INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN

2021-2026
VERMONT ARMY NATIONAL GUARD

ETHAN ALLEN FIRING RANGE

Prepared for: Vermont Army National Guard

State of Vermont Military Department
789 National Guard Rd. Building #5
Camp Johnson
Colchester, Vermont 05446

DRAFT PRELIMINARY ENVIRONMENTAL ASSESSMENT
VERMONT ARMY NATIONAL GUARD, ETHAN ALLEN FIRING RANG
INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN
2019 - 2024
VERMONT ARMY NATIONAL GUARD
ETHAN ALLEN FIRING RANGE

LEAD AGENCY: Vermont Army National Guard

COOPERATING AGENCIES: U.S. Fish and Wildlife Service (USFWS), Vermont Agency of Natural Resources (VTANR). Management of game species: VTARNG, USFWS, and the VTANR Department of Fish and Wildlife. Management of non-game species: VTARNG plus informal agreements with VTANR's Department of Fish and Wildlife, Non-Game and Natural Heritage Program. The Nature Conservancy has assisted in natural resource planning.

TITLE OF PROPOSED ACTION: Integrated Natural Resource Management Plan 2019-2024 Vermont Army National Guard - Ethan Allen Firing Range

AFFECTED JURISDICTIONS: Bolton, Jericho and Underhill, Vermont

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PROPONENTS: Vermont Army National Guard

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Vermont Army National Guard	Natural Resources Administrator
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DOCUMENT DESGNATION: INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN **(**INRMP)

Abstract: This Integrated Natural Resources Management Plan (INRMP) for Vermont Army National Guard (VTARNG) Ethan Allen Firing Range (EAFR) in Jericho, Vermont has been prepared to update the natural resources management program at EAFR from the prior reporting and to provide a guide for resource management for 2019-2024 and beyond. This INRMP will allow EAFR to foster its primary mission of military training readiness while balancing the sustainability of desired military training area conditions and ecosystem viability. In addition, the INRMP will guide natural resources conservation measures and Army activities on rangeland to be integrated and consistent with federal stewardship requirements including the Sikes Act (16 United States Code [U.S.C.], 670a et seq.) and the Sikes Act Improvement Act. The implementation of these INRMP goals will not be a significant change in management direction for this installation.

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Chapter 1.0 Executive Summary

This Integrated Natural Resources Management Plan (INRMP) for Vermont Army National Guard (VTARNG) Ethan Allen Firing Range (EAFR) in Jericho, Vermont has been prepared to update the natural resources management program at EAFR from the prior reporting and to provide a guide for resource management for 2019-2024 and beyond. This INRMP will allow EAFR to foster its primary mission of military training readiness while balancing the sustainability of desired military training area conditions and ecosystem viability. In addition, the INRMP will guide natural resources conservation measures and Army activities on rangeland to be integrated and consistent with federal stewardship requirements including the Sikes Act (16 United States Code [U.S.C.], 670a et seq.) and the Sikes Act Improvement Act.

Maintaining optimal environmental conditions on the training lands is essential for the success of the military mission at EAFR. The management measures developed and presented herein are based on the current conditions of the resources and the anticipated needs of military mission and activities. The primary mission of EAFR is to provide adequate facilities, training areas, and ranges to maintain the readiness of the VTARNG, a division of the State of Vermont Military Department (SVMD) and the Army National Guard (ARNG) for its assigned mission. The Army recognizes that a healthy and viable natural resource base is required to support the military mission. This INRMP helps to ensure that environmental considerations are an integral part of planning activities at EAFR and that natural resources are protected in accordance with Army regulations and policies.

VTARNG has fostered a number of partnerships with various agencies that assist and participate in the natural resources management program. The primary partners involved in the development and implementation of this plan include the U.S. Fish and Wildlife Service (USFWS) and the Vermont Agency of Natural Resources (VTANR). Management of game species on EAFR is accomplished through a cooperative plan between VTARNG, USFWS, and the VTANR Department of Fish and Wildlife. Management of non-game species is primarily conducted in-house with informal agreements with VTANR's Department of Fish and Wildlife, Non-Game and Natural Heritage Program. In addition, The Nature Conservancy has assisted in natural resource planning. VTARNG also utilizes the services of local universities and consultants.

This INRMP documents a variety of studies that detail key environmental initiatives and monitoring data collected and analyzed since the last INRMP was published; these resources form the basis for future environmental analysis and resource protection. The planned initiatives of this INRMP have been identified by the VTARNG with assistance from Northern Stewards, a consultant. The primary management initiative is to seek to maintain or increase the level of biodiversity of native species through maintaining a diversity of habitat types proportional to the structural diversity; that is, size and density of trees. While mature stands are important to have within a landscape and specific species require only mature stands for their life history, many species use mature stands for only part of their life history, while the majority of wildlife will utilize early successional growth resulting from large scale disturbances (such as logging) during some part of their life history, others will utilize early successional growth for all of their life history. Forest Management activities can include 5 to 10 acre patch cuts in areas conducive to large openings. The creation of large-scale early successional habitats as a part of EAFR will maintain or increase the level of biodiversity. Key species identified as Vermont Species of Greatest Conservation Need will benefit from the creation, enhancement, promotion, and retention of early successional habitat. Techniques can include progressive clear cutting, brush hogging, burning, or other operations that increase habitat available to early successional species. In addition, most mammals, birds, amphibians and reptiles require multiple habitat types for reproduction, feeding or cover and connectivity between these habitats without fragmentation. Fragmentation may include roads, buildings, or logging operations. This INRMP has identified the need to manage for specific conditions that will prevent the isolation of a given habitat.

The fringe areas on the edges of the many range clearings, wetlands, open ledges, and the overgrown pastures also provide a diverse mix of habitats.

Additional management initiatives include:

- Prevent the degradation of water quality, protect aquatic and riparian habitats and identify and restore degraded habitats, including wetlands and vernal ponds;

- Identify, map and monitor for the presence of invasive species. Where appropriate, approved control methods will be used. Increased populations of invasive species over time will require control methods. These measures include pulling, cutting, herbicides, fire or a combination of methods. VTARNG will consider the implication of various control methods and plan for their implementation;

- Maintain and improve unique trees and forest stands by conducting activities that protect or enhance natural communities. Communities with exceptional quality and/or rare frequency as identified from previous surveys should be restricted from harvest activities. All activities in natural communities should function to preserve community characteristics. These activities include protection of Aspen and Butternut stands, the favoring of mast-producing trees and the use of snag retention methods**;**

- Wildlife found at EAFR is diverse due to the mix of forests, riparian and open areas. Ongoing scheduled surveys at EAFR include mammals, birds, amphibians and reptiles. Continued, coherent, standardized monitoring will improve understanding of habitat use. Wildlife and wildlife habitat work will be performed in conjunction with forest management activities. Timber sales are designed to improve or protect wildlife habitat and not to cause undo adverse impact on wildlife populations, particularly those state or federally protected or listed as a species of greatest conservation need;

- Provide special protection and management leading to the recovery of threatened and endangered species and protect species of special concern. Include species of greatest conservation need as identified by Vermont's Wildlife Action Plan with priority of medium to high; and,

- As the majority of the land is forest, forestry management and timber sales are a significant component of the INRMP.

The implementation of these INRMP goals will not be a significant change in management direction for this installation. The benefits of this INRMP are numerous. For the military mission, the natural resources management program, as described in this INRMP, will ensure that the environmental conditions of the training lands continue to provide the blend of open and forested areas that are necessary for realistic military training. From an environmental perspective, implementation of this plan will maintain, protect, and enhance the ecological integrity of the training lands and the biological communities (particularly sensitive, rare, threatened and endangered species) inhabiting them. In addition, the natural resources management program described in this plan will protect ecosystems and their components from unacceptable damage or degradation and identify and restore already degraded habitats. This plan will provide users of EAFR with an increased awareness of the potential for impacts to occur as a result of their activities.

Chapter 2.0 General Information

2.1 Purpose

"The Army will be a national leader in environmental and natural resource stewardship for present and future generations as an integral part of our mission." (*U.S. Army Environmental Strategy into the 21st Century*, 1992)

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to update the natural resources management program at EAFR and to provide a solid foundation from which to build the program beyond the year 2019. The INRMP will allow VTARNG to carry out the resource-specific management measures that will enable VTARNG to effectively manage the use and condition of natural resources located on EAFR to protect the natural setting primarily for military training purposes. Implementation of the proposed action will support the Army's continuing need to train soldiers in a realistic natural setting while meeting other mission and community support requirements and complying with environmental regulations and policies.

2.2 Authority

The Authority for environmental management of military lands, including EAFR, is based upon Federal law and guidelines. Under the Natural Resource Management on Military Lands Act of 1960 (Title 16 of the *United States Code* [U.S.C.] § 670a et seq.), commonly known as the Sikes Act, as amended according to the Sikes Act Improvement Act of 1997, the Secretary of Defense provides a program for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary. Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments carries out the program to provide for the conservation and rehabilitation of natural resources on military installations.

In accordance with 16 U.S.C. § 670a(b) of the Sikes Act Improvement Act of 1997, to the extent appropriate and applicable, this INRMP provides for the following:

1) Enforcement of applicable natural resource laws (including regulations).
2) No net loss in the capability of military installation lands to support the military mission of the installation.
3) Establishment of specific natural resource management goals and objectives and time frames for proposed action.
4) Integration of, and consistency among, the various activities conducted under the plan.
5) Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants.
6) Fish and wildlife management, land management and forest management.
7) Fish and wildlife habitat enhancement or modification.
8) Such other activities as the Secretary of the military department determines appropriate.
9) 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.
10) Public access to the military installation that is necessary or appropriate for the use described above, subject to requirements necessary to ensure safety and military security.

The *United States Army Environmental Strategy into the 21st Century* provides the framework to ensure that environmental considerations are integral to the Army mission and that an environmental stewardship ethic governs all Army activities. The Army's environmental strategy is depicted in a model of a building with a foundation and four pillars supporting the overall vision of environmental stewardship. The strategy's goals focus on these four pillars:

1. compliance,
2. restoration,
3. prevention, and,
4. conservation.

The Army's commitment to the conservation of its natural resources is further reflected in Army Regulation (AR) 200-3, *Natural Resources——Land, Forest, and Wildlife Management* and the Headquarters, Department of the Army (HQDA) INRMP Policy Memorandum (21 March 1997), entitled *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plans (INRMP)*. AR 200-3 "sets forth the policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources thereon consistent with the military mission and in consonance with national policies" (HQDA, 1995b). The INRMP Policy Memorandum states that the purpose for completing planning-level surveys and the INRMP is "to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with federal stewardship requirements" (HQDA, 1997). AR 200-2, *Environmental Effects of Army Actions*, "sets forth policy, responsibilities, and procedures for integrating environmental considerations into Army planning and decision making" (HQDA, 1988). In particular, AR 200-2, paragraph 2-6e, Integration with Army Planning, states that "environmental analyses and documentation required by this regulation will be integrated as much as practicable with other environmental reviews, laws, and executive orders (Title 40 of the *Code of Federal Regulations* [CFR], Section 1502.25) . . . and installation management plans, particularly those that deal directly with the environment. These include the Natural Resource Management Plans (Fish and Wildlife Management Plan, Forest Management Plan, and Range Improvement or Maintenance Plan)."

This document reflects the commitment set forth by VTARNG to conserve, protect and enhance the natural resources necessary to provide realistic military training for the soldiers that utilize this installation for training. This INRMP is the plan that will direct the natural resources management program at EAFR from 2019 through 2024. VTARNG has prepared this EAFR's INRMP in accordance with the aforementioned regulations.

2.3 Responsibilities

The success of the management of the natural resources located on the grounds of EAFR and the implementation of this INRMP requires a cooperative effort among responsible parties. The level of success is enhanced by developing additional partnerships among parties that have a vested interest in the responsible management of the natural resources at EAFR. A brief description of responsible parties with direct responsibility for the implementation of this INRMP, and other interested parties, is provided below.

U.S. Army National Guard Bureau (NGB). The National Guard Bureau (NGB) provides administrative and financial support, and policy guidance to EAFR. NGB reviews, provides comments and approves this EAFR INRMP.

Vermont State Military Department (SVMD). The SVMD, through the Vermont Army National Guard (VTARNG), provides administrative, financial, and professional support to EAFR. Support includes Environmental Engineers, Architectural Engineers, Natural Resource Professionals and maintenance

workers and others. The Installation Commander, the Environmental Program Manager and the Adjutant General all support EAFR as part of their responsibilities under VTARNG, a division of SVMD. Key personnel are:

- The Adjutant General - Major General Steven A. Cray
- The Environmental Program Manager - LTC Jacob Roy
- Natural Resources Administrator and ARNG Pest Management Program Manager -Mike O'Hara

EAFR. The role of the organizations at EAFR that provide assistance in the implementation of this INRMP are provided below.

Facilities Management Officer (FMO). The FMO plays a pivotal role in Vermont as far as the planning and maintenance of range facilities. Also, the environmental office, which is very important in the implementation of this plan, falls under the auspices of the FMO. In addition, the FMO serves as the primary manager of the Integrated Training Area Management (ITAM) Program and the chairman of the installation ITAM Steering Committee. Other areas of responsibilities include oversight of the Integrated Natural Resource Management Plan, the Integrated Cultural Resources Management Plan, the Forestry Program, and the Pest Management Program (and certified pest applicator) and approval of pest applicator contracts as needed.

POTO (Plans, Operations and Training Office, a.k.a., DCSOPS — Deputy Chief of Staff, Operations). The POTO identifies training requirements to include numbers and types of small arms ranges to support using units. The POTO is a member of the Environmental Quality Control Council (EQCC), the ITAM Steering Committee, and provides direct input to the INRMP development. Per Army regulations 350-4, the POTO is the proponent for the ITAM program at the State ARNG level. Per AR 210-21, the POTO is also a proponent for the Range and Training Land Program (RTLP)

The Installation Commander/Post Commander. The Post Commander is directly responsible for operating and maintaining EAFR. The following list describes the major duties of the Post Commander in implementation of this INRMP:

- Enforces training practices
- Protects Natural Areas and State Significant Communities
- Notifies Facilities Engineering when Training Area and Range uses change significantly
- Ensures representation and participation on ITAM Committee.
- Monitors and polices training impacts.
- Promotes an awareness program to uses of EAFR.
- Ensures soil management measures, except issues involving timber harvests and logging roads.
- Ensures erosion management practices are used.
- Ensures pesticide management and applications are in compliance with regulation and practice and are approved by the Certified Pesticide Applicator Agent in the VT-FE-EV.
- Participates in fire management.
- Ensures conformance with Command Support.

Other Interested Agencies and Interested Parties. There are a number of State and federal agencies, in addition to Department of Defense (DoD) and EAFR, which have an interest or a role in the management of the natural resources at the Range. The involvement of these agencies is based on cooperative agreements, regulatory authority, and technical assistance as required by Federal laws and regulations.

U.S. Fish and Wildlife Service (USFWS). USFWS provides assistance concerning the conservation, protection, and management of the fish and wildlife resources presented in the INRMP. USFWS is the

primary federal agency for issues regarding fish and wildlife management, as well as the regulatory authority for the Endangered Species Act of 1973 and the Migratory Bird Treaty Act (16 U.S.C. 703-711).

Vermont Agency of Natural Resources. (VTANR). VTANR will provide assistance concerning the conservation, protection, and management of the fish and wildlife resources presented in this INRMP. VTANR is the primary state agency for issues regarding fish and wildlife management, as well as the regulatory authority behind the rules and regulations for hunting, fishing, trapping, surface waters, and freshwater wetlands.

Universities. When compatible with training activities, EAFR volunteers to participate in and provide assistance with various natural resource research projects. The University of Vermont (UVM) is available to lead or participating in research projects on the Range.

Contractors. Contractors provide EAFR with technical support for natural resources and environmental management projects. This technical support includes biological resource surveys and wetland delineations. VTARNG is currently administering the following contracts: Greenleaf Forestry, of Underhill Vermont, holds the contract for forestry support and Northern Stewards holds a contract for ecological consulting at EAFR.

The Nature Conservancy (TNC*).* The Department of Defense and The Nature Conservancy have a Cooperative Agreement to provide effective and efficient protection and management of biodiversity within the context of the DoD's environmental security and military missions. Based on the contents of this Cooperative Agreement, VTANR's Non-game and Natural Heritage Program and the TNC have a mutual interest in conservation and management of the State's Natural Communities of Statewide Significance that EAFR has established within its boundaries.

2.4 Management Philosophy

The preparation of this INRMP involved the review and analysis of past natural resource management practices, ongoing programs and the current conditions of the existing resources as detailed herein. The general goals of this INRMP for EAFR conform to those outlined in the Army Environmental Strategic Action Plan. Those general goals, when consistent with the training mission, include the following:

1. To ensure the long-term sustainability of the lands to support the military mission.
2. To protect the natural resources.
3. To provide ample recreational opportunities (as deemed appropriate in terms of military, safety, and security requirements).
4. To accommodate multiple uses of the land.

The goals of the integrated natural resources management program, as established by VTARNG for EAFR, are to maintain ecosystem viability and ensure the sustainability of desired military training area conditions; to maintain, protect and improve ecological integrity; to protect and enhance biological communities, particularly sensitive, rare, threatened and endangered species; to protect the ecosystems and their components from unacceptable damage or degradation, and to identify and restore degraded habitats. The ability to achieve these goals depends directly on the health and condition of the natural resources. The success of the military mission at EAFR is dependent on the condition of the natural resources, as well. Protecting the ecological and biological integrity of the training lands ensures that the environmental conditions of the training lands continue to provide the vegetation, soil and water resources necessary for realistic military training.

The diverse communities at EAFR provide the needed habitat for many species. The fringe areas on the edges of the many range clearings, wetlands, open ledges, and the overgrown pastures provide a diverse mix of habitats. Habitats utilized by species whose range or life history needs extend beyond a given habitat type require the freedom to move to and from any given habitat. Most mammals, birds, amphibians, and reptiles, require multiple habitat types for reproduction, feeding, or cover and connectivity between these habitats without fragmentation. Fragmentation may include roads, buildings, or logging operations. Mitigation can prevent the isolation of habitats by retaining or creating certain conditions. Where possible, VTARNG will identify habitats and manage for specific conditions that will prevent the isolation of a given habitat.

The management philosophy of this INRMP is to provide special protection and management that lead to the recovery of threatened and endangered species if they occur; and protect species of special concern. Include species of greatest conservation need as identified by Vermont's Wildlife Action Plan as priority, medium, and high value species. Wildlife and wildlife habitat work should work in conjunction with forest management activities. Timber sales should be designed to improve or protect wildlife habitat and to not cause undo adverse impact on wildlife populations, particularly those state or federally protected or listed as a species of greatest conservation need. As the majority of the land is forest, forestry management and timber sales are a significant component of the INRMP.

Management of game species on EAFR is accomplished through a cooperative plan between VTARNG, USFWS, and the VTANR Department of Fish and Wildlife. Management of non-game species is primarily conducted in-house with informal agreements with VTANR Department of Fish and Wildlife, Non-Game and Natural Heritage and Program. Wildlife found at EAFR is diverse due to the mix of forests, riparian areas and open areas. Ongoing scheduled surveys on EAFR include mammals, birds, amphibians and reptiles.

The benefits of this INRMP are numerous. For the military mission, the natural resources management program, as described in this INRMP, will ensure that the environmental conditions of the training lands continue to provide the blend of open and forested areas that are necessary for realistic military training. From an environmental perspective, implementation of this plan will maintain, protect, and enhance the ecological integrity of the training lands and the biological communities (particularly sensitive, rare, threatened and endangered species) inhabiting them. In addition, the natural resources management program described in this plan will protect ecosystems and their components from unacceptable damage or degradation and identify and restore already degraded habitats. This plan will ensure users of EAFR will have an increased awareness of the potential for impacts to occur as a result of their activities. This heightened awareness will serve to minimize the possibility for undesirable impacts, thereby decreasing the effort and costs that must be expended to mitigate.

Maintaining optimal environmental conditions on the training lands is essential for the success of the military mission at EAFR. Therefore, the focus of this INRMP is on the management of the natural resources in the training areas. The management measures have been developed based on the current conditions of the resources, and the military mission and activities as they are anticipated. This INRMP will guide natural resources management at EAFR for the next five years (i.e., 2019 through 2024) and provide a solid foundation from which to build the program beyond the year 2024.

2.5 Conditions for Implementation and revision

Implementation. VTARNG's Environmental Program Manager will work with the Instillation Commander of EAFR, and his staff including the POTO or DCSOPS. And the facilities maintenance officer, as well as interested state and federal agencies and interested parties, including The U.S. Fish and

Wildlife Service (USF&WS), The Vermont Agency of Natural Resources (VTANR), The Nature Conservancy, Universities and consultants, as detailed herein.

VTARNG will prepare for future revisions to this INRMP in the same manner as was provided for in this current update; by maintaining a record of environmental management measures for EAFR, conformance with Army and other environmental regulatory laws and guidelines, coordination with responsible and interested state and federal agencies and interested parties, and through the use of consultants, under the direction of the VTARNG's environmental program manager.

Chapter 3.0 Installation Overview

3.1 Location and Area

EAFR is located on the eastern part of Chittenden County, Vermont. Chittenden County lies in the northwestern portion of Vermont, bordering Lake Champlain. Chittenden County is the most populous and densely settled county in Vermont; the urbanized western portion of the county is contrasted with the rural and mountainous eastern portion to the east. EAFR is located along the sparsely populated mountainous spine of Vermont, on the west slope of the Green Mountain Range.

EAFR encompasses 11,219 acres in the towns of Bolton, Jericho and Underhill. Nearby cities include: Burlington, 20 miles to the west; Essex Junction, 11 miles to the west; Montpelier, the state capital, lies 30 miles to the southeast; and St. Albans is 35 miles to the northwest. Main roads nearby include Interstate 89, located 5 miles to the south, which runs north and south, and State Highway 15 which passes 3 miles to the north of EAFR and crosses the State east to west. The Central Vermont Railway runs along the same valley system as Interstate 89; and carries both freight and AMTRAK passenger service. The eastern half of the range abuts generally larger landholdings, including the State of Vermont (Mt. Mansfield State Forest), Bolton Valley Ski Area, and International Paper Company. Along the southern boundary are several small parcels. The western and northern neighbors are mostly medium-sized ownerships (25-200 acres), with mostly wooded areas (Figure 1 EAFR - General Location Map).

3.2 Installation History

EAFR is an active military firing range and training facility. Established by the War Department in 1926, as the Fort Ethan Allen Artillery Range, the federal government purchased 6,026 acres. In 1941, the range was expanded to its present size of 11,219 acres. The installation was transferred to the US Air Force in 1952, and transferred back to the US Army in 1964, to oversee weapons testing at the range. In 1968 the range was under the command of the US Army Materials Command,-- named Firing Range Jericho. In 1976 the name of the facility was changed to Ethan Allen Firing Range (EAFR), in honor of the Revolutionary War hero who led the Green Mountain Boys in many campaigns in New England/New York. The National Guard Bureau accepted real property accountability for EAFR in 1995. The VTARNG, a branch of the Vermont State Military Department, Manages EAFR for the NGB. General Dynamics operates a Test Firing Facility on the installation under a Facilities Agreement for weapons development and engineering. The National Guard Bureau (NGB) has sized EAFR as a 600 person, battalion sized training site with year-round weekend training and several two-week annual training periods.

Over the last fifteen years, the use and intensity of training at EAFR has increased to meet the needs of VTARNG. VTARNG responsibilities, in particular, the goal to create a larger pool of units to fulfill strategic commitments, has required increased throughput to EAFR. Increased scheduling of training throughout the year, including all four seasons, has enabled the training to increase, without increasing the number of trainees at the base on any given time.

