Division, Natural Resources Branch, Fort Drum, NY. 96 pp.

Raleigh, R.F., 1982. Habitat suitability index models: Brook trout. US Department of the Interior, US Fish and Wildlife Service FWS/OBS-82/10.24. 42 pp.

Reynolds, R.J. 1986. Hydrogeology of the Fort Drum area, Jefferson, Lewis, and St. Lawrence counties, New York. USDI, US Geological Survey Water Resources Investigations Report 85-4119. 6 sheets, 1:48,000 scale.

Robinson, C.W., S.A. McNulty, and V. R. Titus. 2018. No Safe Space: Prevalence and Distribution of *Batrachochytrium dendrobatidis* in Amphibians in a Highly-Protected Landscape. Herpetological Conservation and Biology 13(2):373–382.

Rossi, C., E.Y. Stromdahl, P. Rohrbeck, C. Olsen, and R.F. Defraites. 2015. Characterizing the Relationship Between Tick Bites and Lyme Disease in Active Component U.S. Armed Forces in the Eastern United States. Medical Surveillance Monthly Report. 22(3): 2-10.

Russell, M.B., C.W. Woodall, K.M. Potter, B.F. Walters, G.M. Domke, and C.M. Oswalt. 2017. Interactions Between White-tailed Deer Density and the Composition of Forest Understories in the Northern United States. Forest Ecology and Management 384(2017): 26-33.

Sage, R.W., Jr., W.F. Porter, and H.B. Underwood. 2003. Windows of Opportunity: White-tailed Deer and the Dynamics of Northern Hardwood Forests of the Northeastern US. Journal for Nature Conservation 10 (2003):1-8.

Schlesinger, M.D., J.D. Corser, K.A. Perkins, and E.L. White. 2011. Vulnerability of at-risk species to climate change in New York. New York Natural Heritage Program, Albany, NY. 67 pp.

Sewell, A. 2010. Petition to List the Golden-winged Warbler (*Vermivora chrysoptera*) as a Threatened or Endangered Species under the US Endangered Species Act. 29 pp.

Skrip, M.M. 2010. Fall-Winter Survival, Habitat, and Long-term Population Change of Ruffed Grouse in New York State. M.S. Thesis, State University of New York-College of Environmental Science and Forestry, Syracuse, NY. 119 pp.

Spiller, K.J. 2019. Eastern Whip-poor-will Habitat Associations in Fort Drum, New York. M.S. Thesis, University of Massachusetts Amherst, Amherst, MA. 76 pp.

Stanton, B.F. and N.L. Bills.1996. The Return of Agricultural Lands to Forest: Changing Land use in the Twentieth Century. E.B. 96-03, Cornell University, Ithaca, NY.133 pp.

SLRwP. 2020. St. Lawrence River Watershed Revitalization Plan. EcoLogic, LLC. Cazenovia, NY. 432 pp.

Telford, S.R., III. 2017. Deer Reduction Is a Cornerstone of Integrated Deer Tick Management. Journal of Integrated Pest Management 8(1):1-5.

USACE. 1977. Terrain Analysis, Fort Drum, New York. US Army Corps of Engineers Terrain Analysis Center, Fort Belvoir, VA. 45 pp.

USACE. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, US Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. 143 pp.

USACE. 2016. An Assessment of Military Traffic and Tire Ruts on Amphibian Metapopulation Dynamics (Year 1). US Army Corps of Engineers-Buffalo District, Buffalo, NY. 47 pp.

US Army. 2004. The Army Strategy for the Environment: Sustain the Mission, Secure the Future. US Army, Washington, DC. 12 pp.

US Army. 2022. United States Army Climate Strategy. US Army, Washington, DC. 20 pp.

USDA. 1986. *Urban Hydrology for Small Watersheds.* Technical Release 55. USDA, Natural Resources Conservation Service, Washington, D.C. 164 pp.

USDHHS. 2002. Toxicological Profile for DDT, DDE, and DDD. US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta, GA. 497 pp.

USEPA. 1975. DDT: A review of scientific and economic aspects of the decision to ban its use as a pesticide. Washington, DC: U.S. Environmental Protection Agency. EPA-540/1-75-022

USEPA. 2008. Climate change effects on stream and river biological indicators: a preliminary analysis. Global Change Research Program, National Center for Environmental Assessment, Washington, DC; EPA/600/R-07/085.

USFWS. 2007. National Bald Eagle Management Guidelines. US Fish & Wildlife Service, Washington, D.C. 23 pp.

USFWS. 2022. Endangered and Threatened Wildlife and Plants: Endangered Species Status for Tricolored Bat. Federal Register 87(177) September 14, 2022:56381-56393.

USFWS. 2023. National Domestic Listing Workplan: Fiscal Years 23-27 Workplan (April 14, 2023 Version). US Fish & Wildlife Service, Washington, D.C. 14 pp.

Voorhees, M. 2016. Predicting the Location of Vernal Pools on Fort Drum, NY. US Army Corps of Engineers-Buffalo District, Buffalo, NY. 25 pp.

Wegan, M.T. 2008. Aversive Conditioning, Population Estimation, and Habitat Preference of Black Bears (*Ursus americanus*) on Fort Drum Military Installation in northern New York. M.S. Thesis, Cornell University, Ithaca, NY. 105 pp.

Weiskopf, S.R., O.E. Ledee, and L.M. Thompson. 2019. Climate Change Effects on Deer and Moose in the Midwest. Journal of Wildlife Management 83(4): 769-781.

Weldy, T. 2008. Invasive Species Management on Military Lands. Pages 118-127 *in* Conserving Biodiversity on Military Lands: A Guide for Natural Resources Managers. N. Benton, J.D. Ripley, and F. Powledge, eds. NatureServe, Arlington, VA. 220 pp.

Westbrook, C., K. Ramos, and M. La. 2005. Under Siege: Invasive Species on Military Bases. National Wildlife Federation, Reston, VA. 50 pp.

Whitman, C. and R. Smith. 2014. 2014 Fort Drum Aquatic Plant Survey. Fort Drum, NY. 35 pp.

Wuebbles, D.J., D.R. Easterling, K. Hayhoe, T. Knutson, R.E. Kopp, J.P. Kossin, K.E. Kunkel, A.N. LeGrande, C. Mears, W.V. Sweet, P.C. Taylor, R.S. Vose, and M.F. Wehner, 2017: Our globally changing climate. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I (Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock, eds.). US Global Change Research Program, Washington, DC. pp. 35-72.

Zuckerberg, B., A.M. Woods, and W.F. Porter. 2009. Poleward Shifts in Breeding Bird Distribution in New York State. Global Change Biology 15:1866-1883.