EAFR is the home of the Army National Guard Mountain Warfare School (proponent for winter and mountain training for the U.S. Army) and the 172nd Infantry Battalion (Mountain). Training includes small arms firing (individual and crew-served weapons), artillery firing (155mm) and mortar firing (60mm, 81mm and 120mm), sub-caliber tank gunnery firing, tactical and administrative bivouacs (a temporary camp without cover) and engineer equipment operations. Air Force, Air National Guard, Army National Guard, Active Army, Army Reserve, Marine Corps Reserve, ROTC units and civilian law enforcement agencies use the training facilities.

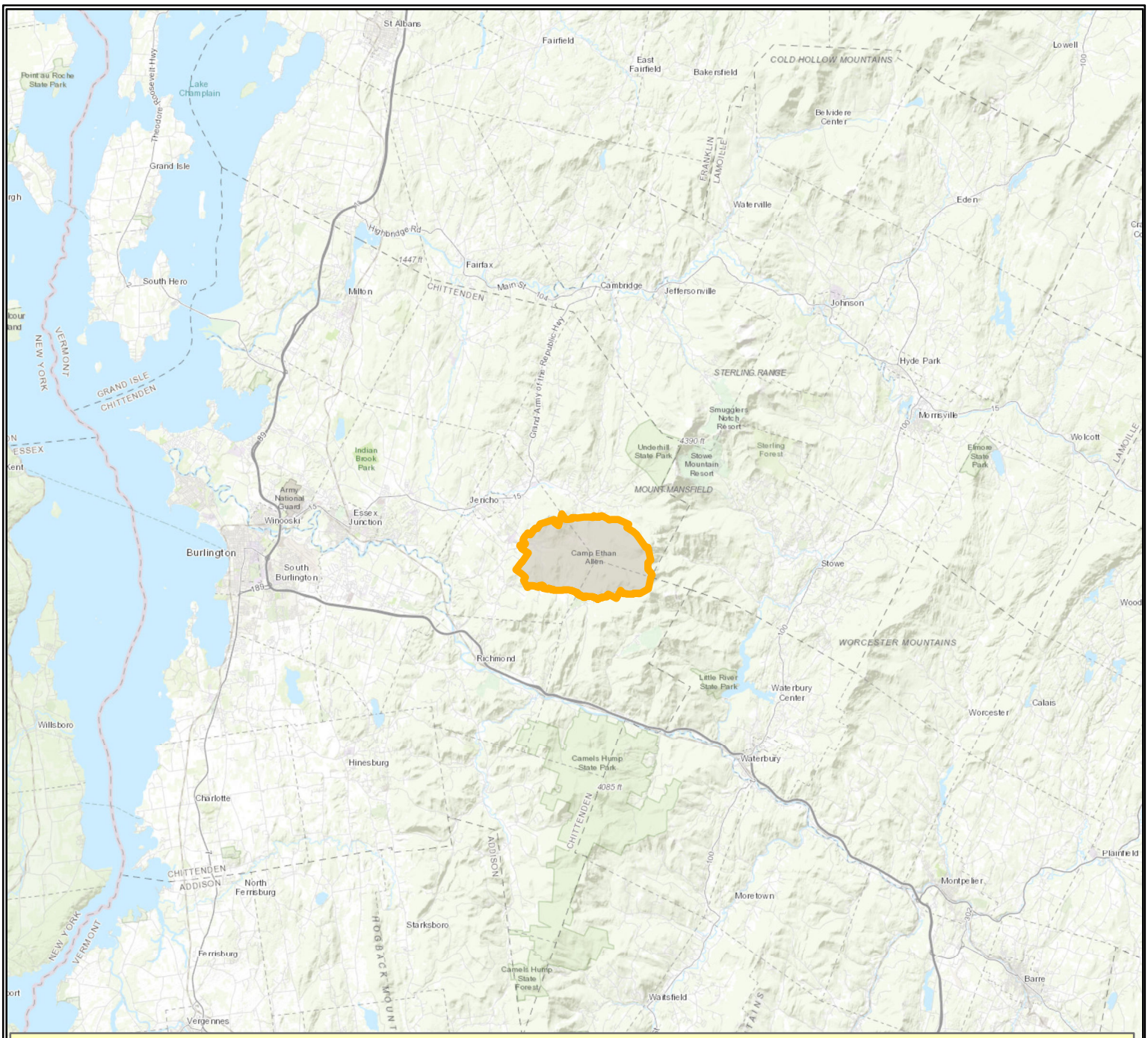


Figure 1 - EAFR General Location Map

Scale=1:406,000
October, 2019

N
W E
S

4 2 0 4
Kilometers

1 cm = 4 km

0 0.75 3 4.5 6
Miles

1 inch equals 6 miles

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
EAFR Boundary

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

3.3 Military Mission

The primary mission of EAFR is to provide adequate facilities, training areas, and ranges to maintain the readiness of the Army National Guard (ARNG) for the assigned mission that is consistent to ensure the preparedness of the Armed Forces. Readiness results from receiving high-quality training that incorporates all mission elements and tasks and provides the high-quality, realistic training to the individuals and units. Units receive training in a realistic setting in order to maintain high preparedness. The stewardship of the natural resources on the base helps to maintain this realistic setting. EAFR operates under the National Guard Bureau and the State of Vermont Military Department (SVMD), VTARNG and is a Major Training Site for Reserve Component and Active Duty Forces.

3.4 Installations Land Use

Land use on EAFR, prior to 1926, when EAFR was initially established and constructed, was agricultural. The second phase of land use began in 1926 when the United States Government acquired 6,026 acres for EAFR. In 1941, EAFR was expanded to its current size of 11,218 acres. From 1926 to 1941 construction was minimal. A stone ammunition bunker and the ruins from a Civilian Conservation Corps (CCC) camp are all that survive from this period.

Today General Dynamics and the Vermont National Guard hold 500 and 10,718 acres, respectively, of EAFR. Administrative buildings, barracks, and maintenance and storage buildings for both organizations are located in the northwestern quarter of EAFR. Firing ranges, bivouac areas, trails, and the main impact area (375 acres), is shared by both General Dynamics and the Vermont National Guard and are located in the remainder of EAFR.

EAFR is comprised of land in the three Chittenden County towns of Bolton, Jericho and Underhill. EAFR contains a significant portion of each town's land area: nearly 25 percent of Jericho, nine percent of Underhill, and nearly eight percent of Bolton. EAFR is federal property, leased to the State of Vermont Military Department. It is not subject to local zoning controls. EAFR consists of land devoted to use as a military base: specifically, range and test activities. This category of land use includes a variety of auxiliary uses to support the overall military base use, a cantonment area where trainees are housed, a Mountain Warfare School, a Unit Training Equipment Site (UTES), biathlon facilities, numerous training areas and firing ranges. Administrative buildings, barracks, and maintenance and storage buildings for both organizations are located in the northwestern quarter of the range. Firing ranges, bivouac areas, trails, and the main impact area, shared by both General Dynamics and the Vermont Army National Guard, are located in the remainder of the range. General Dynamics provides a wide variety of weapons and munitions testing services at the range.

3.5 Training Areas

EAFR has 11,219 acres of maneuver training land divided into eight training and maneuver areas. Each training area is further subdivided into 33 sub-areas, which are identified by an alphanumeric designator. The terrain of the training areas varies, ranging from fairly flat in the north to steep hills in the southern portion of the post. Improved roads and natural barriers such as rivers and streams form boundaries See Figure 2 - EAFR Training Areas**.** The three training are described below:

TA-1. Training area 1 consists primarily of EAFR cantonment area. It contains numerous buildings and additional miscellaneous facilities. A Mountain Warfare training school, consisting of three buildings, is located in the western half of TA-1-B. Training area one also has the Range Headquarters Building, billets, a dining facility, the Unit Training Equipment Site (UTES) and the Range Control office.

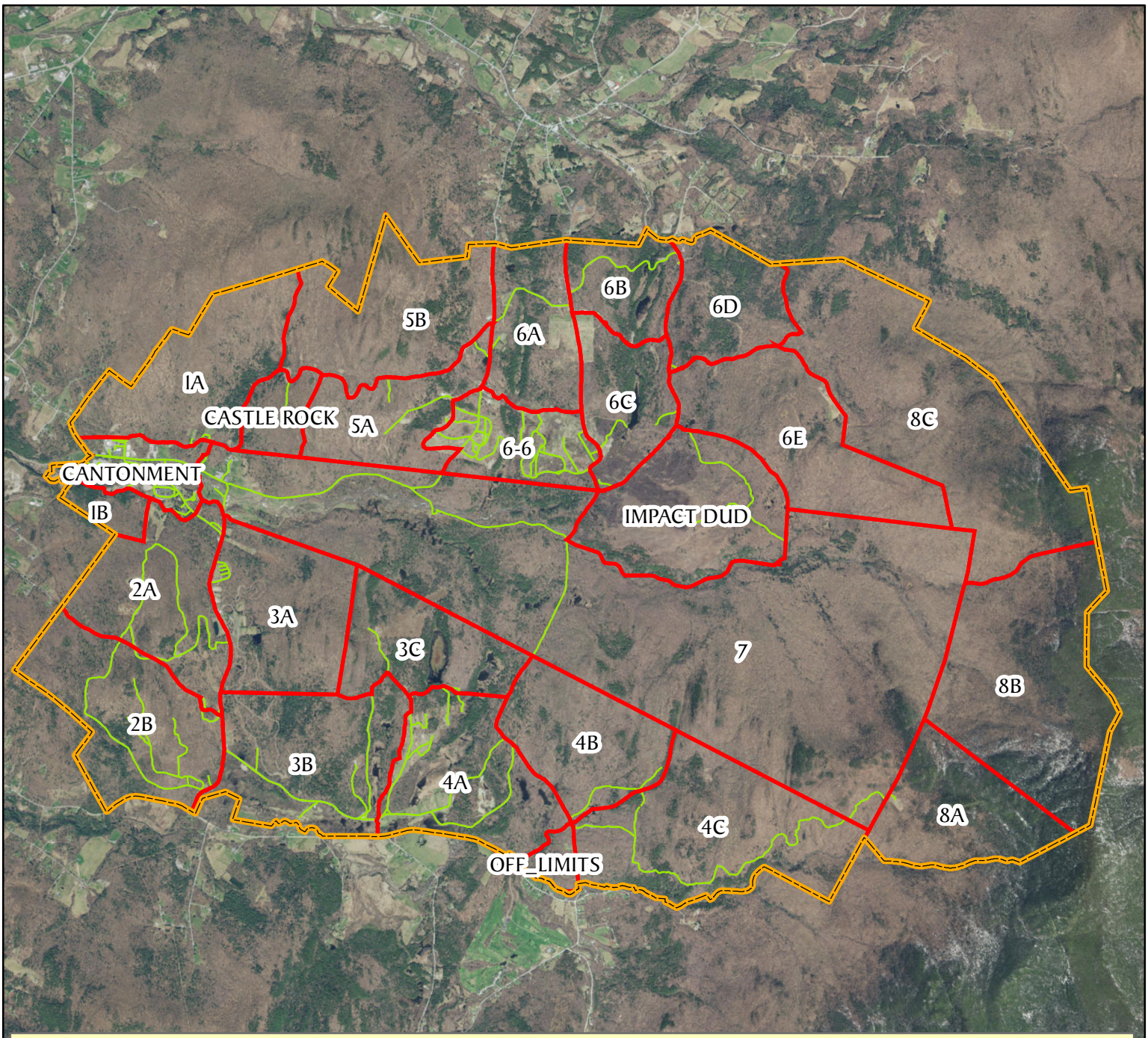


Figure 2 - EAFR Training Areas

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Scale=1:50,000
October, 2019

N
W E
S

Meters
0 250 500 1,000
1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334
1 inch = 4,167 feet

Legend
EAFR Boundary
Training Areas

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

Data for Training Areas determined by
the Vermont National Guard

TA-2. Training area 2 contains one grenade type range. This is the only range in training area 2. The area is suitable primarily for tactical training for infantry and includes a land navigation course. There is limited access to vehicular traffic in the Birch Hill area, except for tactical wheeled vehicles. Occasional individual defensive fighting positions (foxholes) may be excavated and then backfilled after their use.

TA-3. The western portion of TA-3 has limited use as a tactical training area because of a drainage pattern that parallels West Road. Ground disturbance is minimal in this area. Bivouac areas in the southern part of TA-3 can be reached with tactical wheeled vehicles. The eastern side of TA-3 contains rough terrain suitable for patrol-type training, bivouac areas, and wheeled traffic in the south. A climbing area is located in the eastern portion of TA-3C. There is a quarry east of observation post #2 in this area. Land along the eastern boundary is generally swampy.

The northern third of TA-3 contains two firing ranges, range 3-1 and 3-2. Range 3-1 is a small caliber range. The east facing firing line is east of and parallels west road. There are 50m and 25m target lines as well as a biathlon target shack, parking areas, latrines, mess shelter and a training building. Vehicles are restricted to dirt roads and not allowed on grassy areas. Range 3-2 lies north of 3-1 at the intersection of Essayons and West Roads. The firing line faces east and is east of and parallels West Road. Range facilities include a 100-yard target berm, parking area, target shed and a latrine west of West Hill road. In the south of TA-3, directly south of KD road, is EAFR airfield. The airfield

3.6 Forestry Compartments. The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately ninety percent of EAFR is forested with five percent upland, non-forested and two percent wetlands. The remaining land is developed military construction. VTARNG provides stewardship of these lands and their environmental resources, including forests, wetlands, flora and fauna. As the majority of the land is forest, forestry management and timber sales are a significant component of the INRMP.

EAFR is divided into nine forestry compartments. These compartments were delineated using roads and geographic boundaries, and are approximately equal in size. Each compartment is then divided into areas of relative similarity (such as age, species, topography, etc.) that can be managed and treated uniformly (map areas). Each map area in the Forest Management Plan has a management objective, acreage, volume description, and recommendation section (Forest Management Plan, Greenleaf Forestry, Jericho VT, 1991-1997). These plans are not included in this document but can be provided upon request. A general description of treatment strategies follows the compartment descriptions and is divided into upper slopes (above 1,200 ft.) and lower slope (below 1,200 ft) sections. For a location map of the compartments, see Figure 3 EAFR – Compartment Locations. A brief summary of each compartment follows.

Compartment I. Occupying the northwest corner of the range, Compartment I is bounded on the north and west by the Range boundary, on the south by the General Dynamics Cone of Fire, and on the east by the Poor Farm Road. The Castle Trail, which passes through the center of the compartment, is the major access route for all areas above the road. Below the Castle Trail access is primarily from Poor Farm Road and from several old farm roads that originate at the west end of Range 6-5. Slopes in this compartment are generally south facing, and vary from 5% up to 60% or more. There are some short cliffs and ledges that do restrict forestry activities. Operability overall is only fair because of the relatively steep terrain. There is one major stream that flows in a southwest direction along the west side of the Castle Trail. This stream generally has water flowing year-round. Military use in this Compartment consists of mostly field exercises, mountain skills training, land navigation, traveling through to other parts of the Range, and a small pistol range on the north side of Castle Trail near Post Headquarters. Use of the pistol range will temporarily prevent forestry activities in the western third of the compartment. The Cove Forest, A Natural Community of Statewide Significance, is located in this compartment just south of Castle Trail. No logging should take place in this area, and caution should be exercised when conducting management

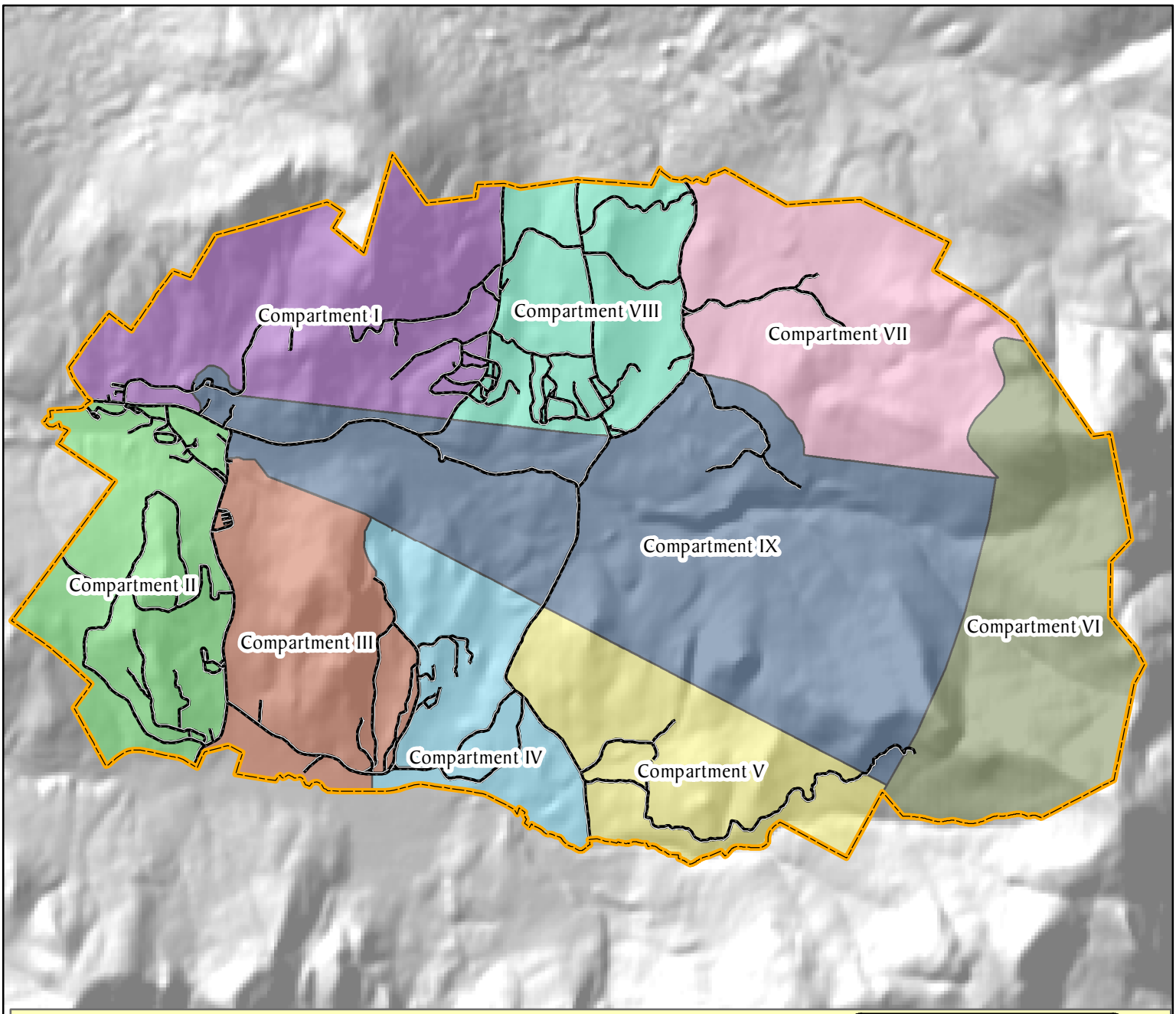


Figure 3 - EAFR Forest Compartments

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Scale=1: 50, 000
October, 2019

N
W E
S

Meters
0 250 500 1,000

1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334

1 inch = 4,167 feet

Legend

- EAFR Boundary
- EAFR Roads
- Compartment I
- Compartment II
- Compartment III
- Compartment IV
- Compartment IX
- Compartment V
- Compartment VI
- Compartment VII
- Compartment VIII

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

activities near the perimeter of the area.

Compartment II. Located in the southwest corner of the Range, Compartment II is bounded on the east by West Road, on the south by Nashville Road, on the west by the Range boundary, and on the north by the Lee River and the barracks area. The best access for forestry activities is from several points along West Road where logging roads enter the compartment, and from the gravel pit west of the barracks. Two log landings have been used in the past four years, just north of the Nashville Road and in the gravel pit on the north edge of the compartment, west of the barracks and ski slope. Some steep slopes in the south-central section of the compartment, but overall no major factors limit forestry operations. Elevations ranges from 700 feet near the Lee River to 1320 feet. There are no major watercourses in this compartment. A small tributary to Mill brook flows southwest in the southwest quadrant. Primary military exercises are for bivouac sites, land navigation exercises and skiing. There is also some gravel extraction and biathlon trail use. Several historic archaeological sites, indicated by old cellar holes and outbuilding foundations, mark the landscape on the southern slopes of the compartment, along with some stone walls. Around Pecor Farm, along the western boundary (stand 1), old-field edges, farm roads and stonewalls can be found.

Compartment III. This compartment is located on the east side of Compartment II, south of the GD cone, bounded on the west by West Road, on the south by Nashville Road, on the east by the OP Hill Road, and on the north by the General Dynamics Cone boundary. There are several points that provide good access into this compartment. From the KD road in the southwest corner of the compartment, and improved road system about 500 yards to FP5 is an excellent landing site. Several other woods roads intersect with the KD road, and a road along the eastern edge of the compartment will also provide excellent access. Biathlon trails that traverse much of the western and southwest sections should only be used for forestry work whenever weather conditions are appropriate and when they are not being used for other purposes. This compartment is dominated by OP Hill, which is the highest point of a major ridgeline running north-south. Elevation ranges from 1480 feet down to 7500 feet along Nashville Road. All of the land south of the KD Road is fairly flat and poorly drained, and includes a large marsh, which is part of the Mill Brook system. There are no forestry objectives for all lands south of the KD Road. The OP Hill ridge is relatively flat on top, with very steep east slopes, up to 100%, and more moderate west-facing slopes. The east slopes will limit forestry operations. Mill Brook is the main water course on the compartment. There are intermittent streams that flow through several beaver ponds along the southwest boundary, just east of West Road, and along the southeast boundary. Both of these empty into Mill Brook. Military personnel often use several areas within this compartment. These include the biathlon range and trail network, the observation post on OP Hill, a rock climbing training area just to the east of OP Hill, a rifle range (3-2) in the northwest corner, and gravel pits and bivouac areas in the southeast corner. Trails leading to OP Hill are also used.

Compartment IV. Located on the south-central portion of the Range, Compartment IV is bounded on the north by the General Dynamics Cone, on the south be the range boundary and Nashville Road, on the east by Poor Farm Road, and on the west by the OP Road. Access is generally good with three main access points; OP Hill road to the west, KD Road to the south, and Poor Farm Road to the east. Several existing military and old farm roads provide access to the majority of the interior of the compartment. Access may be temporarily limited to the southwestern areas due to activity associated with ranges 4-3 and 4-1. Slopes are generally east or west facing and vary from 5 to 45% or more. Overall operability is good with the limiting factor being water. The low area through the central portion of the compartment contain a series of beaver ponds and associated wetlands connected by a small stream that appears to run all year. This stream flows in a southerly direction through the compartment into Mill Brook. This Compartment provides moderate to heavy use for military field exercises, land navigation, rock climbing, rifle range (4-3, 4-1) and travel through to points further west within the range. There are several gravel pits located in the compartment that are currently being used on a regular basis. The Otter Bog, a Natural Community of

Statewide Significance, is located in this area. Care should be taken to maintain the integrity of this unique bog if any management activity is planned in the vicinity.

Compartment V. Located in the southeast corner of the range, Compartment V is bounded on the north by the General Dynamics Cone of fire, on the south by Mill Brook and the Range Boundary, on the west by the West Bolton Road and on the east by Poor Farm Road. Most areas can be accessed from the West Bolton Road via established roads and trails. One landing area has been used extensively and is located north of the "off limits" area of the cone, just east of Guard Post 3. A winter landing was constructed approximately 3500 feet east of the original landing area in 1996. A second landing is located just north of the beaver ponds. A small portion of the compartment south of Mill Brook must be accessed from Nashville road. A right of way currently exists to access the former International Paper lot south and east of the compartment and range boundary. This road was improved in 1990 with subsequent damage and erosion due to flooding in 1992 that has rendered it impassable due to the loss of several large culverts crossing Mill Brook. There is a ridgeline, which passes through the central portion of the compartment in a north-south direction. This ridge has several steep and rocky slopes that limit operability in some areas. Elevations range from 940 feet at the West Bolton Gate and Mill Brook to approximately 1820 feet along the ridgeline at the Cone of Fire. Mill Brook comprises the major stream course in the compartment. Mill Brook comprises much of the southern boundary of the range. The remainder of the water in the compartment consists of two tributaries of Mill Brook that flow from the Cone of Fire south along each side of the main ridge line. The western most stream flows through a small wetland area of old beaver ponds and alder just before exiting the compartment to the west. Primary military uses are for bivouac sites, land navigation, climbing and mountain survival training. This compartment is not extensively used by the military, making it a prime area for intensive forest management. Due to the rugged character of the terrain within most of this compartment, very little of it was ever settled or cleared for agricultural purposes. Several historic archaeologic sites of farmsteads and residences including stone walls and wire fence lines are found throughout the old-field areas along the West Bolton Road. Several stone foundations can be found along West Bolton Road as well, particularly to the south. Evidence of past sugaring activities can be found as far east as Stand 7. This evidence includes large cull sugar bush trees, old buckets, small foundations and tap holes and staining in harvested timber. Upper Mill Brook Ravine, a Natural Community of Statewide Significance is located in this compartment. This area is off limits to logging consideration.

Compartment VI. Most of Compartment VI is above 2,100 feet elevation and will not be considered for forest management activities.

Compartment VII. Compartment VII is located in the northeast corner of the Range, bounded on the south by the General Dynamics "Cone of Fire", on the west by Bear Town Road, on the north by the Range boundary, and on the east by the approximate location of the 2,100 feet elevation contour. Access to most of the compartment is from Feigel Hill Road. This compartment is dominated by Feigel Hill located in the center of the compartment. Steinhour Brook, a perennial stream, flows down the northwest flank of Feigel Hill and exits the compartment on the northern boundary and is the only major water source in this compartment. There is a small stream that flows south off the south side of Feigel Hill and empties into the Lee River. There are some small beaver ponds associated with this unnamed creek at the southern boundary of the compartment. The eastern boundary is the approximate 2,100 ft. elevation contour at the toe of Mount Clark. Primary uses are for bivouac sites and land navigation exercises. This compartment is not extensively used by the military. A secondary biathlon course is used on occasion in the vicinity of Feigel Hill. A Forest Bird Monitoring Route, part of a nationwide bird-monitoring program, is located east of Feigel Hill in stand 11, along a bench at approximately 1,900'. There are 5 points located 200 meters apart in a typical northern hardwood forest. Logging operations are precluded from this area.

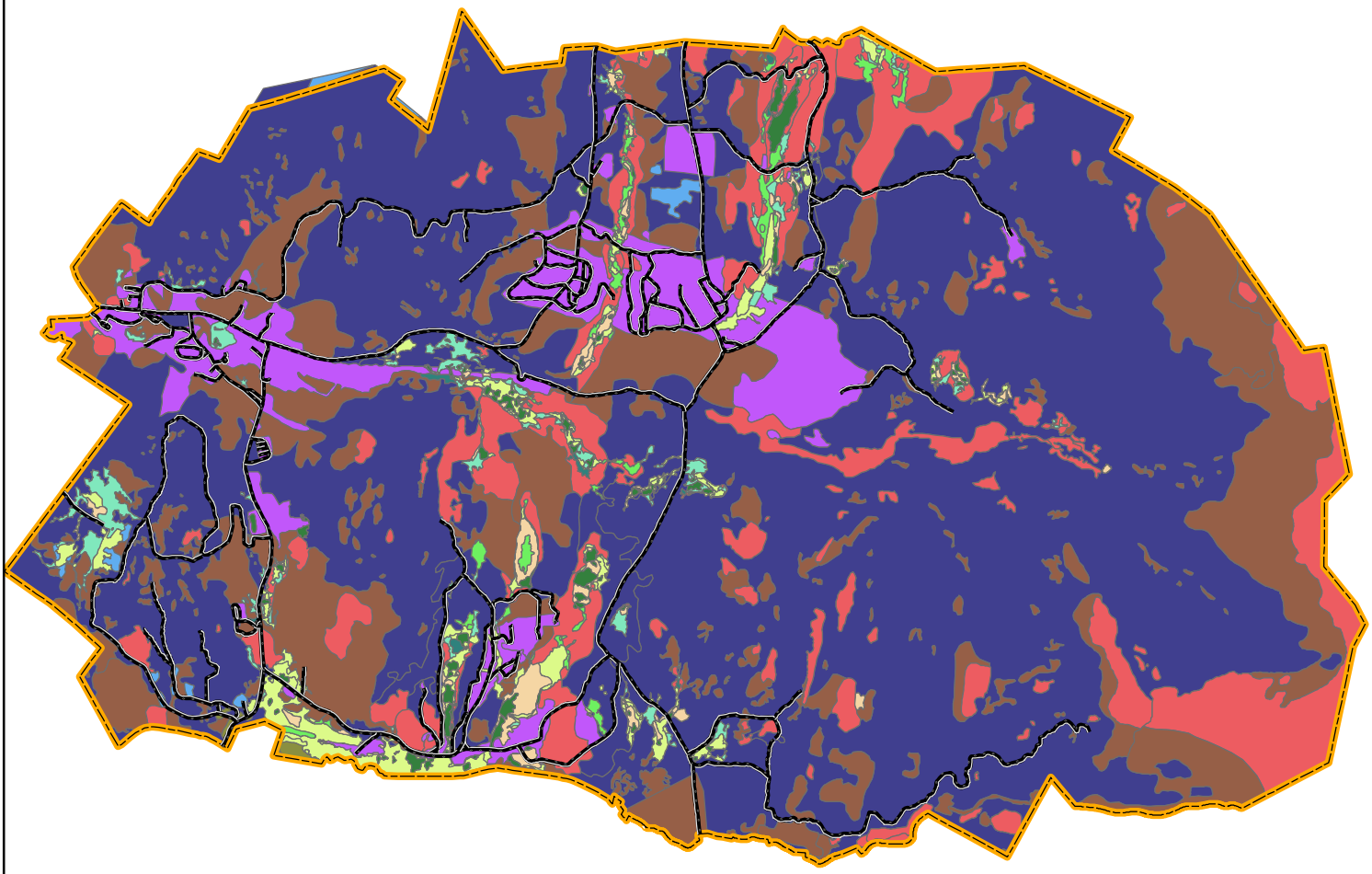
Compartment VIII. Located along the central portion of the northern boundary, Compartment VIII is bounded on the south by the cone of fire, on the west by Range Road, and on the east by Beartown Road. Access to most of the compartment is good, given the location of Bear town road along the entire eastern edge of the compartment, range road along the western edge, and West Bolton road running through the center. Additional access is provided by several maintained roads in the northeast and southwest corners of the compartment. The area is characterized by rolling terrain. This compartment is less rugged than the remainder of the range with the possible exception of compartment IV, which follows the same valley. Elevations range from 900 feet along the two wetland areas that feed Lee River to 1,160 feet at Cushing Hill. Primary military uses are for bivouac sites, land navigation, and firing exercises. Activities are severely limited in the southern third of the compartment due to the location of Range 6-6 tank range. Due to the valley location of the compartment, this area has evidence of past settlement. Several stone walls and wire fence lines are found throughout. Several cellar holes and stone foundations are located along the roads as well, particularly West Bolton and Bear town roads.

Compartment IX. This compartment occupies the low land area and headwaters around Lee River. Bounded entirely by a blue blazed line with markers designating the area as "Cone of Fire". Access within the entire compartment is extremely limited due to the live firing by General Dynamics. Access is provided primarily by the Lee River Road, which travels east west through the center of the western portion of compartment. Lee River Road intersects West Bolton Road in the center of the compartment. West Bolton Road divides the compartment into two roughly equal sections east and west of the road. Secondary access west of West Bolton road is provided by several old farm roads, which pass through the compartment. Access east of this road is limited to an old road, which follows along the river approximately half way to the boundary of the compartment where it crosses the river and continues in a northwesterly direction into the impact area. The compartment can be divided into two areas, separated by West Bolton Road. Areas west of the road are relatively flat with the exception of the shoulder of a ridge at the western edge of the compartment, which enters the area from the south. Slopes should not provide any limitations to management activities. Areas east of West Bolton Road are generally rougher in topography with slopes generally west facing and vary from 5% up to 60% or more. There are some short cliffs and ledges that do restrict forestry activities. Operability overall is fair. Water resources consist of the headwaters and tributaries of the Lee River. An extensive network of beaver ponds is located through the central portion of the compartment west of West Bolton Road. Several small beaver ponds are located along the northern boundary of the compartment, adjacent to the Impact Area. This area is used exclusively by General Dynamics for live firing and testing. Access is restricted at all times, preventing completion of forestry and other activities. Some minor rock climbing and land navigation activities do occur in areas, which are in defilade.

3.6 EAFR Land Use

Land use on the EAFR can be divided into two distinct phases: (1) land use prior to 1926, when EAFR was initially established and constructed, and (2) land use subsequent to the establishment of EAFR, that is, during its use. See Figure 4 EAFR - Land Use and Land Cover. The primary land use during phase one was agricultural. The second phase of land use began in 1926, when the United States Government acquired 6,026 acres for EAFR. In 1941, EAFR was expanded to its current size of 11,218 acres. From 1926 to 1941, construction was minimal. A stone ammunition bunker and the ruins from a Civilian Conservation Corps (CCC) camp are all that survive from this period. Today, General Dynamics and the Vermont National Guard hold 546 and 10,672 acres of EAFR, respectively. Administrative buildings, barracks, and maintenance and storage buildings for both organizations are located in the northwestern quarter of EAFR. Firing ranges, bivouac areas, Roads, and the main impact area (375 acres), shared by both General Dynamics and the Vermont National Guard, are located in the remainder of EAFR.

EAFR is comprised of land in the three Chittenden County towns of Bolton, Jericho, and Underhill.



Land Use Land Cover

- Agriculture/ Pasture/ Old Field
- Altered Areas/ Firing Ranges
- Clearcut/ Regenerating
- Coniferous Upland
- Coniferous Wetland
- Deciduous Upland
- Deciduous Wetland
- Developed Land
- Emergent Wetland
- Mixed Upland
- Mixed Wetland
- Open Water
- Scrub/ Shrub Wetland

Figure 4 - EAFR Land Use Land Cover

Scale=1: 50,000
October, 2019

N
W E
S

Meters
0 250 500 1,000

1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334

1 inch = 4,167 feet

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend

- EAFR Boundary
- EAFR_Roads_All_2015

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Data for Land Use Land Cover by The University of Vermont Spatial Analysis Lab, 2000.

EAFR contains a significant portion of each town's land area: nearly 25 percent of Jericho, 9 percent of Underhill, and nearly 8 percent of Bolton. EAFR is federal property, licensed to the State of Vermont Military Department. It is not subject to local zoning controls. EAFR consists of land devoted to use as a military base: specifically, range and test activities. This category of land use includes a variety of auxiliary uses to support the overall military base use, including a cantonment area where trainees are housed, an Army Mountain Warfare School, a Unit Training Equipment Site (UTES), biathlon facilities, numerous training areas, and firing ranges. Administrative buildings, barracks, and maintenance and storage buildings for both organizations are located in the northwestern quarter of the range. Firing ranges, bivouac areas, Roads, and the main impact area, shared by both General Dynamics and the VTARNG, are located in the remainder of the range.

3.6.2 Land Use EAFR Vicinity

The majority of land uses bordering EAFR are in conservation, agricultural, and rural residential land uses. The following describes the existing land uses, population density, character of development, guiding planning issues and documents of the local governments (the county and affected towns) with jurisdiction in EAFR vicinity. Existing land use and development in EAFR vicinity is rural in character. Rural development, conservation, and preservation of natural resources are the central land use planning principles of the jurisdictions in EAFR vicinity. (See Figure 5, Community Land Use - EAFR Vicinity. Representative excerpts for each plan are presented below.

Land use development in Bolton, Jericho, and Underhill as presented in each Town Plan, focuses on village centers and preservation of rural character. Each town's land use plan outlines current uses and prescriptions for land use which recognize the rural carrying capacity of the land, that is, each town has segmented land uses into zones which characterize the development potential in terms of physical limitations, such as steep slopes or high water table to limit development, including the need to preserve open land for agriculture, forestry, and rural housing. Even in the village centers, where development is at its most dense; a rural density is encouraged to be maintained.

Town of Bolton. Bolton's focus is that of a ski resort community: "Bolton is a community of unusual beauty, where the majestic mountain peaks contrast the scenic Winooski River Valley. The Town lies in the heart of the Green Mountains, one of Vermont's most treasured resources. It also lies on the fringe of the growth area of western Chittenden County. Its topography makes it ideal for a recreational area." (Bolton: 2007). Bolton's land uses present considerable land use conservation, with limited rural and resort development. Bolton's Town Plan continues: "Future development will be focused towards village centers in an effort to preserve the historic and efficient layout of the Town…the very elements which account for Bolton's natural beauty also impose limitations on development. A large amount of land adjacent to the Winooski River is categorized as flood plain. The town's mountainous topography creates significant limitations on development due to the extreme slopes and soil conditions found in many areas. In fact, very little of the town has soils suitable for on-site sewage disposal "(Bolton: 2007). The Bolton Town Plan states that in the past, the town relied on Vermont's Act 250 permit process and Town zoning and subdivision regulations to regulate development; however, as growth pressures increase and become more varied, a more active stance in limiting development is advocated. (Bolton: 2007)

Town of Jericho. Jericho presents itself as a rural residential community: "Residential and sprawl-like development outside of the village centers has declined as the environmental, social, and economic costs of such development have been recognized, although small agriculturally-based enterprises, home businesses, and tourism continue to thrive there. Areas of the town still more remote from the villages remain virtually untouched and still provide important habitat to some of the Northeast's most sensitive species. These concepts of Village centers, small-scale local businesses, and preservation of natural resources are consistent with a wider view of Jericho's role in Chittenden County" (Jericho: 2006:17).

Jericho's Land Use Plan provides for more residential growth, perhaps because land in this community is less constrained by natural topography and soil conditions, however, land use zones reflect limited development along the rivers, steep slopes and agricultural lands (Jericho: 2006:75). The Jericho Town Plan expresses a need for improved communications with EAFR: "It is generally felt that more interaction between Town and Range officials would be desirable, both to keep informed of activities occurring in the Range and how those activities might affect Jericho residents, as well as to explore possible beneficial aspects of the Range."(Jericho: 2006:73)

Town of Underhill. Underhill's Land Use Plan reflects the Town's land use goal to preserve and protect its rural character in the face of development pressures: "There is a tension between the tendency to grow and the wish to remain rural…This tension is unresolved and growing – we cherish our forests, fields and farms, but scattered development continues. The challenge is to grow with little impact on the environment and our small town ambiance" (Underhill: 2004:3). Underhill's Town Plan and zoning regulations also provide an environmental basis to the zone plan, with districts designated by the soil capacity, steep slopes and floodplains. However, development pressure exists: In addition to the zone plan, Underhill utilizes preservation easements as a means to control development: "There are three types of contracts, State, Town and Conservation…The State program taxes farm and forest property according to its "actual use" value determined by the State Advisory Board, as opposed to its potential development value. …Under the Town contract, the landowner agrees to keep at least 10 acres free of development for 10 years. In return, the town taxes the land at 50%. If the land owner withdraws from the program before ten years, the landowner must pay the taxes saved over the last five years. (The third type of contract is a) conservation contract. Only conservation contracts guarantee that land remains permanently open."(Underhill: 2004:21)

Land Use Compatibility – EAFR and Vicinity. The majority of land uses bordering EAFR are conservation lands, agricultural lands and rural residential land use. The existing land use of EAFR and vicinity is primarily rural. As documented in the Chittenden County Plan and town plans for Bolton, Jericho and Underhill, a local land use planning goal is to maintain and preserve rural character. Within the rural conservation zones in each town, residential uses are permitted at varying densities to protect the carrying capacity of the land. These environmentally based zones are not intended to serve as a buffer to EAFR and its uses. The areas proximate to EAFR contain residential uses.

Land use planning for EAFR focuses on maintaining compliance with the needs of the Vermont Army National Guard, and training requirements of the National Guard Bureau, while also maintaining stewardship of the land. The land use planning goals of the county, affected towns, and EAFR are consistent on the point of recognizing goals to protect the area's existing resources and character.

Local and Regional Natural Areas. The surrounding communities also provide considerable natural areas. Open space in Jericho includes land currently held by public or quasi-public organizations: EAFR, the University of Vermont Research Forest, and the Mobbs Farm. Recent large public acquisitions include the Wolfrun Natural Area and Mills Riverside Park. Bolton also hosts many natural areas, including Mount Mansfield State Forest, Camel's Hump State Park and Robbins Mountain Wildlife Management Area, Bolton Valley Ski Area, and International Paper Company lands. The Mount Mansfield State Forest also extends into the Town of Underhill.

Chapter 4.0 Physical Environment

4.1 Climate

The weather in this mountainous, northern central Vermont region varies greatly on a day-to-day basis, but the annual variance in temperature and precipitation is minimal. Annual temperature extremes range from the 90 degrees Fahrenheit ('F) in the summer, to minus 30'F in the winter. The record high and low temperature for Huntington, Vermont, the closest weather station with similar conditions to EAFR, is 101 F and –35 F, respectively. Mean temperatures average 69'F in July and 16'F in January. The interaction between rugged topography and prevailing westerly flow across it gives rise to a complex but orderly distribution of precipitation. Yearly precipitation totals range from 35 inches at the lower elevations of the range to 60 inches at the higher elevations. A fair amount of the precipitation totals come from snow. Annual totals range from 82 inches at the lower elevations to over 100 inches on the higher ridgelines

Situated at the eastern edge of North America, the region enjoys an invigorating climate with all four well-marked seasons. The Appalachian Mountains cross the region; most of the major summits vary between 3,500-4,300 feet. Mount Mansfield, the highest point in Vermont at 4,393 feet, lies a few miles northeast of the boundary of EAFR. The Adirondack Mountains to the west rise to between 4,000 and 5,000 feet. Major valleys include the Champlain to the west, the St Lawrence to the north, and the Connecticut to the east.

4.2 Landforms

EAFR is located in the foothills of the western slope of the Green Mountain physiographic province, characterized by rugged slopes and narrow valleys. The facility straddles watersheds of the Lamoille and Winooski Rivers, which cuts through the range on an east-west axis, and drains west until it joins the Browns River in Jericho. The Browns then flows north until it meets the Lamoille in Fairfax, about 14 miles upstream from the Lamoille's confluence with Lake Champlain. The Lee River and Mill Brook valleys provide easy east-west access into the area encompassed by the installation, and small stream valleys which lie between high north-south trending bedrock formations allow access from the north and south as well. The mountains, with elevations of 2700-3600 feet, block access from the east.

The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately ninety percent of EAFR is forested with five percent upland, non-forested and two percent wetlands. The remaining land is developed military construction. Within the mountainous terrain are considerable scenic areas.

4.3 Geology and Soils

Geology. The surficial geology of EAFR is primarily a product of glacial and early post- glacial influences, with the general features of the landscape developed prior to 12,000 Before Present (B.P). The last advance of continental ice covered all of Vermont by 18,000 B.P., depositing a veneer of till and destroying deposits from previous periods of glaciation. By about 15,000 B.P., glaciation had begun. With the ice mass continuing to melt back in a northwesterly direction, the mountain peaks east of Jericho and Underhill were exposed. In the upper Lee River and Mill Brook valleys, ice contact deposits can be found which may date to this period. The bedrock formations within EAFR are covered with Pleistocene or early post-Pleistocene deposits comprising:

1. Glacial till, usually as a thick mantle on the north and south sides of hills and at higher elevations;
2. Glacial outwash and ice contact deposits;
3. Lacustrine deposits of silt and sand; and
4. Fluvial deposits of alluvium.

The last three types are generally restricted to areas in the bottoms of the Lee River and Mill Brook Valleys at elevations below 800-900 feet.

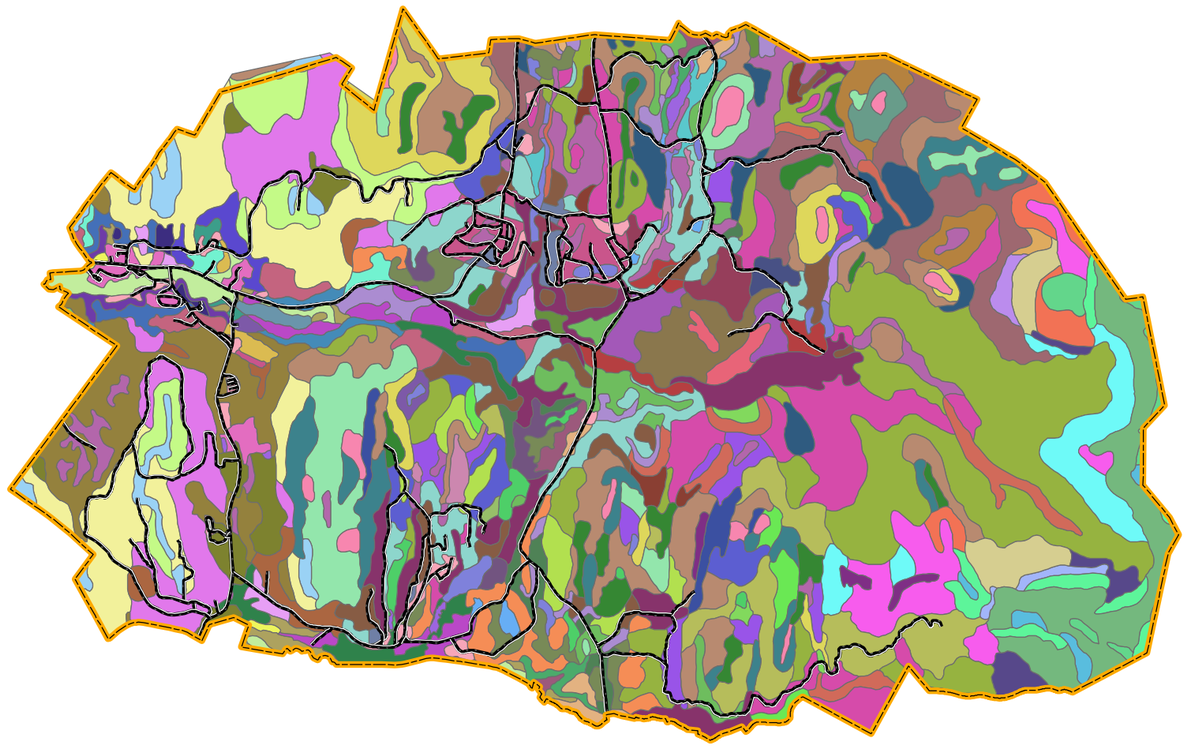
Soils: The Natural Resources Conservation Service Soil Survey for Chittenden County, Vermont (2010) identifies 21 soil map units within the boundaries of EAFR (see Figure 6, EAFR - Soil Types). The foothills of the Green Mountains in and near the range have been heavily glaciated, resulting in soils that are both loamy and stony. The major soil series are as follows:

1. The majority of upland soils are of the Lyman-Marlow series. These soils were formed of glacial till derived from mica schist, and are classified as rocky to extremely rocky loams. Found primarily on hillsides and hilltops, they are shallow soils underlain by bedrock, well drained and low in fertility. Erosion potential is moderate to slight, unless disturbed, in which case, because of their sloping nature, considerable damage can be done. Potential for timber production is rated as only fair because of the low fertility and lack of drought tolerance.
2. Cabot soils are found in valleys and depressions. These soils were formed in glacial till derived from schist and limestone, and are classified as stony to extremely stony silt loam. These are deep and highly fertile soils, but because of a slowly permeable fragipan, they are poorly drained. This poor drainage is not a significant problem except on disturbed soil on steep hills, where extreme care must be taken. Because of the poor drainage, these soils are rated as having fair potential for timber production.
3. Peru series soils are found on the hillsides at lower elevations. These soils were formed in till derived from quartzite and schistose, and are classified as stony to extremely stony loam. They are deep, moderately well drained above a fragipan, and have low fertility. On disturbed ground, the erosion hazard is slight to severe, depending on the slope. Timber potential is rated as good.
4. The numerous other soils tend to be sandy or gravely loam soils. While these soils are not highly disposed towards erosion, slope dictates when care should be taken.

4.4 Hydrology and Water Quality

The hydrologic framework and water quality of EAFR were assessed between October 2002 and December 2003 by the U.S. Geological Survey (USGS:2004). As part of the study, stream flow was continuously measured in the Lee River and 24 observation wells were installed at 19 locations in the stratified drift and bedrock aquifers to examine the hydrogeology. Chemical analyses of surface water, ground water, streambed sediment, and fish tissue were collected to assess major ions, trace elements, nutrients, and volatile and semivolatile compounds. Sampling included 5 surface-water sites sampled during moderate and low-flow conditions; streambed-sediment samples collected at the 5 surface-water sites; fish-tissue samples collected at 3 of the 5 surface-water sites; macroinvertebrates collected at 4 of the 5 surface-water sites; and ground-water samples collected from 10 observation wells, and *Escherichia coli* samples collected at all surface and ground water sites. (Figure 7, EAFR - Rivers, Streams and Tributaries.

EAFR hydrology is characterized by the upland mountain and valley setting of the site. Groundwater hydrology in EAFR is largely defined in the lower areas by topography and the distribution and saturated thickness of high conductivity glacial outwash deposits and low conductivity glacial till deposits. The distribution of unconsolidated sediments results in steep hydraulic gradients in the upland areas, with a general flattening of the water table within the regions of glacial outwash. Groundwater flows from hills toward valleys and discharges into streams, rivers, wetlands, and ponds. In the higher elevations, where soils are often shallow and bedrock close to the surface, the source of sufficient quantities of potable groundwater is deep within the bedrock.



Legend

EAFR Soil Types

- Adams-Allagash complex, 15 to 25 percent slopes
- Adams-Allagash complex, 25 to 60 percent slopes
- Adams-Allagash complex, 3 to 8 percent slopes
- Adams-Allagash complex, 8 to 15 percent slopes
- Agawam fine sandy loam, 15 to 25 percent slopes
- Agawam fine sandy loam, 25 to 60 percent slopes
- Agawam fine sandy loam, 3 to 8 percent slopes
- Agawam fine sandy loam, 8 to 15 percent slopes
- Belgrade silt loam, 0 to 3 percent slopes
- Belgrade silt loam, 3 to 8 percent slopes
- Berkshire and Monadnock soils, 15 to 35 percent slopes, unexploded ordnance phas
- Berkshire and Monadnock soils, 15 to 35 percent slopes, very stony
- Berkshire and Monadnock soils, 3 to 15 percent slopes, unexploded ordnance phase
- Berkshire and Monadnock soils, 3 to 8 percent slopes, very stony
- Berkshire and Monadnock soils, 35 to 60 percent slopes, unexploded ordnance phas
- Berkshire and Monadnock soils, 35 to 60 percent slopes, very stony
- Berkshire and Monadnock soils, 8 to 15 percent slopes, very stony
- Bucksport muck, 0 to 2 percent slopes
- Cabot loam, 0 to 8 percent slopes, extremely bouldery
- Cabot loam, 0 to 8 percent slopes, very stony
- Cabot loam, 8 to 15 percent slopes, very stony
- Colonel fine sandy loam, 15 to 35 percent slopes, extremely bouldery
- Colonel fine sandy loam, 3 to 8 percent slopes, very stony
- Colonel fine sandy loam, 8 to 15 percent slopes, extremely bouldery
- Colonel fine sandy loam, 8 to 15 percent slopes, very stony
- Colton fine sandy loam, 15 to 25 percent slopes
- Colton fine sandy loam, 25 to 60 percent slopes
- Colton fine sandy loam, 3 to 8 percent slopes
- Dixfield fine sandy loam, 15 to 35 percent slopes, extremely bouldery
- Dixfield fine sandy loam, 15 to 35 percent slopes, very stony
- Dixfield fine sandy loam, 35 to 60 percent slopes, extremely bouldery
- Dixfield fine sandy loam, 35 to 60 percent slopes, very stony
- Dixfield fine sandy loam, 8 to 15 percent slopes, extremely bouldery
- Dixfield fine sandy loam, 8 to 15 percent slopes, very stony
- Eldridge-Windsor complex, 15 to 25 percent slopes
- Eldridge-Windsor complex, 25 to 60 percent slopes
- Eldridge-Windsor complex, 3 to 8 percent slopes
- Fullam silt loam, 15 to 35 percent slopes, very stony
- Fullam silt loam, 8 to 15 percent slopes, very stony
- Glebe-Stratton-Londonderry complex, 8 to 15 percent slopes, very rocky
- Glover-Vershire complex, 15 to 35 percent slopes, very rocky
- Glover-Vershire complex, 35 to 60 percent slopes, very rocky
- Glover-Vershire complex, 8 to 15 percent slopes, very rocky
- Grange very fine sandy loam, 0 to 3 percent slopes
- Hitchcock silt loam, 15 to 25 percent slopes
- Hitchcock silt loam, 25 to 60 percent slopes
- Hogback-Rawsonville complex, 15 to 35 percent slopes, very rocky
- Hogback-Rawsonville complex, 35 to 60 percent slopes, very rocky
- Hogback-Rawsonville complex, 8 to 15 percent slopes, very rocky
- Hogback-Rawsonville-Rock Outcrop complex, 60 to 80 percent slopes, very stony
- Lyman-Tunbridge complex, 15 to 35 percent slopes, very rocky
- Lyman-Tunbridge complex, 35 to 60 percent slopes, very rocky
- Lyman-Tunbridge complex, 8 to 15 percent slopes, very rocky
- Lyman-Tunbridge-Rock Outcrop complex, 15 to 35 percent slopes, very stony
- Lyman-Tunbridge-Rock Outcrop complex, 35 to 60 percent slopes, very stony
- Lyman-Tunbridge-Rock Outcrop complex, 60 to 80 percent slopes, very stony
- Lyman-Tunbridge-Rock Outcrop complex, 8 to 15 percent slopes, very stony
- Medomak silt loam, 0 to 2 percent slopes, frequently flooded
- Ninigret fine sandy loam, 0 to 3 percent slopes
- Ninigret fine sandy loam, 3 to 8 percent slopes
- Occum fine sandy loam, 0 to 2 percent slopes, frequently flooded
- Pits, Sand and Pits, Gravel
- Pondicherry and Wonsqueak mucks, 0 to 2 percent slopes
- Pootatuck fine sandy loam, 0 to 2 percent slopes, frequently flooded
- Rawsonville-Mundal complex, 15 to 35 percent slopes, rocky
- Rawsonville-Mundal complex, 35 to 60 percent slopes, rocky
- Rawsonville-Mundal complex, 8 to 15 percent slopes, rocky
- Ricker-Londonderry-Rock Outcrop complex, 60 to 80 percent slopes
- Rippowam fine sandy loam, 0 to 2 percent slopes, frequently flooded
- Saco mucky silt loam, 0 to 2 percent slopes, frequently flooded
- Sheepscot fine sandy loam, 3 to 8 percent slopes
- Sheepscot fine sandy loam, 8 to 15 percent slopes
- Stratton-Londonderry-Ricker complex, 15 to 35 percent slopes, very rocky
- Stratton-Londonderry-Ricker complex, 35 to 60 percent slopes, very rocky
- Sunapee fine sandy loam, 15 to 35 percent slopes, very stony
- Sunapee fine sandy loam, 3 to 8 percent slopes, very stony
- Sunapee fine sandy loam, 8 to 15 percent slopes, very stony
- Tunbridge-Berkshire complex, 15 to 35 percent slopes, very stony
- Tunbridge-Berkshire complex, 35 to 60 percent slopes, very stony
- Tunbridge-Berkshire complex, 8 to 15 percent slopes, very stony
- Tunbridge-Dixfield complex, 15 to 35 percent slopes, very stony
- Tunbridge-Dixfield complex, 8 to 15 percent slopes, very stony
- Udorthents and Udipsamments, 0 to 8 percent slopes
- Udorthents and Udipsamments, 15 to 25 percent slopes
- Udorthents and Udipsamments, 8 to 15 percent slopes
- Urban Land-Udorthents-Udipsamments complex, 0 to 8 percent slopes
- Vershire-Dummerston complex, 15 to 35 percent slopes, very stony
- Vershire-Dummerston complex, 8 to 15 percent slopes, very stony
- Water

Scale=1:50,000
October, 2019

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Meters
0 250 500 1,000
1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334
1 inch = 4,167 feet

Figure 6 - EAFR Soil Types

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
- EAFR Boundary
- EAFR Roads

Data for Soil Types was determined by
the State of Vermont

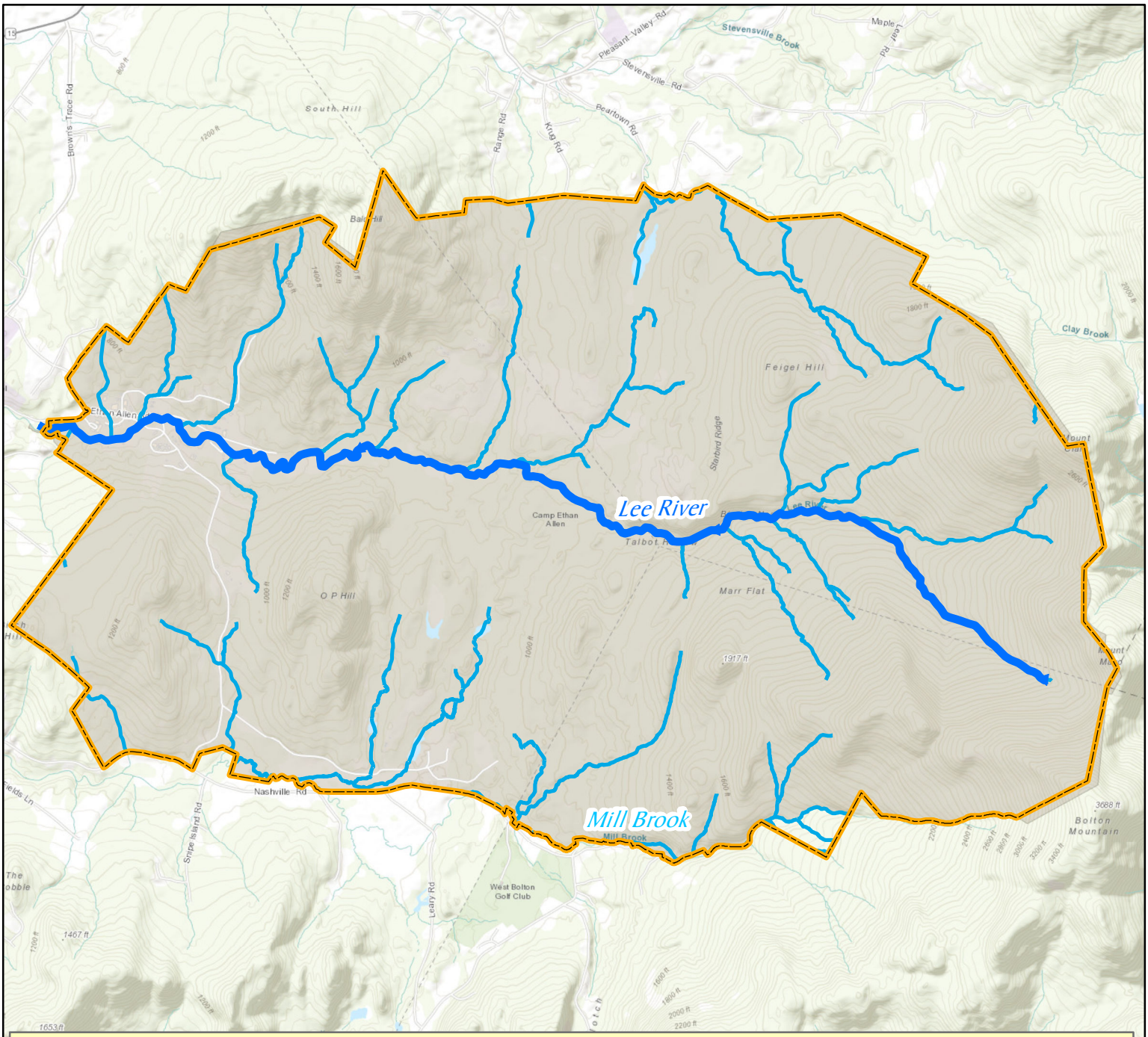

Figure 7 - EAFR Rivers, Streams and Tributaries

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October, 2019

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Meters
0 250 500 1,000
1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334
1 inch = 4,167 feet

Integrated Natural Resource Management Plan 2020-2025

Military Department
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Army National Guard

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Environmental Consulting

Legend
- *EAFR Boundary*
- *Streams & Rivers*

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Data for Tributaries provided by the State of Vermont

Although the Champlain Water District now supplies EAFR with potable water, EAFR was supplied by a series of rock wells that are still functional. The depth of the wells ranges from 200-300 feet, which is deep within the bedrock. EAFR has water Bedrock wells, which yield low to moderate amounts of water (0 to 23 liters per minute). In the narrow river valleys, layered stratified-drift deposits of sand and gravel of up to 18 meters thick fill the Lee River and Mill Brook Valleys. In these deposits the water table is generally within 3 meters below the land surface; overall ground-water flows from east to west.

Lee River and Mill Brook drain EAFR and have their headwaters within range boundaries. A few small tributaries occur with moderate-to-steep gradients. None are over a mile and a half in length. Several small ponds lie between Cushing and Feigel Hills. Beavers are currently active in these ponds and in many wetland areas. EAFR is drained by three riparian systems (Lee River and its tributaries, Mill Brook and its tributaries, and Steinhour Brook) Steinhour Brook, a tributary of Browns River, runs in the northern portion of the property. All three streams originate on the installation; therefore, no drainage is received from the surrounding areas.

The Lee River originates at the eastern end of the installation and flows west across the central portion of the property, exiting near the main gate. The Lee River joins the Browns River near Fairfax. Lee River drains approximately 58 percent of the installation, including all areas near National Guard buildings and the tank ranges. Several small ponds are located along the Lee River. Stream flow in the Lee River averaged 0.72 cubic meters per second (25.4 cubic feet per second) between December 2002 and December 2003. Streams are highly responsive to precipitation events in this mountainous environment and a comparison with other nearby watersheds shows that Lee River maintains relatively high stream flow during dry periods. Mill Brook drains the southern 30 percent of the installation, flowing east to west along the properties southern boundary. Steinhour Brook, which drains the northern 12 percent of the installation, flows north to the Browns River.

Concentrations of trace elements and nutrients in surface water sampled by the USGS are well below freshwater-quality maximum thresholds for the protection of aquatic life. Brook trout samples collected in 1992 and 2003 show trace-metal concentrations have decreased over the past 15 years. *Escherichia coli* concentrations in water samples are well below levels that restrict swimming at all five stream sites at moderate and low-flow conditions and in all observation wells. Comparisons among surface-water, streambed-sediment, and biological samples collected in 2003 to earlier studies at EAFR indicate water-quality conditions are similar or have improved over the past 15 years. Ground water in the stratified-drift aquifers at the facility is well buffered with relatively high alkalinities and pH greater than 6. Concentrations of arsenic, cadmium, chromium, lead, nickel, uranium, and zinc were below detection levels in ground-water samples. Barium, cobalt, copper, iron, manganese, molybdenum, and strontium were the only trace elements detected in ground-water samples. Cobalt and iron were detected at low levels in two wells near Mill Brook, and copper was detected at the detection limit in one of these wells. These same two wells had concentrations of barium and manganese 2 to 10 times greater than other ground-water samples. Concentrations of nutrients are at or below detection levels in most ground-water samples. Volatile organic compounds and semi-volatile organic compounds were not detected in any water samples from EAFR.

A report, EAFR, Streams, Rivers and Tributaries Report, Greenleaf Forestry, June 2009, summarizes the conditions of the Lee River, Mill Brook and Steinhour Brook within EAFR. Two stream assessment models were used, Rapid Assessment (RHA) and Rapid Geomorphic Assessment (RGA), to assess the potential for portions of these water bodies to provide aquatic habitat and a baseline for monitoring changes in floodplain and/or channel conditions. A variety of conditions were found in the forested areas of the Lee River, with poor conditions in central portion, improving in the westernmost sections of the River. Mill Brook exhibited fair to good conditions throughout its length within the range and Steinhour Brook is currently in excellent condition throughout its length in EAFR.

Chapter 5.0 Ecosystems and the Biotic Environment

5.1 Ecosystem Classification

This Chapter of the INRMP presents information on the flora and fauna of EAFR. The flora includes both the historic vegetation cover and its current vegetation, including species. Forest cover is the largest component of the landscape at EAFR. Although EAFR is an active military training facility, its large expanses of forest, wetlands, and maintained grassy openings create important habitats for numerous wildlife species. The ecosystem classification is based on an examination of natural communities. The natural communities and biota will be presented first; an examination of the forest types is next, followed by a presentation of the fish and wildlife within EAFR. The biological studies performed since the last INRMP are summarized in this chapter and are appended to this report.

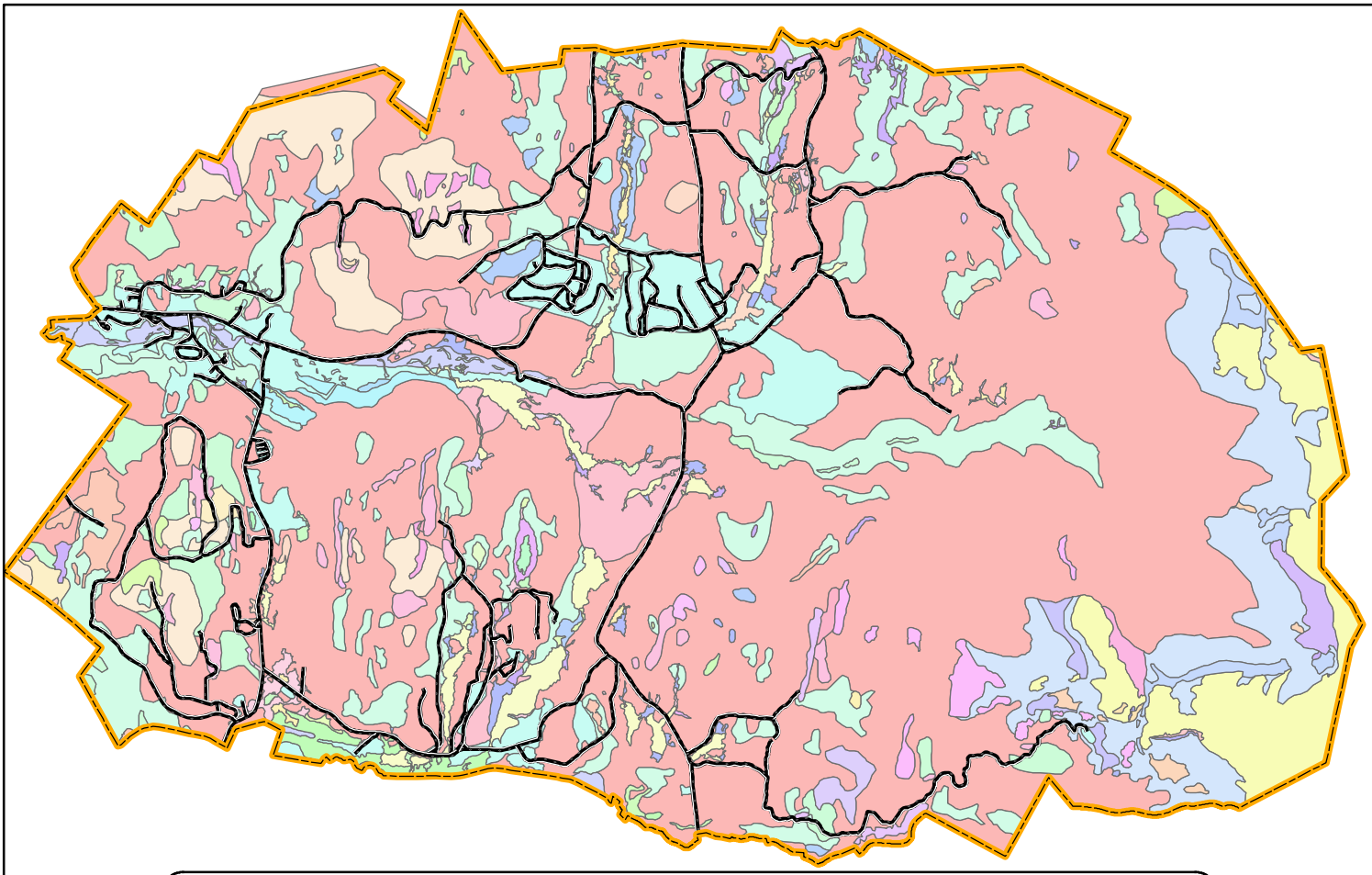
History of Vegetative Cover. EAFR is part of a larger ecosystem that includes mountain terrain and the lower foothills that form the boundary for the Champlain Valley. The prevalence of native plants and animals demonstrates that much of the biological diversity at EAFR has been preserved and is being improved. The most recent glacial event, the incursion of the Wisconsin ice sheet, caused the majority of plants native to the area at that time to be buried under tons of ice and glacial debris. Remnants of these populations can still be found further to the south. This has minimized the amount of locally significant plant species found in Vermont. The bedrock geology of the Range is mostly the Underhill formation phyllite and metaqraywacke with restricted inclusions of calcareous and amphibolitic greenstone. (*Robert A. Christman, and Donald T. Secor, Geology of the Camels Hump Quadrangle Vermont*) (Vermont Geological Survey, Bulletin No. 15, 1961) The glacial till soils derived from this bedrock are loamy and productive for forest growth. Except for restricted localities where the calcareous greenstone outcrops in combination with appropriate slope factors, the forest soils are typical and cannot be considered enriched. Alluvial and organic soils can be found along the rivers and in wetlands, respectively.

Current Vegetative Cover. Forest cover is the largest component of the landscape at EAFR. The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately ninety percent of EAFR is forested with five percent upland, non-forested and two percent wetlands. The remaining land is developed military construction. Although EAFR is an active military training facility, its large expanses of forest, wetlands, and maintained grassy openings create important habitats for numerous wildlife species.

5.1.1 Natural Community Assessment

In 2008, Mr. Brett Engstrom, working with VTARNG contractor GCI, completed a natural community assessment of EAFR. This report and detailed mapping is appended to this INRMP (Engstrom 2008). This report provides an easy-to-use reference for the VTARNG, to identify and prioritize the locations and habitats of known – as well as potential – rare, threatened, and endangered plant species on EAFR by natural community. Natural communities define the habitats for individual species are a useful lens through which to identify areas of conservation priority for rare, threatened, and endangered plant

The Natural Communities Report is used during natural resource and construction project planning. Although these sites are not protected by law, VTARNG is committed to managing these areas in a manner that protects their ecological value, see Figure 8, EAFR – Natural Commuities. Natural communities that have been classified in *Wetland, Woodland, and Wildland (*Elizabeth H. Thompson and Eric R. Sorenson) are categorized as significant or non-significant, which is a measure of conservation priority. In addition, natural communities are categorized as those which provide habitat for confirmed occurrences of rare plant species on EAFR and those that do not. Significant natural communities with confirmed rare plant occurrences are considered to be of highest conservation priority. Other factors that



Natual Communities

- Alder Swamp
- Alluvial Shrub Swamp
- Beech-Red Maple-Hemlock Forest
- Boreal Acidic Cliff
- Boreal Talus Woodland
- Dry Oak Forest
- Hemlock Forest
- Hemlock Swamp
- Hemlock-Hardwood Swamp
- Hemlock-Northern Hardwood Forest
- Hemlock-Red Spruce Forest
- Mesic Red Oak-Northern Hardwood Forest
- Montane Spruce-Fir Forest
- Montane Yellow Birch-Red Spruce Forest
- Montane Yellow Birch-Sugar Maple-Red Spruce Forest
- Northern Hardwood Forest
- Northern Hardwood Talus Woodland
- Poor Fen
- Red Maple-Black Ash Swamp
- Red Spruce-Hardwood Swamp
- Red Spruce-Northern Hardwood Forest
- Rich Northern Hardwood Forest
- River Cobble Shore
- River Sand or Gravel Shore
- Sedge Meadow
- Seep
- Semi-alluvial Seep
- Semi-rich Northern Hardwood Forest
- Shallow Emergent Marsh
- Sugar Maple-Ostrich Fern Riverine Floodplain Forest
- Temperate Acidic Cliff
- Temperate Acidic Outcrop
- White Pine-Northern Hardwood Forest
- Alluvial Grassland/Meadow
- Altered Land
- Artificial Pond
- Beaver Meadow
- Beaver Meadow and Pond
- Beaver Pond
- Cliff-Brow Spruce-Fir Thicket
- Dry-Mesic, Semi-Rich, Rocky Sugar Maple-Red Oak-Hophornbeam Forest
- Hemlock Seepage Forest
- High Elevation Northern Hardwood Forest
- Mixed Sloping Seepage Forest
- Montane Birch Glade Forest/Woodland
- Montane Paper Birch-Spruce-Fir Forest
- Montane Yellow Birch-Paper Birch Forest
- Northern Hardwood Seepage Forest
- Northern Hardwood-Hemlock Forest
- Red Spruce-Paper Birch Rocky Slope/Summit
- Seepage Woodland
- Sloping Seepage Forest
- Small Stream Alluvial Woodland
- Typical Northern Hardwood Forest
- Wet-Mesic Northern Hardwood Forest

Scale=1:50,000
October, 2019

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Meters
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1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334

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Figure 8 - EAFR Natural Communities

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
- EAFR Boundary
- EAFR Roads

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Data for Natural Communities was determined by the State of Vermont

may also be important to consider include wildlife habitat, proximity to development, presence of invasive species, and sensitivity to disturbance.

Four natural community types found at EAFR are considered rare in Vermont (ranked S1 or S2 by the Nongame & Natural Heritage Program), these EAFR natural communities, listed below, are all ranked S2, the lesser of the two rare classifications:

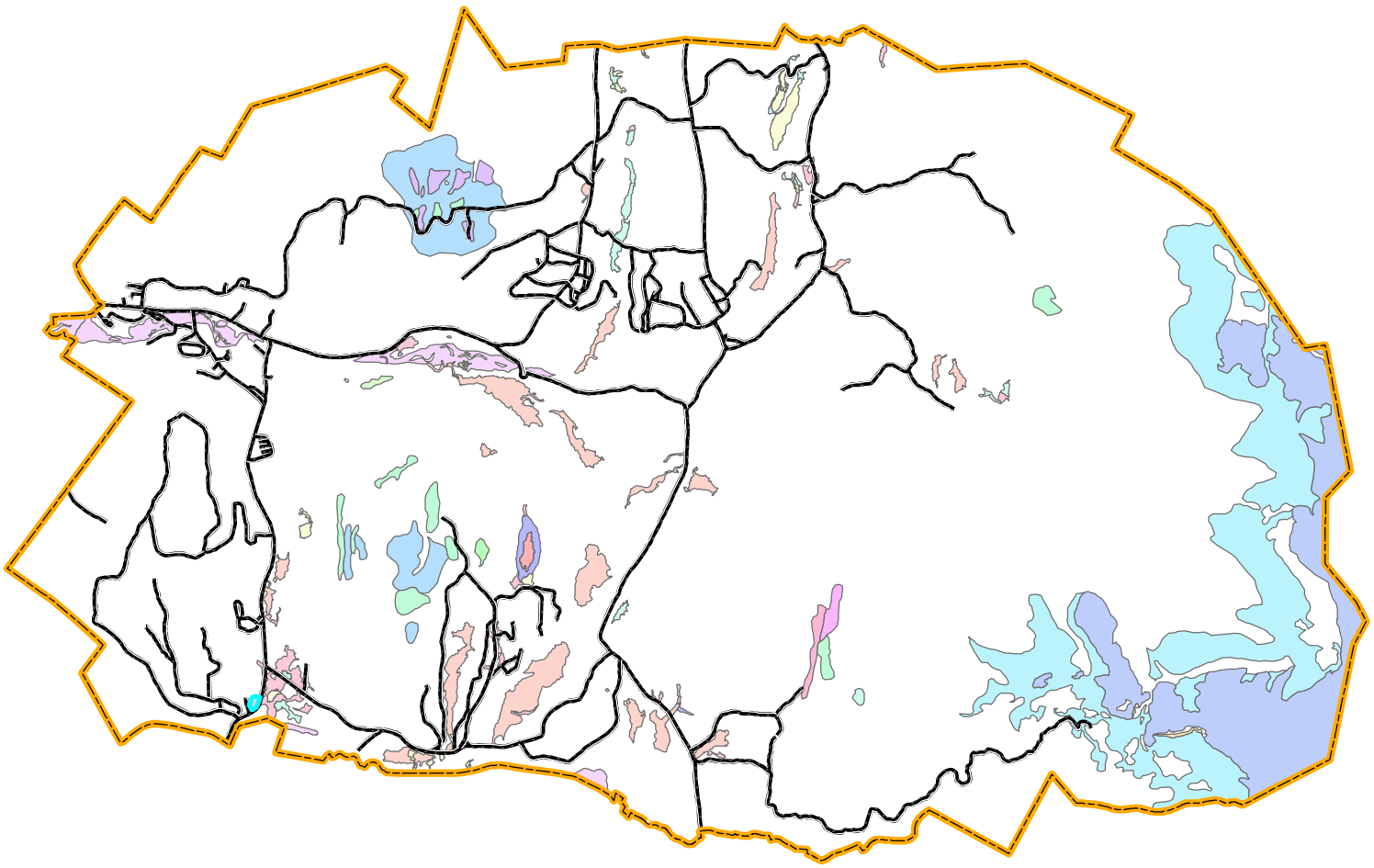
1. Sugar Maple-Ostrich Fern Riverine Floodplain Forest,
2. Hemlock Swamp,
3. Poor Fen, and
4. River Cobble Shore.

Of these rare natural community types, only the single Poor Fen occurrence (Otter Bog) is definitely significant on the state level. The other types may be significant on the state level, but need more inventory and documentation before the element occurrences can be ranked.

Occurrences of several of the more common (S3, S4, S5) natural community types at EAFR are provisionally ranked as state significant. These include Boreal Acidic Cliff, Montane Spruce-Fir Forest (occurrence extends off property), Montane Yellow Birch-Red Spruce Forest (also extends off of property), and Vernal Pool. Additionally, the Red Oak-Northern Hardwood Forest and Dry Oak Forest complex on Bald Hill, the Rich Northern Hardwood Forest of OP Hill, the Semi-Rich Northern Hardwood Forest and Seeps east of Feigel Hill, and the large beaver wetland complexes are at least locally significant. The first two of these complexes might be state significant. Although not found within the state classification, the three pristine "montane tall herb glade" occurrences found in the headwaters of Mill Brook are likely rare natural community types that warrant conservation.

Significant natural communities without confirmed rare plants are considered to be the next highest conservation priority, which includes Vernal Pools and Montane Spruce-Fir Forest, followed by unranked or non-significant natural communities with confirmed rare plants, which includes Boreal Calcareous Cliff, Northern Hardwood Talus Woodland, Hemlock Northern Hardwood Forest, and Northern Hardwood Forest. Three S2 natural communities without confirmed rare plants may be state-significant and are also of high conservation priority: Hemlock Swamp (including Hemlock-Hardwood Swamp variant), River Cobble Shore, and Sugar Maple-Ostrich Fern Riverine Floodplain Forest. Several unclassified natural communities and variants were identified that are not listed in *Wetland, Woodland, and Wildland*. Of these, the "montane tall herb glade" is of particular interest and conservation priority. Several of these communities also support confirmed occurrences of rare plants. All classified natural communities in this report include a list of potential rare plants that have been shown to be associated with these communities. These lists are intended to guide further survey work and to give a sense of the importance of different natural communities for habitat for rare plants. Several natural communities stand out as having the potential to support an exceptional diversity of rare plants. These include Poor Fen, Dry Oak Forest, Mesic Red Oak-Northern Hardwood Forest, Rich Northern Hardwood Forest, and Boreal Calcareous Cliff. The 14 Ecologically Significant Areas at EAFR, illustrated in Figure 9, EAFR - Ecologically Significant Areas, are based upon this inventory and analysis:

1. Otter Bog
   Approximate acreage: 23
   Description: Includes 4-acre state significant Poor Fen (S2) and associated wetlands in a beaver-impounded basin that likely has additional groundwater input. The Poor Fen is a large, floating, open peat mat in the center of the bog that is dominated by sphagnum mosses, sedges, and heath shrubs. The center of the mat is dominated by sphagnum moss with *Rhyncospora* and is surrounded by a sphagnum-leatherleaf mat. A 1942 aerial photo shows the open fen mat



Ecologically Significant Areas		
Alder Swamp	Mesic Red Oak-Northern Hardwood Forest	Sedge Meadow
Boreal Acidic Cliff	Montane Spruce-Fir Forest	Shallow Emergent Marsh
Dry Oak Forest	Montane Yellow Birch-Red Spruce Forest	Sugar Maple-Ostrich Fern Riverine Floodplain Forest
Hemlock Swamp	Northern Hardwood Talus Woodland	Beaver Meadow
Hemlock-Red Spruce Forest	Poor Fen	Beaver Meadow and Pond
	Rich Northern Hardwood Forest	Beaver Pond

Figure 9 - EAFR Ecologically Significant Areas

Scale=1:50,000
October, 2019

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Meters
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1 centimeter = 500 meters

Feet
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Legend
EAFR Boundary
EAFR Roads

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Data for the Ecologically Significant Areas was determined by Greenleaf Forestry and the Vermont National Guard.

surrounded by dense conifers indicating that the beaver meadow was a hemlock swamp until some time after 1942. Poor Fens are sites with exceptional potential to support a high diversity of rare plants. The rare plant, bog sedge (*Carex exilis* – S2) was confirmed in 1999 growing in a 15x30 m area on the west side of the bog mat.

2. Bald Hill Complex and Cove Forest

Approximate acreage: 150

Description: This site on either side of the Castle Trail on the ridges and slopes of Bald Hill is a complex consisting of a Mesic Red Oak – Northern Hardwood Forest (S4) matrix surrounding localized patches of Dry Oak Forest (S3) and Rich Northern Hardwood Forest (S4) on dry convex and rich concave slopes respectively. Both the Mesic Red Oak – Northern Hardwood Forest and Dry Oak Forest in this complex are locally significant and may be state significant. These communities also have the potential to support a high diversity of rare plants; four rare plant species have been documented in Dry Oak Forest communities in this complex, along with an additional four rare species in the Mesic Red Oak – Northern Hardwood Forest.

The Cove Forest is a 50 acre section of the Mesic Red Oak – Northern Hardwood Forest in this complex located south of the Castle Trail. This site is definitely state significant due to its excellent condition; this mature example shows little evidence of human disturbance over the past 150+ years. The generally closed canopy of red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), and basswood (*Tilia americana*) reaches 70-90 ft. and includes many individuals with tall, straight trunks 16-24 in diameter. "Old forest" structural characteristics are beginning to be evident including a broad distribution of tree diameters, multiple vertical vegetative layers, natural canopy gaps, and large amounts of coarse woody debris. The cove forest type is restricted to warm, moist hollow microsites that are separated by drier bedrock benches. Red oak regeneration in this forest is currently minimal. Dry Oak Forests upslope from the Cove Forest will likely be important oak seed sources for this community.

The forests of the Bald Hill Complex support five known rare plant species: Loose sedge (*Carex laxiculmis*), Back's sedge (*Carex backii*), bronze sedge (*Carex foenea*), drooping bluegrass, (*Poa saltuensis ssp. saltuensis*), and tall millet-grass, (*Milium effusum*).

3. Meyer's Dome Ravine

Approximate acreage: 33

Description: This north-south running ravine is formed where bedrock ledge and talus slopes descend steeply between two heights of land to the east of Meyer's Dome. The bottom of the ravine is a narrow, seasonal drainage filled with loose gravel, rich alluvium, moss-covered boulders, and woody debris in various states of decay. Loose talus and boulders along a portion of the ravine's slopes supports a Northern Talus Woodland (S3) that is likely state significant due to its excellent condition and connectivity. The soil in this community is thin, but rich with coluvium and supports a sparse canopy of yellow birch (*Betula alleghaniensis*), white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), and basswood (*Tilia americana*). Mountain maple (*Acer spicatum*) and red-berried elder (*Sambucus racemosa*) grow on the talus, along with a thick herb layer dominated by wood nettle (*Laportea canadensis*) in the lower ravine and polypody fern (*Polypodium virginianum*) and mosses on the upper slopes.

A good example of a Rich Northern Hardwood Forest (S4) occurs on a gently sloping terrace at the southern end of the ravine. Large-diameter (24+ inches) sugar maples form a shady canopy along with white ash and basswood. A lush herbaceous layer of rich indicator species is present. Blue cohosh (*Caulophyllum thalictroides*), wood nettle (*Laportia canadensis*), and Virginia waterleaf (*Hydrophyllum virginianum*) dominate. Wild ginger (*Asarum canadensis*), maidenhair

fern (*Adiantum pedatum*), and plantain-leaved sedge (*Carex plantaginia*) are also present. A Hemlock-Red Spruce Forest (S4) dominates the upper slope of the west-facing side of the ravine. The ravine is known habitat for the mourning warbler (*Oporornis philadelphia*), and provides potential habitat for the canada warbler (*Wilsonia canadensis*).

4. Upper Mill Brook Ravine
   Approximate acreage: 18
   Description: This steep-sloped ravine supports a mature example of a Hemlock- Northern Hardwood Forest (S4) that is locally significant due to its age.

5. Boreal Acidic Cliffs (S4)
   Approximate acreage: 2.5
   Description: These six cliffs are located on the northwest spur of Bolton Mountain and are likely state significant due to their excellent condition, connectivity, and collective size. The schist/phyllite cliff faces reach heights between 50-100 feet. Thickets of red spuce (*Picea rubens*), mountain paper birch (*Betula papyrifera var. cordifolia*), and mountain holly (*Ilex montana*) run along the tops of the cliffs. Stunted black spruce (*Picea mariana*) occurs on the brow of the eastern cliff face. The two larger cliffs have used for climbing and military training exercises in the past. This natural community supports three known rare plant species on EAFR: fragrant fern (*Dryopteris fragrans*), highland rush (*Juncus trifidus*), and alpine bilberry (*Vaccinium uliginosum*).

6. Montane Yellow Birch-Red Spruce Forest (S3)
   Approximate acreage: 573
   Description: This forest is likely state significant due to its excellent, undisturbed condition, connectivity, and large size. The 573 acres of this forest on EAFR are part of a larger significant element occurrence that extends off of the property. The forest forms a large matrix block on the steep, northeast-facing slopes of the headwaters of the Lee River between ~2,000-2,600 feet and extends in smaller patches along minor, higher-elevation drainages. It is dominated yellow birch with scattered red spruce, American beech, and red maple. The ground cover consists of wood ferns (*Dryopteris spp.*), shining clubmoss, and mountain sorrel. This natural community supports three known rare plant species: Tall millet-grass (*Milium effusum*), large-leaved avens (*Geum macrophyllum*), and boreal bedstraw (*Galium kamtschaticum*).

7. Rich Northern Hardwood Forest (S4), OP Hill
   Approximate acreage: 25
   Description: These 7 polygons (all under 20 acres) located on OP Hill are collectively locally significant and possibly state significant. Rich Northern Hardwood Forests grow on enriched sites, often slopes with colluvial inputs and/or sites where calcium-rich bedrock is at or near the surface. Because of this nutrient enrichment, these sites are often botanical "hotspots" that support a high diversity of plant species, especially in the herb layer. Many of these herbs, such as blue cohosh (*Caulophyllum thalictroides*) and hepatica (*Hepatica spp.*), are species that are so strongly associated with these rich sites, that their presence is used as an indictor of richness.

   Rich Northern Hardwood Forests are also hotspots for rare plants, making them sites worthy of special consideration when planning management and development projects. The OP Hill Rich Northern Hardwood Forests support three known rare plant species: glade fern (Athyrium pycnoparpon), Back's sedge (Carex backii), and tall millet-grass, (*Milium effusum*).

8. Rich Northern Hardwood Forest with Seeps (S4), Freigle Hill
   Approximate acreage: 10

Description: This area is at least locally significant due to their collective size and excellent condition. Seeps are woodland areas, frequently less than one-tenth acre in size, where ground water saturates soils year-round, creating a wetland growing environment for unique assemblages of plants and important amphibian breeding habitat. The plant assemblages growing in seeps vary with the pH of the groundwater, the extent of the surrounding forest canopy, and other physical characteristics of the site such as aspect and elevation.

9. Beaver Wetland Complexes
   Approximate acreage: 250
   Description: The beaver complexes at EAFR are at least locally significant and are made up shifting mosaics of several classified natural communities, including Sedge Meadows, Shallow Emergent Marshes and Alder Swamps, that are impacted by relatively regular cycles of disturbance by beavers and succession following beaver abandonment. Through this activity, beavers help to create a diversity of habitats for wetland plants and animals. Part of the significance of the wetland complexes at EAFR is their collectively large size and position in a relatively unfragmented landscape. One known rare plant occurs in the beaver wetland complexes at EAFR: Hayden's sedge (Carex haydenii).

10. Hemlock Swamp (S2), east of OP Hill
    Approximate acreage: 3
    Description: Hemlock Swamps are forested wetlands that are dominated by eastern hemlock (*Tsuga canadensis*). Soils are acidic, organic mucks that are generally saturated year-round by ground and/or surface water. The small example east of OP Hill has developed characteristics of a more mature forest structure, including windthrow and tip-ups. Although small, this example is likely state significant due to its mature condition, which is rare in Vermont.

11. Sugar Maple-Ostrich Fern Riverine Floodplain Forest (S2)
    Approximate acreage: 71
    Description: The forested portions in good current condition along the Lee River are locally significant. Sugar Maple-Ostrich Fern Riverine Floodplain Forests are found in the floodplains of higher energy, higher gradient streams and rivers, like the Lee River, and on terraces above lower gradient rivers. Soils are typically well-drained and are saturated for shorter durations than other floodplain forests. Alluvium deposited during flooding enriches the soil and supports a diversity of rich woods plants, such as wild leeks (*Allium tricoccum*) and ostrich fern (*Matteuccia struthiopteris*) which dominates the herb layer. Intact examples of this community are rare within Vermont since most sites have been converted to agricultural use. At EAFR, most of these floodplain forests are degraded, but the small, intact sections contribute greatly to the ecological diversity of the property.

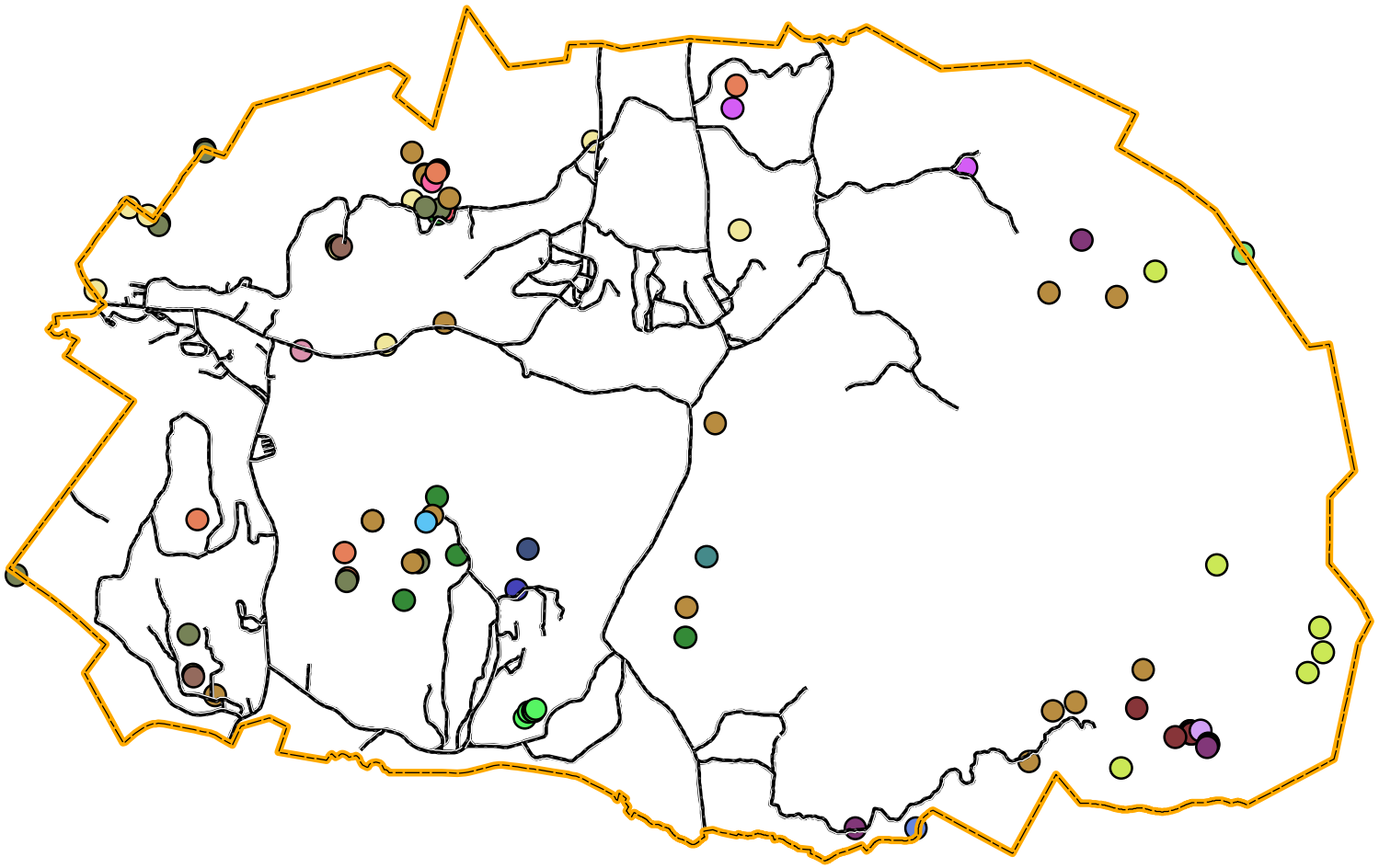
12. Vernal Pools (S3)
    Approximate acreage: 0.5
    Description: Vernal pools are small, ephemeral wetlands that often provide critical breeding habitat for amphibian species, such as the spotted salamander, whose eggs and larvae are preyed on by fish in permanent bodies of water. Typically, these pools form in shallow, woodland depressions that fill with spring rain and snow melt then dry up during the summer. Significant pools are natural pools that have been documented as supporting breeding amphibians in addition to being in good condition. Natural Resource Consulting Services (NRCS)'s inventory of vernal pools on the eastern half of the EAFR located 40 vernal pools and Greenleaf Consulting Inc (GCI) documented 19 on the western half of EAFR. These 59 vernal pools are likely to be viewed collectively as state-significant given their excellent landscape connectivity, and that at least some of them are in excellent condition, support breeding amphibians, and are large.

13. Montane Spruce-Fir Forest (S3)
    Approximate acreage: 397
    Description: Montane Spruce-Fir Forests are the dominant matrix community generally found above 2,500-2,700 feet in elevation along the spine of the Green Mountains in Vermont. They are characterized by a short growing season and high levels of cloud cover and precipitation. Soils are shallow, acidic, nutrient-depleted, and vulnerable to wind-throw which is a significant cause of natural disturbance in these forests. The Montane Spruce-Fir forest occurrence on EAFR consists of one large patch greater than 300 acres and several smaller patches ranging in size from 0.5-50 acres and in elevation from 2,200-3,600 feet. It is part of a larger documented occurrence that extends off of the property along the spine of the Green Mountains. This occurrence is considered significant since it is large, well-connected to the surrounding landscape, and generally mature and in good condition.

14. Montane tall herb glade (unclassified)
    Montane tall herb glade is proposed as a new natural community type by Brett Engstrom that is significant on EAFR due to its rarity, excellent condition, and connectivity. This is a very small community of lush herbaceous vegetation associated with seepage at higher elevations in the mountains. The one example found at EAFR is a 0.12-acre opening on a steeply-pitched slope at 2700 feet elevation in the upper Mill Brook drainage. Overhanging paper and yellow birch, and balsam fir, partly shaded the glade, and gangly clumps of mountain maple occur within the lush fern-herb-graminoid groundcover vegetation. Dominant groundcover species include mountain wood-fern (*Dryopteris campyloptera*), the grass *Glyceria melicaria*, the sedge *Carex gynandra*, large-leaved goldenrod (*Solidago macrophyllus*), white snakeroot (*Eupatorium rugosum*), wood nettle (*Laportea canadensis*), and pale touch-me-not (*Impatiens pallida*). Some uncommon species found in the community are wild millet (*Milium effusum*), Braun's holly-fern (*Polystichum braunii*), Kamtschtka bedstraw (*Galium kamtschticum*), and large-leaved avens (*Geum macrophyllum*). While seepage is clearly feeding the glade, not all the soil is hydric. Some of the soil is wet-mesic. The glade appears to be self-maintaining, perhaps because the herbaceous layer is so vigorous and the soil relatively unstable. While only a single example was observed at EAFR, two other sites were mapped nearby as the same glade community. Brett Engstrom has observed this same community in the mountains of far northern New Hampshire.

5.1.2 Rare, Threatened, and Endangered Plant Species

A total of 21 Rare, Threatened, and Endangered Plant Species were mapped at EAFR by Greenleaf Consulting Inc. in 2009. Of these, 12 are considered Rare (a Vermont Nongame and Natural Heritage Program (VNNHP) rarity rank of S1, S1S2, S2, or S2S3). Four of these 12 are considered Very Rare (VNNHP Rank of S1). Only one species found is State Endangered according to state statute. Table 1 provides a complete list and general characteristics of the species found (Figure 10, EAFR - Rare Plant Locations).



Rare Plants
Common Name

- Alpine Bilberry
- American Ginseng
- Back's Sedge
- Bog Sedge
- Boreal Bedstraw
- Bronze Sedge
- Drooping Bluegrass
- Fernald's Alkali Grass
- Fragile Rockbrake
- Fragrant Fern
- Glade Fern
- Hayden's sedge
- Highland Rush
- Large-leaved Avens
- Loose Sedge
- Minnesota Sedge
- Narrow Triangle Moonwort
- Pendulous Bulrush
- Small-flowered Rush
- Smooth Woodsia
- Summer Sedge
- Tall Millet-grass

Figure 10 - EAFR Rare Plant Locations

Scale=1:50,000
October, 2019

N
W E
S

Meters
0 250 500 1,000
1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334
1 inch = 4,167 feet

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
- EAFR Boundary
- EAFR Roads

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

Data for Rare Plant Locations was determined by the State of Vermont and GCI, Inc.

Table 1
List of Rare and Uncommon Plants Found at EAFR

Common Name	Scientific Name	State Rank	State Status	# Points
Summer Sedge	Carex aestivalis	S1	none	1
Highland Rush	Juncus trifidus	S1	none	4
Alpine Bilberry	Vaccinium uliginosum	S1	none	2
Bronze Sedge	Carex foenea	S1S2	E	2
Bog Sedge	Carex exilis	S2	none	1
Fragrant Fern	Dryopteris fragrans	S2	none	2
Small-flowered Rush	Luzula parviflora	S2	none	1
Smooth Woodsia	Woodsia glabella	S2	none	1
Loose Sedge	Carex laxiculmis	S2S3	none	12
Boreal Bedstraw	Galium kamtschaticum	S2S3	none	7
American Ginseng	Panax quinquefolius	S2S3	none	2
Drooping Bluegrass	Poa saltuensis	S2S3	none	9
Narrow Triangle Moonwort	Botrychium lanceolatum var. angust.	S3	none	2
Minnesota Sedge	Carex albursina	S3	none	1
Back's Sedge	Carex backii	S3	none	5
Fragile Rockbrake	Cryptogramma stelleri	S3	none	1
Glade Fern	Diplazium pycnocarpon	S3	none	5
Large-leaved Avens	Geum macrophyllum	S3	none	3
Tall Millet-grass	Milium effusum	S3	none	21
Pendulous Bulrush	Scirpus pendulous	S3	none	1
Fernald's Alkali Grass	Torreyochloa pallida var. fernaldii	S3	none	1
Source: GCI, 2009.				

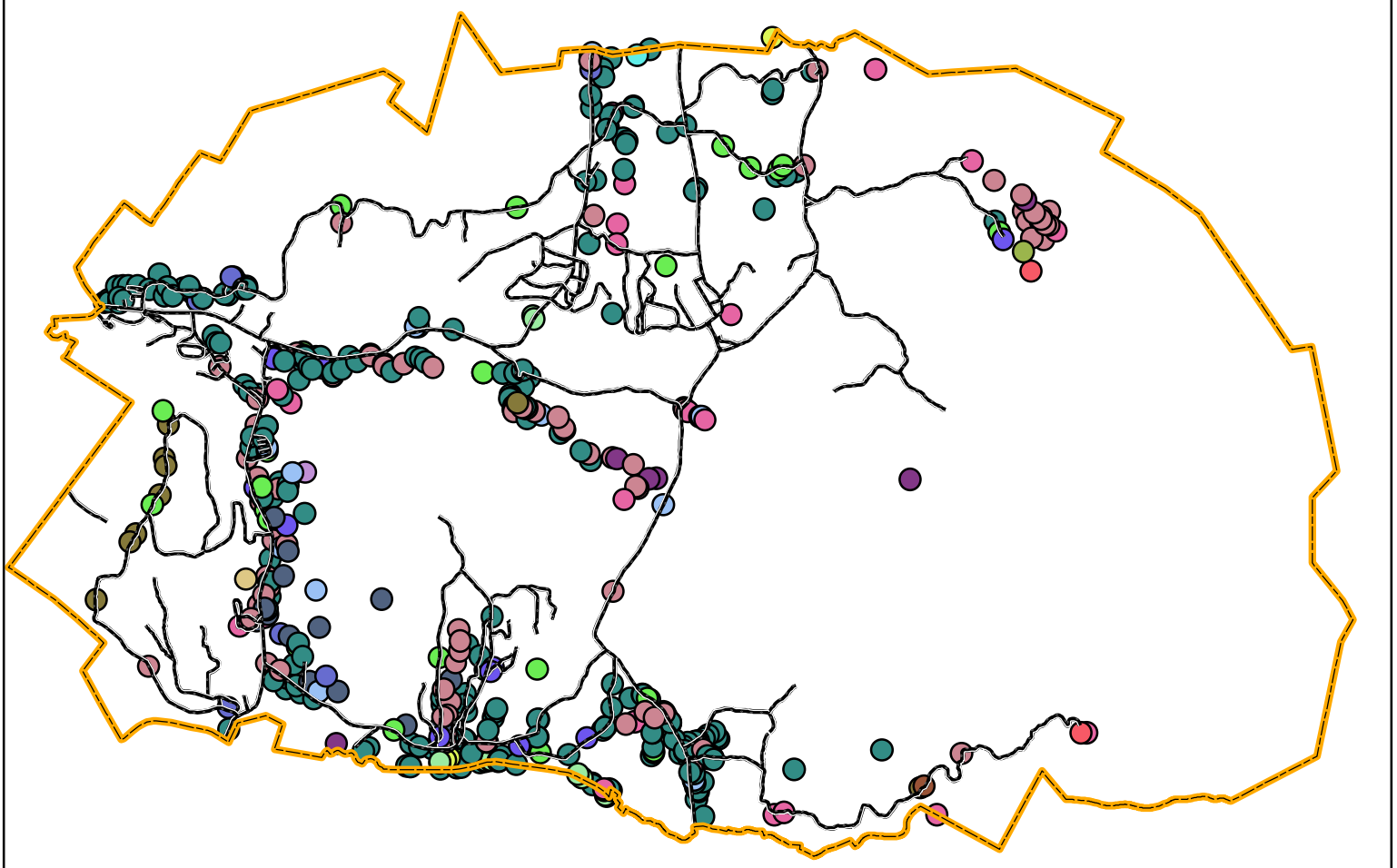
A Baseline Botanical Survey for the Land Condition Trend Analysis Project at EAFR was conducted by GCI in 2006, under contract to VTARNG. This floristic study of EAFR was designed to correspond with the LCTA program (land trend analysis). This report is a summary and analysis of baseline botanical survey collected in July and August 2005 from 51 permanently established plots.

5.1.3. Invasive Species Management Plan

A series of Invasive Species Management Plans were conducted for EAFR by GCI, under contract to VTARNG beginning in June 2009 through 2014, with the assistance of the Nature Conservancy of Vermont. The 2009 report created a baseline documentation of the level of invasive species infestation within the site and establishes a management plan. This report also documents the former and current uses of EAFR and their high likelihood of possessing existing invasive species infestation. (Figure 11, EAFR - Invasive Species Locations)

Annual Reports on the Invasive Species Management Plan from 2009 through 2014, indicate that the goals of the plan have been met. These goals include:

1. Manual & chemical control/removal of invasive populations,
2. Development and distribution of educational/outreach materials within EAFR and adjacent communities and,



Invasive Species Locations

- Japanese Barberry
- Japanese Knotweed
- Norway spruce
- Bedstraw
- Black Locust
- Coltsfoot
- Common Barberry
- Common Buckthorn
- Common Periwinkle
- Common Reed
- Glossy Buckthorn
- Goutweed
- Shrub Honeysuckle
- Moneywort
- Multiflora Rose
- Purple Loosestrife
- Reed Canary Grass
- Spotted Knapweed
- Wild Chevril
- Wormwood

Figure II - EAFR Invasive Species Locations

Scale=1: 50,000
October, 2019

N
W E
S

Meters
0 250 500 1,000
1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334
1 inch = 4,167 feet

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Legend
- EAFR Boundary
- EAFR Roads

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Data for Invasive Plant Species Locations was collected by GCI, Inc. Summer, 2007

3. Workshops for EAFR and community members on invasives identification, removal methods and monitoring.

Areas where known Rare, Threatened & Endangered (RT&E) species and/or natural communities interfaced with invasive species locations (ISLs) were identified as top priority for treatment. The project focused on species that are characterized as Class B Noxious Weeds by the Vermont Invasive Invasive Plant Fact Sheet Series. They fall under plant quarantine laws and regulations. Sale, transport, and possession of these plants are prohibited. The Class B species treated at EAFR were Japanese Honeysuckle, Common & Glossy Buckthorn, Common Reed, Purple Loosestrife & Japanese Knotweed. Vermont Watch List species treated at EAFR included Japanese Barberry, Spotted Knapweed and Reed Canary Grass.

Actions include:

- Cut-stump for honeysuckle and buckthorn (Manual *removal* and chemical control)
- Repeated treatment of Japanese Knotweed (The plants will be weed whacked, treated with 30% glyphosate and covered with 5-7 ml plastic sheeting. The sheeting was removed after a season at which time subsequent treatments were applied.
- Treatments for Common Reed and Reed Canary Grass

Continued education and outreach, monitoring and control efforts will be vital over the coming years to ensure the effectiveness and success of the invasive species management program for the Vermont National Guard. Increased awareness of invasive plants and the threat they pose will aid in the plant populations' mitigation and spread. A dramatic reduction and/or eradication of existent invasive plant populations are imperative for the vitality of natural resource management at both installations. In the years to come it will become increasingly more important for the Vermont National Guard to continue the work that has started and to prevent new species or populations from threatening the management of their natural resources.

5.1.4 Wetlands

Wetlands are defined by the USEPA as "those areas that are inundated or saturated by surface or groundwater 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." Wetland areas have been identified at EAFR. Figure 12, EAFR - Wetlands, illustrates mapped Class II and Class III wetlands of EAFR.

During the fall of 1996, all Class Two Wetlands from the National Wetlands Inventory were delineated and mapped, except those that were inside the General Dynamics "cone of fire". Seven wetlands within the cone itself were delineated in 1997 and 1998 when activity at the test firing facility permitted.

As required by provisions of the Vermont Wetland Rules, delineations were done using the methodology contained in the 1998 Federal Manual for Identifying and Delineating Jurisdictional Wetlands. Documentation of wetlands boundaries is provided through data recorded on U.S. Army Corps of Engineers data forms for transects established at various points along the delineated boundary. These forms contain information on plant species composition and abundance, descriptions of soil horizons, and evidence of hydrology at wetland and upland points of either side of the boundary. Transects were completed for representative boundary type and at sites where there was a marked change in boundary characteristics.

All wetlands in Vermont are classified as Class I, II or III. Class I wetlands are those wetlands that, in and

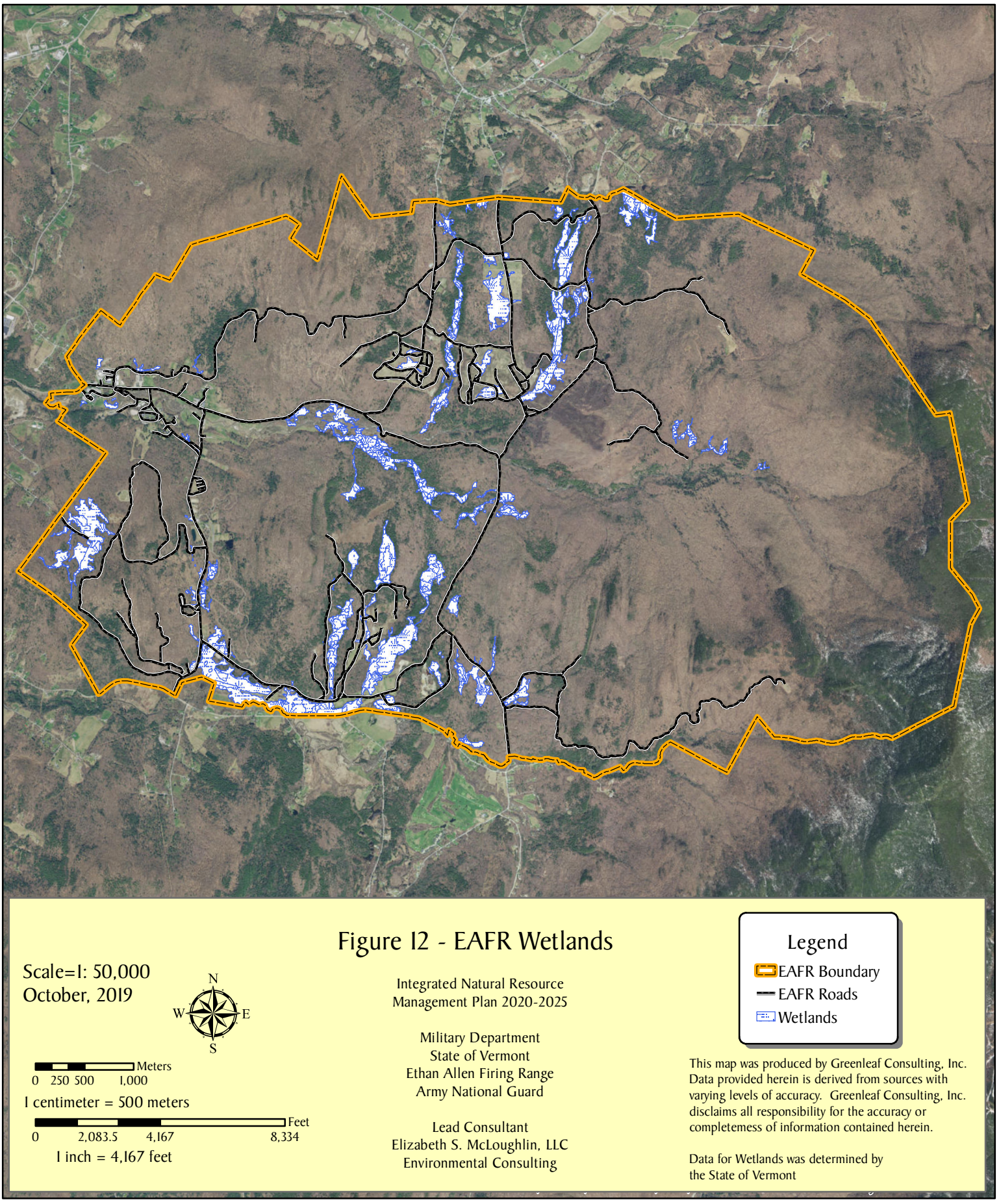

Figure 12 - EAFR Wetlands

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Scale=1: 50,000
October, 2019

N
W E
S

Meters
0 250 500 1,000

1 centimeter = 500 meters

Feet
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Legend
- EAFR Boundary
- EAFR Roads
- Wetlands

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Data for Wetlands was determined by the State of Vermont

of themselves, are exceptional or irreplaceable in their contribution to Vermont's natural heritage and are therefore so significant that they merit the highest level of protection. There are no identified Class I wetlands on EAFR. Class II wetlands are those other than Class I that are found to be so significant, either taken alone or in conjunction with other wetlands, that they merit protection under the Vermont wetland rules. Class IIII wetlands are those that are not significant enough to merit protection under the Wetland Rules.

Some of the wetlands on the training site are natural, but others have been created by excavation, impoundment, either manmade or by wildlife, or modifications to the drainage flow. The majority of the wetlands on EAFR have been formed during use of the drainage ways by beavers or muskrats. Most of the wetlands are attributed to tributaries of either Mill Brook or the Lee River, however, some are associated with changes in drainage patterns over the years since the areas were cleared and farmed. The areas south and west of Birch Hill that are now classified as Class II wetlands were functional farm meadows less than 60 years ago. An area is considered a wetland regardless of how it was formed. EAFR contains 475 acres of wetlands.

5.1.5 Riparian Habitat

Riparian habitat is characterized by vegetated areas along bodies of freshwater including streams, lakes and rivers. Riparian areas are beneficial to water bodies. The essential component of these riparian areas is vegetation. Riparian areas typically have high levels of species productivity and greater species diversity than upland sites. Broader riparian zones have greater species diversity than narrow, steep-sided riparian areas. The diversity of species is critical in providing protection from extreme changes in environmental conditions such as those created by floods or forest fires. Rich riparian diversity is partially due to the presence of many species adapted to two adjacent habitat types; this is known as the "edge effect." Grassy areas surround most of the water bodies at EAFR or forested areas, which can help trap the sediment load transported by storm water before it enters the water system and can help stabilize the stream banks to avoid additional erosion problems. However, descriptive characterizations and quantitative habitat assessments have not been conducted for these areas. Without this information, the ecological integrity of EAFR's riparian areas remains unknown.

5.1.6 Vernal Pools

Vernal pools, also called vernal ponds or ephemeral pools, are temporary pools of water. They are usually devoid of fish, and thus allow the safe development of amphibian and insect species. A 2003 report, "Identification and Characterization of Vernal Pools in the Eastern Half of EAFR" was conducted by Natural Resource Consulting Services (NRCS). This inventory of vernal pools on the eastern half of the EAFR located 40 vernal pools. UVM documented 19 on the western half of EAFR. These 59 vernal pools are likely to be viewed collectively as state-significant given their excellent landscape connectivity, and that at least some of them are in excellent condition, support breeding amphibians, and are large, see Figure 13, EAFR - Vernal Pools.

Vernal pools constitute a vital habitat types, and both human-made and natural vernal pools on EAFR support breeding populations of many amphibians and aquatic invertebrates. The pools identified in this study ranged widely in species diversity and abundance. The highest quality pools were likely those containing the highest observation and richness totals, indicating that their physical characteristics and landscape context provided the best combination of habitat features for breeding species, both in the 2003 season and in previous years. Virtually all pools at EAFR contained species that are adapted to life in vernal pools but also use other wetlands for breeding and other lifecycle elements (Kenney and Burne 2000). Some pools provide marginal breeding habitat for amphibians. However, the researchers were unable to develop a season-long assessment of amphibian breeding status. It is possible that amphibian

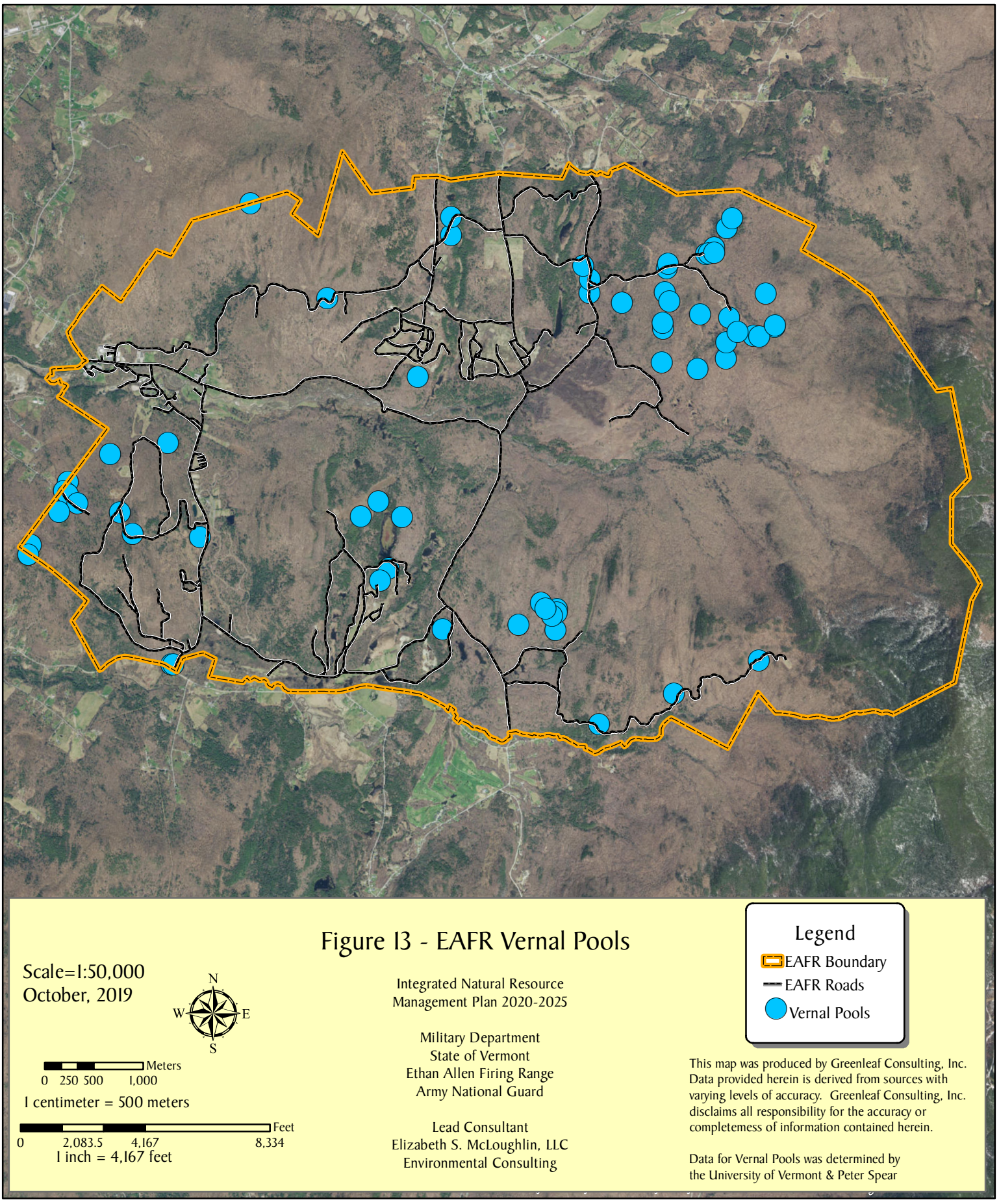

Figure 13 - EAFR Vernal Pools

Scale=1:50,000
October, 2019

N
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Meters
0 250 500 1,000

1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334

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- Vernal Pools

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Data for Vernal Pools was determined by the University of Vermont & Peter Spear

richness at individual pools is underestimated.

Given the long history of anthropogenic disturbance on EAFR, initially from farming and later from military operations, many of the identified pools were likely human-made. The origin of the pools was not always apparent, but we estimated that more than half of the pools were created by past landscape disturbances. Interestingly, however, some of the more productive pools were human-made. The high productivity of these pools indicates that, at least on EAFR, the degree of naturalness is not a good predictor of pool quality; human-made pools may provide habitat of equal or higher quality. Consequently, human-made pools should be afforded the same status as naturally-formed ones (Calhoun et al. 2003).

5.2 Fish and Wildlife

Surveys were conducted for fish, amphibians, reptiles, birds, mammals, and invertebrates on EAFR. Special attention was directed toward locating any threatened, endangered, or rare species suspected on the base. Surveys for birds and mammals are ongoing and occur to some extent on an annual basis. Wildlife found at EAFR is diverse due to the mix of forests, riparian areas and open areas. Ongoing scheduled surveys on EAFR include mammals, birds, *amphibians and reptiles.*

A "Habitat Assessment of Vermont Species of Greatest Conservation Need, Species of Concern and Federally Listed Species at the EAFR" was prepared by Keith and Allan Thompson of Northern Stewards, under contract to VTARNG in 2008. This report summarizes habitat needs, habitat suitability, and probability of occurrence at EAFR, based on available habitat of EAFR for High Priority Species of Greatest Conservation Need, state listed as Species of Concern (SC), threatened (T) or endangered (E), and federally listed as T or E. Some of these lists overlap, between these classifications and the species included in this report will be referred to as Species of Greatest Conservation Need or SGCN. Habitat preferences are based on extensive literature reviews and experience. Habitat availability, suitability and probability of occurrence are based on extensive experience with the range habitats and GIS land use/land cover maps. This report summarizes habitats for 42 species and each concludes with management, monitoring and/or survey recommendations based on population status, habitat preferences, and habitat availability. Species whose range or preferred habitat does not overlap with EAFR are not included in the report to forego allocating energy managing for species we can confidently say, will not occur within the EAFR. This information, and additional guidance from Northern Stewards, provides a basis for much of the management recommendations for the INRMP found in Chapter 7.0 of this report.

5.2.1 Mammals

Biologists have recorded thirty-two mammals at EAFR. Mammals present include common mammals such as white-tailed deer, cotton-tailed rabbits, moose, black bear, beaver, red fox, coyote and muskrat. Species also recorded are those less commonly seen in Vermont such as bobcat and fisher. Results of summer spotlight surveys and wintertime track surveys are assessed in this report. As large areas of clearings (new tank range at Range 6-6) have created increased "fringe areas" that improve habitat for certain wildlife, the number of observed quantities and species have increased. 25 species of greatest conservation need have been identified as potentially present on EAFR.

Table 2 Status of Mammal Species, EAFR			
Common Name	Scientific Name	State Status	SGCN Priority Level
American water shrew	*Sorex palustris*		High Priority
Long-tailed shrew	*Sorex dispar*		High Priority
Pygmy shrew	*Sorex hoyi*		High Priority
Masked shrew	*Sorex cinereus*		Medium Priority
Smoky shrew	*Sorex fumeus*		Medium Priority
Hairy-tailed mole	*Parascalops breweri*		Medium Priority
Indiana bat	*Myotis sodalist*	State and Federally E	High Priority
Small-footed bat	*Myotis leibii*	State T	High Priority
Eastern pipestrelle	Pipistrellus subflavus		High Priority
Eastern red bat	*Lasiurus borealis*		High Priority
Hoary bat	*Lasiurus cinereus*		High Priority
Silver-haired bat	*Lasionycteris noctivagans*		High Priority
Little brown bat	*Myotis lucifugus*		Medium Priority
Big brown bat	*Eptesicus fuscus*		Medium Priority
Southern Flying Squirrel	*Glaucomys volans*		Medium Priority
Northern Flying Squirrel	*Glaucomys sabrinus*		Medium Priority
Rock vole	*Microtus chrotorrhinus*		High Priority
Woodland vole	*Microtus pinetorum*		High Priority
Southern bog lemming	*Synaptomys cooperi*		High Priority
American Marten	*Martes americana*	State E	High Priority
Canadian lynx	*Lynx canadensis*	State E Federally T	High Priority
Muskrat	*Ondatra zibethicus*		Medium Priority
Common gray fox	*Urocyon cinereoargenteus*		Medium Priority
Black bear	*Ursus americanus*		Medium Priority
Long-tailed weasel	*Mustela frenata*		Medium Priority
Mink	*Neovison vison*		Medium Priority
Northern river otter	*Lontra canadensis*		Medium Priority
Bobcat	*Lynx rufus*		Medium Priority
Source: Northern Stewards, 2007.			

Bat and Mammal Study. Bats have been the subject of numerous recent studies at EAFR. Beginning with Northern Stewards small mammal trapping inventory of EAFR from 2007 to the recent bat study by Vesper Environmental, LLC (2015), bats have been assessed within EAFR. This work includes the Informal Consultation and Management Guidelines For The Northern Long-eared Bat Involving Ongoing Operations on Army National Guard Property (2015). The intent of this consultation is to evaluate Military operations and activities on Army National Guard (ARNG) installations and facilities that may affect, but are not likely to adversely affect (NLAA) the northern long-eared bat (*Myotis septentrionalis*; NLEB), a species listed as Threatened under the ESA as of May 4, 2015 (USFWS 2015a). The ARNG, in cooperation with the USFWS, has proposed guidelines containing operating procedures/conservation measures for the NLEB that the USFWS has deemed acceptable .

Northern long-eared bats (Myotis septentrionalis) (northern bats) were common across most of the state of Vermont prior to 2005. With the arrival of the disease White Nose Syndrome (WNS) in 2006 (Blehert et. al. 2009) the species suffered severely and by 2010 had declined by over 99% in known hibernacula within the State (Turner et al. 2011) by 2010. They are still likely declining and are now rarely netted in Vermont during the summer months (Scott Darling personal communication 2015). The species is now

protected under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as threatened (northern bat) under the Endangered Species Act (ESA) of 1973, as amended.

A 2015 netting survey intended to capture northern bats conducted at the Vermont National Guard Camp Ethan Allen Training Site, the survey was conducted as a follow-up to 2014 acoustic surveys that recorded calls attributed to northern bats (Thompson 2014). Camp Ethan Allen Training Site 2015 Bat Netting Survey Bat densities as measured by captures (0.42 bat captures per net night) and acoustic detections (14.5 per detector- night) were very low by historical standards but within reasonable values for higher elevation areas since the onset of WNS. The netting and acoustic results were similar in that big brown bats were the most common species detected by both methods and two of the three species predicted by MLE's were captured in nets. Northern bats were not present at the sampling sites in densities that were detectable at this level of effort.

Vermont's bats require roosting habitat; where they spend the nights and more importantly raise their young. These roosting sites are typically found within 1 mile of water and foraging areas. At least four types of roosting sites are used by Vermont bats. The highest numbers of individuals of typically, the big brown and little brown, use buildings or other man-made structures. Tree boles with exfoliating bark, cracks or crevices where bats can crawl under and colonize and raise young are used by northern long-eared bats, Indiana bats and to a lesser extent, little brown bats. Canopies of softwoods or red oaks are used by canopy roosting bats like red, hoary and silver-haired bats. And lastly, rocky cliffs and talus slopes are used as well by eastern small footed bats. Keeping in mind that there is some overlap with roosts used by a given species. All bats will use wetlands, fields, and forests during a foraging bout but have specific within-site foraging niches based on form and function. These niches are not important here.

Table 3
Number and Percentage of Total Captured for EAFR
Small Mammal Inventory.

Common Name	Scientific Name	Number (n)	Percent
Deer or white footed mouse	*Peromyscus* spp	114	70
Southern red-backed vole	*Clethrionomys gapperi*	18	11
Northern short-tailed shrew	*Blarina brevicauda*	8	5.5
Eastern chipmunk	*Tamias striatus*	9	5.5
Red squirrel	*Tamiasciurus hudsonicus*	7	4.3
Short-tailed weasel	*Mustela erminea*	2	1.2
American toad	*Bufo americanus*	2	1.2
Meadow vole	*Microtus pennsylvanicus*	1	0.6
Southern flying squirrel	*Glaucomys volans*	1	0.6
Masked shrew	*Sorex cinereus*	1	0.6
Source: Northern Stewards, 2007.			

Fifteen small mammal species expected to be found were not detected during this survey. The water shrew (*S. palustris*), long-tailed shrew (*S. dispar*), pygmy shrew (*S. hoyi*), rock vole (*Microtus chrotorrhinus*, and the southern bog lemming (*Synaptomys cooperi*) require specific habitats and are rarely detected. Low detection probabilities result from low densities of individuals and the percent of traps covering each specific habitat. The smoky shrew (*S. fumeus*), woodland vole (*Microtus pinetorum*), meadow and woodland jumping mice (*Zapus hudsonius* and *Napaeozapus insignis* respectively), are common to uncommon in Vermont. Preferred habitats of these species were represented in our trapping grid but were not detected on the range. Habitats normally occupied by the muskrat (*Ondatra zibethicus*),

Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*), and the northern flying squirrel (*Glaucomys sabrinus*) were not included in the trapping grid. These common species, while not detected, are most likely present.

The muskrat is an aquatic species that spends most of its time in water or along the banks of water bodies. Trap locations in close proximity to water is avoided due to the possibility of drowning. The Norway rat and house mouse are usually found in and around buildings and no traps represented these habitats. The Northern Flying squirrel prefers mature hardwood and boreal forests and no traps represented boreal forests. Aquatic habitats, transitional boreal forests, and man-made structures are all present on the range and most likely support the muskrat, Norway rat, house mouse, and the northern flying squirrel. Two short-tailed weasels were detected as well. The masked shrew (*Sorex cinereus*) and the southern flying squirrel (*Glaucomys volans*) are considered by Vermont Fish and Wildlife to be Species of Greatest Conservation Need.

Bot fly larvae were found in *Peromyscus* spp. Bot flies lay eggs in the ground and burrows of mice. The eggs hatch and small larvae enter through nose, mouth, eyes, or wounds and travel to the lower abdomen where they grow to 1-2cm in length. Bot fly larvae parasitize the body, reduce reproductive success, and are associated with population decline (Burns et al 2005). Bot flies are regularly associated with mice, squirrels, and lagomorphs.

5.2.2 Birds

Biologists have reported sighting over 100 species of breeding birds during surveys conducted in 1998. Of the birds found on the Range, only the great blue heron and the whip-poor-will are tracked by the Vermont Nongame and Natural heritage Program as uncommon breeding birds in Vermont. No federally threatened or endangered birds have been observed so far as nesting species at the Range. *23 species of greatest conservation need have been identified as potentially present on EAFR.* The diverse communities at EAFR provide the needed habitat for many species. The fringe areas on the edges of the many range clearings, wetlands, open ledges, and the overgrown pastures provide a diverse mix of habitats.

One hundred three species of breeding birds were recorded during the 1998 breeding season. This compares with 193 breeding birds recorded in the state. The siting of over half the breeding birds of the state is quite remarkable, given that the Range's 17.5 square-mile area is roughly one-fifth of a percent of the state's 9,609 square miles.

The ten most frequently encountered, and abundant species, in decreasing order, are red-eyed vireo, black-throated blue warbler, ovenbird, winter wren, black-throated green warbler, veery, hermit thrush, rose-breasted grosbeak, American robin, and common yellowthroat/ yellow-bellied sapsucker (tied). Not surprisingly, 42 percent of the breeding birds are associated with hardwood and mixed forests. However, the number of species associated with forested (montane plus hardwood forests) habitat types compared to the non-forested habitat types (wetlands, field and shrubby lands, and aerial) are nearly equal, 49 to 44, respectively, even though the non-forested habitat types cover a much smaller proportion of the landscape.

Of this group of 103 breeding species listed, over 80% of the species are migratory. Of these migratory species, over half are neo-tropical migrants, meaning they primarily winter in Central and South America and the West Indies, while the other half are short-distance migrants, wintering in the United States, sometimes only as far away as southern New-England. The high percentage of migratory birds has profound implications for avian conservation. Of the birds found on the Range, the Vermont Nongame and Natural Heritage Program track only the great blue heron and the whip-poor-will as uncommon breeding birds in Vermont. No federally threatened or endangered birds have been observed so far as

nesting species at the Range. Species managed for and listed as R, T, or E or Identified as Medium or High Priority in Vermont's Wildlife Action Plan. Are presented in Table 4.

Table 4
Status of Bird Species, EAFR

Common Name	Scientific Name	State Status	SGCN Priority Level
American Bittern	*Botaurus lentiginosus*		High Priority
Least bittern	*Ixobrychus*	State SC	High Priority
Great Blue Heron	*Ardea Herodias*		Medium Priority
Black-crowned night heron	*Nycticorax nyticorax*		Medium Priority
Coopers Hawk	*Accipiter cooperii*	State SC	Medium Priority
Northern Goshawk	*Accipiter gentilis*		Medium Priority
Red-shouldered hawk	*Buteo lineatus*		Medium Priority
American kestrel	*Falco sparverius*		Medium Priority
Peregrine falcon	*Falco peregrines*		High Priority
Ruffed grouse	*Bonasa umbellus*		Medium Priority
American woodcock	*Scolopax minor*		Medium Priority
Upland sandpiper	*Bartamia longicauda*	State E	High Priority
Black-billed cuckoo	*Coccyzus erythropthalmus*		Medium Priority
Barn owl	*Tyto alba*	State SC	Medium Priority
Short-eared owl	*Asio Flammeus*	State SC	Medium Priority
Long-eared owl	*Asio otus*	State SC	Medium Priority
Whip-poor-will	*Caprimulgus vociferus*	State SC	High Priority
Common nighthawk	*Chordeiles minor*		High Priority
Chimney swift	*Chaetura pelagic*		Medium Priority
Black-backed woodpecker	*Picoides arcicus*	State SC	Medium Priority
Purple martin	*Progne subis*		High Priority
Sedge Wren	*Cistothorus platensis*	State E	High Priority
Olive-sided flycatcher	*Contopus cooperi*		Medium Priority
Veery	*Catharus fuscescens*		Medium Priority
Bicknell's Thrush	*Catharus bicknelli*	State SC	High Priority
Wood thrush	*Hylocichla mustelina*		Medium Priority
Brown thrasher	*Toxostoma rufum*		Medium Priority
Blue-winged warbler	*Vermivora pinus*		Medium Priority
Chestnut-sided warbler	*Dendroica pensylvanica*		Medium Priority
Black-throated blue warbler	*Dendroica caerulescens*		Medium Priority
Prairie warbler	*Dendroica discolor*		Medium Priority
Bay-breasted warbler	*Dendroica casanea*		Medium Priority
Blackpoll warbler	*Dendroica striata*		Medium Priority
Canada warbler	*Wilsonia canadensis*		High Priority
Cerulean warbler	*Dendroica cerulean*	State SC	Medium Priority
Wilson's Warbler	*Wilsonia pusilla*	State SC	
Grasshopper Sparrow	*Ammodramus savannarum*	State T	High Priority
Henslow's Sparrow	*Ammodramus henslowii*	State E	Medium Priority
Vesper sparrow	*Pooecetes grammineus*	State SC	High Priority
Field Sparrow	*Spizella pusilla*		Medium Priority
Rufous-sided towhee	*Pipilo erythophthalmus*		High Priority
Rusty Blackbird	*Euphagus carolinus*	State SC	Medium Priority
Source: Northern Stewards, 2007.			

5.2.3 Reptiles and Amphibians

Reptiles. Biologists have reported 2 turtles, and 3 snakes present on EAFR. Historically maligned, snakes have gone through population declines as a result of human caused mortality. In addition, the maturing of forests results in reduced habitat suitability. Snakes are predators of small mammals and prey for birds of prey. Turtles are long lived and don't become reproductive until late in life. In addition, turtle eggs are subject to predation by meso carnivores, which are subsidized by increased fragmentation. As a result, turtle populations are subject to many disturbances and populations have difficulty rebounding. Lee River and Mill Brook and the many wetlands offer excellent habitat for most of Vermont's turtles. Surveys are planned to inventory turtle populations and identify preferred habitat.

Amphibians**.** Biologists have reported 6 salamanders and 7 frogs present in the variety of wetlands at EAFR. Amphibians play an important role in ecosystem functions; they bridge the gap between aquatic-terrestrial food webs, and trophic levels. They also can act as the canary in a coal mine water quality. Amphibian populations around the world and in Vermont are in continued decline as a result of a variety of habitat damaging effects. Amphibians are very susceptible to terrestrial and aquatic habitat disturbances. Erosion, silt deposition and water temperature changes are the main reason for local declines but the chytrid fungus has been implicated in regional declines, in southern latitudes. Species not recorded but possible include the Jefferson salamander, additional surveys are planned to survey for vernal pool breeders, like the Jefferson salamander.

Thirteen species of amphibian and five species of reptiles have been identified at EAFR. None of these are rare or endangered. The most interesting species is the ring neck snake. This small snake is unusual in Vermont although in a few pockets of southern Vermont it is more frequently found. It is found in the cove forest area of EAFR. It is listed as an S4 species. S4 species are those listed by the Vermont Non-game and Natural Heritage Program as apparently secure, but unusual. The spring salamander, an S4 species, is the most unusual salamander located so far. It requires cold, clean, well oxygenated moving water and was located it in tributaries of both the Lee and Mill Brook. It is a higher order predator and hence is not found in great abundance.

Table 5
Status of Reptiles and Amphibian Species, EAFR
Amphibians/Reptiles

Common Name	Scientific Name	State Status	SGCN Priority Level
Fowlers Toad	*Anaxyrus fowleri*	State SC	High Priority
Boreal chorus frog	*Pseudacris maculata*	State E	High Priority
Jefferson salamander	*Ambystoma Jeffersonianum*	State SC	High Priority
Blue spotted salamander	*Ambystoma laterale*	State SC	Medium Priority
Spotted salamander	*Ambystoma maculatum*		Medium Priority
Four-toed salamander	*Hemidactylium scutatum*	State SC	Medium Priority
Mudpuppy	*Necturus maculosus*	State SC	High Priority
Wood turtle	*Glyptemys insculpta*	State SC	High Priority
Northern Map Turtle	*Graptemys geographica*	State SC	Medium Priority
Eastern Ribbon Snake	*Thamnophis sauritus*	State SC	High Priority
Timber Rattlesnake	*Crotalus horridus*	State E	High Priority
Common Musk Turtle	*Sternotherus odoratus*	State SC	Medium Priority
Smooth green snake	*Opheodrys vernalis*		Medium Priority
Brown snake	*Storeria dekayi*		Medium Priority
Source: Northern Stewards, 2007.			

As discussed in the vernal pool study, presented in section 5.2.? Vermont's numerous amphibian species require vernal pools for successful reproduction, including the wood frog (*Rana sylvatica*), three species of mole salamander (spotted salamander, *Ambystoma maculatum*; blue-spotted salamander, *A. laterale*; and Jefferson salamander, *A. jeffersonianum*), and two species of fairy shrimp (*Eubranchipus vernalis* and *E. intricatus*). However, each vernal pool does not contain all or even most of the typical indicators. Various forms of amphibian life (i.e., eggs, tadpoles, terrestrial juveniles, adults) were observed in 24 of 29 pools, at EAFR representing 5 known species: wood frog (*Rana sylvatica*), northern leopard frog (*R. pipiens*), green frog (*R. clamitans melanota*), red-spotted newt (*Notophthalmus viridescens viridescens*), and spotted salamander (*Ambystoma maculatum*). Other species may have been present, but some adults, tadpoles, and egg masses could not be reliably identified without intensive capture effort and were thus assigned to general categories. The largest and deepest pool, Pool 23, had the highest amphibian richness, containing 4 of 5 known species and many unidentified eggs, tadpoles, and adult frogs.

5.2.4 Fish

Fish surveys were conducted on EAFR during July and August of 1999. 19 sites were sampled using a backpack electro shocker, which can sample in water up to 1 meter deep, and covered a variety of habitats. The spring and summer of 1999 were unusually dry, and water levels in lakes, ponds, rivers and streams throughout Vermont were lower than normal. Several smaller streambeds were completely dry by the end of June, and beaver ponds appeared lower than usual. This lack of water made it impossible to sample some locations. Nevertheless, given the variety of habitats that were sampled, it is assumed that a representative sample of the fishes of EAFR was obtained. A total of 13 species, representing five families were found on EAFR. No unusual or rare species were found. In general, the fish communities of the habitats sampled were quite representative of similar, relatively undisturbed habitats elsewhere in Vermont. No new fish surveys were preformed since the 2001 INRMP.

5.2.5 Invertebrates

Invertebrate surveys were completed during the summer of 1999 on EAFR. Specifically, surveys were conducted for butterflies, moths, and the orders Coleoptera (beetles) and Hymenoptera (bees, wasps, and ants). Terrestrial invertebrates constitute an enormous percentage of the planet's biological diversity, however, they have historically received little attention in conservation planning.

A survey of aquatic macro invertebrates in streams and vernal pools was conducted at EAFR in 1999. Preliminary results of these surveys indicate good quality on the range, although results were somewhat inconclusive due to Hurricane Floyd's high water and scouring effects, which may have caused a temporary decline in species density. Further sampling should be conducted to verify this hypothesis. A few species of interest were identified during these surveys including a beetle that is considered rare for Vermont and inhabits beaver lodges.

As discussed above under vernal pools, Vermont's numerous Invertebrate species require vernal pools for successful reproduction. Insects (Class Insecta) were the most common invertebrates in the identified pools, represented by 24 families (1 unidentified) in 8 orders. These insects included beetles (Order Coleoptera), flies (Order Diptera), mayflies (Order Emphemeroptera), true bugs (Order Hemiptera), dobsonflies (Order Neuroptera), dragonflies and damselflies (Order Odonata), stoneflies (Order Plecoptera), and caddisflies (Order Trichoptera). In particular, predacious diving beetles (Order Coleoptera, Family Dytiscidae), Siphlonurid mayflies (Order Emphemeroptera, Family Siphlonuridae), northern caddisflies (Order Trichoptera, Family Limnephilidae), and mosquitoes (Order Diptera, Family Culicidae) dominated this group.

Other invertebrates included fingernail clams (Class Gastropoda, Order Mollusca, Family Sphaeriidae),

snails (Class Gastropoda, Order Basommatophora), fairy shrimp (Class Branchiopoda, Order Anostraca), millipedes (Class Diplopoda), leeches (Class Hirundinea), worms (Class Oligochaetae), and spiders (Class Arachnida). These specimens represented 10 families (6 unidentified) in 8 orders and 5 classes. As with amphibians, Pool 23 showed the highest invertebrate richness, containing 138 specimens grouped into 19 of 34 families. In comparison, the next richest pool (Pool 26) contained only 11 families, and overall 12 pools contained 5 families or fewer. Pool 23 was also the only pool among those identified containing fairy shrimp, an invertebrate that is considered an indicator species in vernal pools (Kenney and Burne 2000). Water striders (Order Hemiptera, Family Gerridae) were also observed at many pools during field visits, but only one specimen was collected among all invertebrate samples.

5.3. Forests

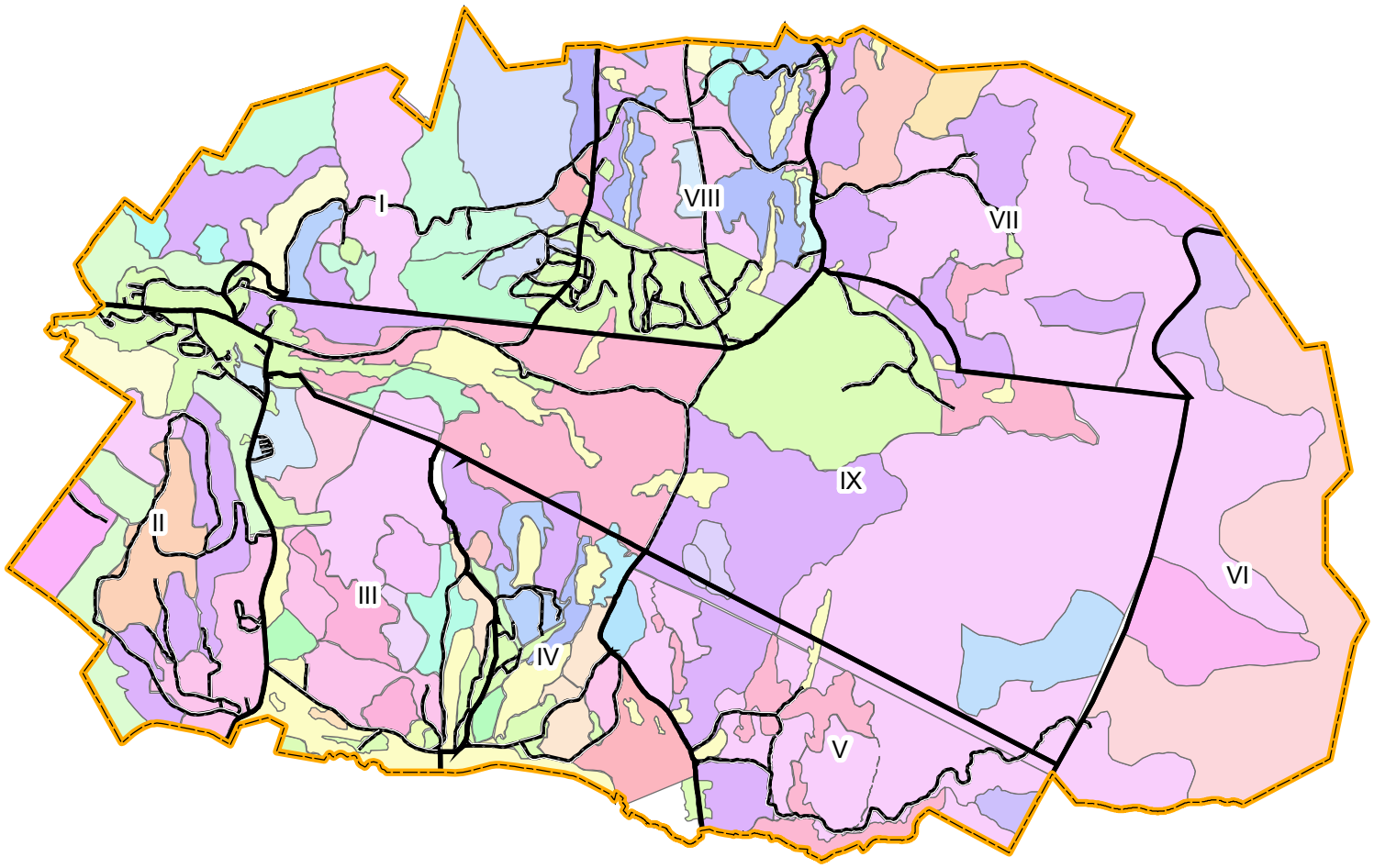
Forest cover is the largest component of the landscape at EAFR. The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately ninety percent of EAFR is forested with five percent upland, non-forested and two percent wetlands. The remaining land is developed military construction. Although EAFR is an active military training facility, its large expanses of forest, wetlands, and maintained grassy openings create important habitats for numerous wildlife species.

The vegetation at the Range consists primarily of northern hardwood forest with some red oak (Quercus rubra), and montane spruce-fir forest. A transition zone between this major forest type contains a mix of northern hardwoods (especially birches), and spruce and fir. Subunits with these two broad forest types include: dry oak-hop hornbeam forest on the upper south slope of Bald Mountain; rich hardwood forest in a cove south of OP Hill summit; cliffs above LZ Gold; sand and gravel bars along the Lee River; and hemlock forest in a ravine along Mill Brook. Some of these areas were visited during the 1991 Chittenden County biological natural areas inventory (Vermont Nongame and Natural Heritage Inventory)

Forest studies conducted since the last edition of the INRMP include the "Forest Land Condition Trend Analysis (FLCTA), 2002 Baseline Report, EAFR", conducted by Greenleaf Forestry Inc, under contract to VTARNG. This study was conducted to collect data to evaluate the capability and capacity of training lands to meet multiple use demands on a sustainable basis. The forest land on the firing range has been managed for timber production, wildlife habitat, and water quality for many years. This FLCTA is a means to monitor and detect any changes in the forest's land condition. Of 120 plats, 100 were categorized as forest management data points, and 20 were health monitoring points. These plots were calculated to cover an area of 9,582 acres.

EAFR's forests are generally considered as two distinct categories, the Upper Forested Slopes and the Lower Forested Slope. Forest management is also segmented into nine forestry compartments. A general description of the forests are presented below and is divided into upper slopes (above 1,200 ft.) and lower slope (below 1,200 ft) sections. Treatment strategies are presented in the management sections of this report. A general map of Forest types is presented in Figure 14, EAFR - Forest Types.

Upper Forested Slopes Forest (above 1,200'). The upper-forested slope area of EAFR includes stands of northern hardwood with a dense understory of witch hobble, red spruce, striped maple and mountain maple. Less common understory vegetation includes mountain ash, winterberry and hazelnut. Very little disturbance to this area has occurred on EAFR in the last 80 years. Species present are characteristic of late seral and/or climax vegetative communities. If left undisturbed, true climax conditions would be achieved in 50-100 years. Vegetative transition would be to an increasing dominance by northern hardwoods. There is a belt of northern hardwoods in which beech predominates between 1,400' and 1,800 feet in elevation.



Forest Types

- aspen/mixed hardwood
- birch/red maple
- hemlock
- hemlock (modified)
- hemlock/mixed hardwood
- hemlock/red spruce
- improved land
- mixed hardwood
- mixed hardwood/early successional
- mixed hardwood/softwood
- mixed hardwood/white pine
- mixed softwood
- mixed wood
- non-productive
- northern hardwood
- northern hardwood/hemlock
- northern hardwood/red oak
- old field/mixed hardwood
- paper birch
- paper birch/mixed wood
- paper birch/red maple
- paper birch/yellow birch
- pioneer forest
- red maple
- red maple/mixed hardwood
- red maple/mixed wood
- red maple/northern hardwood
- red oak
- red oak/sugar maple
- scots pine
- softwood/northern hardwood
- spruce/paper birch/yellow birch
- sugar maple
- sugar maple/ash
- white pine
- white pine/hardwood
- white pine/mixed brush
- white pine/red maple
- yellow birch/mixed wood
- yellow birch/spruce/fir
- yellow birch/sugar maple

Figure 14 - EAFR Forest Types

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Scale=1:50, 000
October, 2019

N
W E
S

Meters
0 250 500 1,000
1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334
1 inch = 4,167 feet

Legend
- EAFR Boundary
- Compartment Boundaries
- EAFR Roads

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

Forest Type Data was Determined by GCI Inc.

Lower Slope Forest (below 1,200'). The forested lower slopes run from 1200' elevation to the western boundary of EAFR. Here, northern hardwoods occupy mesic or temperate sites with red oak associations on the more xeric or drier sites. Riparian areas are dominated by a hemlock-white pine association with varying amounts of red maple, aspen and paper birch. The understory vegetation within these lower slope forests shows the influence of past land use. Mid-successional reversion of farmlands to forest has increased the species diversity with the appearance of raspberry, wild grape, gray birch, serviceberry, wild apple, crab apple, sumac, blue beech, common juniper, spirea, common barberry, and ironwood. Some of the more common forest herbaceous species present on EAFR include during the spring, May apple, clintonia, trillium, trout lily, wood anemone, spring beauty, Canada mayflower and meadow rue. In the summer, wood sorrel, yarrow, bristly sarsaparilla, false Solomon's-seal, asters and Solomon's- seal are present. Common ferns include the ostrich fern, cinnamon fern, interrupted fern, New York fern, hay-scented fern and bracken fern. There are several areas of special importance within the forested lower slopes. These include two areas of mature oak (south slope of Bald Hill and OP Hill), and a conifer corridor connecting the north and south boundary of EAFR at approximately the 900-foot elevation. Acorns, like beechnuts, are a valuable food for wildlife. Northern Hardwood stands are distinct from Oak stands. Aspen/Birch stands are also found in the Lower slope areas. White pine stands are found in, along and beyond wetland areas.

Chapter 6.0 Mission Impacts on Natural Resources

6.1 Introduction

This chapter presents the changes and additions to the Range since the 2001 INRMP. These recent actions, along with actions and construction activities that have been proposed, will be discussed herein. In addition, any impacts to the environmental setting associated with these proposed actions are also presented.

These new actions consist of:

1. The addition of Range Area 7-1
2. The addition of ISBC
3. The change in Range area 6-6 to the MPM6
4. A new Readiness Center

Two new actions were proposed, but are not now considered for construction:

5. Improved Explosive Device (I E D) Facility and
6. Urban Assault Course and Live Fire Shoothouse.

Two new actions are proposed for construction:

7. High Angle Range (HAR) and
8. Light Demo Range.

6. 2 Recent Construction at EAFR

In 2006, VTARNG proposed the construction of 4 individual projects at EAFR:

1. The construction of a new Readiness Center/Range Control Facility was proposed to replace an outdated facility and to provide needed classroom and meeting room facilities. This facility is located near the existing Range Control facility. This project was constructed in 2010.

2. The modification of Area 6-B to serve as a Modified Record Firing Range was provided in order to provide up to date M-16 training to Army Standards. This area occupies approximately 20 square acres at the range. This project was completed in 2006.

3. The ISBC or Infantry Squad Battle Course was constructed to meet the Army training standards for both training and safety at the range. This course is adjacent to Range 4-3, occupying 14 acres within which are 4 new target areas. This project was completed in 2007.

4. The Multi-purpose Machine Gun Range (MPM6) was identified as necessary to support machine gun transition qualification for the M249. This project is located within the existing Range 6-6 area. Approximately 80 acres of Range 6-6 are now used for this purpose, with additional targets added.

6.3 Formerly Proposed Construction at EAFR

Urban Assault Course and a Live Fire Shoothouse. In 2009, VTARNG proposed the construction of two new training facilities, an Urban Assault Course (UAC) and a Live Fire Shoothouse (LFSH). These two facilities are no longer proposed for construction.

Improved Explosive Device. An Improved Explosive Device (IED) facilities was proposed for EAFR in 2010. This facility is no longer proposed for construction.

These training facilities were proposed to meet changes in mission at the VTARNG and to help support the transition of the VTARNG to the Infantry Brigade Combat Team concept as part of the Nationwide Modularization of the Army National Guard Forces, however, VTARNG chose not to continue with this program.

6.4 Proposed Construction at EAFR

The HAR. The High Angle Range or HAR is an action consisting of the additional construction elements to the existing temporary High Angle Range (HAR) for the Army Mountain Warfare School (AMWS) and the Vermont Army National Guard (VTARNG) in the Ethan Allen Firing Range (EAFR). VTARNG has identified this training facility as necessary for its training regimen. AMWS was challenged to find and create a range to train soldiers in the art of unorthodox marksmanship. The location was selected to utilize EAFR's steep slopes at a location where minimal construction is needed. Land recently cleared for natural land management was developed in 2010 on a temporary basis for this purpose. VTARNG proposes to upgrade this existing, temporary, non-standard HAR and construct an access road to reach the firing line. Upgrades will include a three-season gravel HAR access road and a 100-foot . radio repeater tower. This upgrade does not include the use of larger-caliber munitions The HAR is the subject of a draft EA. Implementation of this project is not anticipated to result in significant impact to land use, air resources, noise levels, geology, soils, natural resources, cultural resources, socioeconomics, infrastructure, or hazardous material.

Light Demolition Range. The proposed Light Demolition Range is a live fire demolition and explosive facility designed by the Engineering School at Fort Leonard Wood, Missouri. The facility is a multi-station facility that will allow units to train on the use and employment of explosives in various applications such as timber cutting, steel cutting, and obstacle reduction. Nested in the center portion of the northwest quadrant of the Ethan Allen Firing Range, the Light Demolition Range uses the natural mountainous landscape to establish each station. Each station has specific mission tasks that can be applied in either rural or urban settings. The Light Demolition Range will not only keep Vermont Army Guard units training in Vermont, but will attract military units and Law Enforcement Agencies that are required to use demolitions and explosives to the area, assisting in vitalizing Vermont's economy.

These recent activities as well as standard operations at EAFR are presented in order to review impacts to land use and environmental impact. A summary of environmental impacts from operation of EAFR is presented.

6.5 Land Use Compatibility – EAFR and Vicinity

The majority of land uses bordering EAFR are conservation lands, agricultural lands and rural residential land use. The existing land use of EAFR and vicinity is primarily rural. As documented in the Town plans for Bolton, Jericho and Underhill, a local land use planning goal is to maintain and preserve rural character. Within the rural conservation zones in each town, residential uses are permitted at varying densities to protect the carrying capacity of the land. These environmentally based zones are not intended to serve as a buffer to EAFR and its uses. Thus, the areas proximate to EAFR contain residential uses.

Land use planning for EAFR focuses on maintaining compliance with the needs of the Vermont Army National Guard, and training requirements of the National Guard Bureau, while also maintaining stewardship of the land. The land use planning goals of the county, affected towns, and EAFR are consistent on the point of recognizing goals to protect the area's existing resources and character.

The widespread residential land use in the adjacent communities, however rural in character, imposes a constraint on the military land use, which was located in this rural portion of Vermont for the purpose of

conducting a military firing range in an area with substantial natural buffers. Residences in single family homes and farms are scattered close to EAFR boundary in both Jericho and Underhill. Residential land use areas should be considered by local planners when revising land use plans, ordinances, and zoning restrictions. EAFR can participate in this process in order to inform the civilian population of training activities in the geographical areas affected by activities at EAFR.

The military use and the rural residential character of the community can be compatible with the establishment of greater communication and dialog. Improved communication can be identified as a recommendation of this report. The measures recommended for improved communication intended to result in improved land use compatibility are currently being established in an ad hoc manner. A more formal land use committee, composed of civilian and military representatives would be an appropriate measure. The focus of this enhanced communication would include measure that the Town of Underhill and EAFR have already begun to establish: EAFR identifies the training schedule to the local community; the community posts this correspondence and schedule on its website.

6.6 Hazardous Waste at EAFR

The EAFR is a 11,219 acre facility, the majority of the land is preserved in its natural state, with only 3% developed as active range lands. Hazardous waste assessments are only provided for lands that have been subject to human activity. Hazardous Waste assessment of active and proposed construction sites have determined that the facilities are not located in areas where the Environmental Condition of Property Category indicated the presence of areas where release, disposal, and/or migration of hazardous substances has occurred. Based on a review of existing records and available information, none of the active lands or land slated for construction is known to contain unexploded ordnance. However, based on the past uses of the proposed project areas, the possibility exists there may be unexploded ordnance in the area of Range 6-6 as a result of munitions being fired from other firing points on EAFR landing short of the impact area. The foxholes located in the area of the formerly proposed LFSH, are areas that have not been evaluated or require additional evaluation, specifically soil testing to determine if heavy metals contamination has occurred, prior to development or reuse. There are no environmental remediation orders/agreements applicable to the subject property. There are no other hazardous conditions that present an unacceptable threat to human health or the environment on the land.

6.7 Identified Impacts to EAFR Habitats from Proposed Activities

The HAR. In order to document the impact of the creation, proposed activities, and management of the HAR and associated roads on state and/or federally RTE amphibians, reptiles, mammals, or birds, previous studies and literature were reviewed, habitat assessments were made, and wildlife inventories were conducted during 2012. Allan Thompson of Northern Stewards prepared a review, field studies, analysis, and recommendations of the project study area with regard to wildlife. This report identified impacts to RTE wildlife species and their associated habitats. Only a few RTE wildlife species have been observed on EAFR. The state endangered little brown bat and northern long-eared bat (NLEB) have been observed foraging along roads, wetlands, and forested areas throughout EAFR. No roosts have been identified, but bats are likely utilizing natural and man-made roosts within EAFR. As the NLEB is listed under the federal Endangered Species Act (ESA), VTARNG contacted the US Fish and Wildlife Service (USF&WS), providing them with the bat survey information. During 2012, mammal surveys included two three-night small mammal trapping efforts and bat acoustic surveys. The small mammal trapping efforts included 100 Sherman traps: 25 at Otter Bog, 25 in the talus slopes of OP2 Hill, and 50 within the existing, temporary HAR. There is the potential for impact to state endangered bats from the creation of the access road to the permanent HAR. The little brown (*Myotis lucifugus*) and northern long-eared bat (NLEB) (*Myotis septentrionalis*), which require trees with exfoliating bark, may be impacted from the removal of potential roost trees in order to build the proposed roads. To mitigate for the potential direct or

indirect mortality to these state endangered bats, trees will be removed during winter months (October-April). VTARNG has sought and received concurrence with the US Fish and Wildlife Service (USF&WS), that the project may affect, but is not likely to adversely affect NLEB. USF&W appreciated the proposed time of year restrictions on tree clearing during the occupied summer roosting habitat. It is proposed that tree all cutting occur during winter months (October-April).

Wetlands were noted on the range itself; these consist of two wetlands totaling less than one-quarter (1/4) acre in size. As no construction or improvements to the downrange portion of the site are proposed, no impact to these wetland areas is anticipated. The area within the USACE wetlands permit, where minor filling along the proposed HAR access road will occur, is not expected to impact any biological resources. VTARNG has sought and received authorization from the US Army Corps of Engineers (USACE) to fill a small area (approximately 200 square feet or 0.005 acres) within an intermittent stream (wetland) in conjunction with the construction of the access road to the HAR. This authorization is USACE Permit Number: NAE-2014-0149. The Proposed Action has been designed consistent with the provisions of the Clean Water Act, including Section 404, as administered by USACE.

The Light Demo Range

During construction of the Light Demo Range, mitigation measures will include avoiding any potential negative impacts through the design of the project and by utilizing Best Management Practices (BMPs). USF&W concurs that the potential to impact state endangered bats is minimized by conducting tree removal during winter months (October-April). In order to document the impact of the creation, proposed activities, and management of the Light Demo Range on state and/or federally Rare, Threatened or Endgangered amphibians, reptiles, mammals, or birds, previous studies and literature were reviewed, habitat assessments were made, and wildlife inventories were conducted during 2015. In a manner similar to the investigations for the HAR, Allan Thompson of Northern Stewards prepared a review, field studies, analysis, and recommendations of the project study area, that is, the Light Demo Range, with regard to wildlife. This report identified impacts to RTE wildlife species and their associated habitats. Only a few RTE wildlife species have been observed on EAFR. The state endangered little brown bat and northern long-eared bat (NLEB) have been observed foraging along roads, wetlands, and forested areas throughout EAFR. No roosts have been identified, but bats are likely utilizing natural and man-made roosts within EAFR. As the NLEB is listed under the federal Endangered Species Act (ESA), VTARNG again contacted the US Fish and Wildlife Service (USF&WS), providing them with the bat survey information. During construction, mitigation measures will include avoiding any potential negative impacts through the design of the project and by utilizing Best Management Practices (BMPs). USF&W concurs that the potential to impact state endangered bats is minimized by conducting tree removal during winter months (October-April).

Also found at the Lt Demo Range, is one southerly-trending wetland band located within a low area within the upland area. The existing skidder trail crosses this wetland. The proposed access road improvements for the Light Demo Range follow the existing skidder trail. The proposed improvements will stabilize the soils in this area and will reduce the potential for erosion along the existing trail. The Light Demo Range is not anticipated to have any undue adverse impacts to any wetlands as it relates to the functions of these wetlands. The proposed project is subject to the permitting requirements of the ANR and the Corps Vermont General Permit. Vermont. VTARNG has concurrently submitted a US Army Corps of Engineers permit to fill small wetland areas along the existing skidder trail. The state threatened eastern whip-poor-will and grasshopper sparrow have both been observed utilizing the open field conditions of FP6-6. Although the creation of the Light Demo Range and HAR will alter some bird species slightly there are not any significant impacts on birds or bird habitats within or near these proposed actions.

Chapter 7.0 Natural Resources Program Management

7.1 Management Overview

Maintaining optimal environmental conditions on the training lands is essential for the success of the military mission at EAFR. The management measures developed and presented herein are based on the current conditions of the resources and the anticipated needs of military mission and activities. As the majority of the land is forest, forestry management and timber sales are a significant component of the INRMP.

The planned initiatives of this INRMP have been identified by the VTARNG with assistance from Northern Stewards and Greenleaf Forestry, consultants under contract to VTARNG. The primary management initiative is to seek to maintain or increase the level of biodiversity of native species through maintaining a diversity of habitat types proportional to the structural diversity; that is, size and density of trees. While mature stands are important to have within a landscape and specific species require only mature stands for their life history, many species use mature stands for only part of their life history, while the majority of wildlife will utilize early successional growth resulting from large scale disturbances (logging) during some part of their life history, others will utilize early successional growth for all of their life history. Forest Management activities can include 5-10 acre patch cuts in areas conducive to large openings. The creation of large-scale early successional habitats as a part of EAFR will maintain or increase the level of biodiversity. Key species identified as Vermont Species of Greatest Conservation Need will benefit from the creation, enhancement, promotion, and retention of early successional habitat. Techniques can include progressive clear cutting, brush hogging, burning, or other operations that increase habitat available to early successional species. In addition, most mammals, birds, amphibians and reptiles require multiple habitat types for reproduction, feeding or cover and connectivity between these habitats without fragmentation. Fragmentation may include roads, buildings, or logging operations. This INRMP has identified the need to manage for specific conditions that will prevent the isolation of a given habitat. The fringe areas on the edges of the many range clearings, wetlands, open ledges, and the overgrown pastures also provide a diverse mix of habitats.

Additional management initiatives include the prevention of the degradation of water quality, the protection of aquatic and riparian habitats and the identification and restoration of degraded habitats, including wetlands and Vernal Ponds;

The identification, mapping and monitoring of the presence of invasive species. Where appropriate, approved control methods will be used. Increased populations of invasive species over time will soon require control methods. These include pulling, cutting, herbicides, fire or a combination. VTARNG will consider the implication of various control methods and plan for their implementation;

Maintaining and improving unique trees and forest stands by conducting activities that protect or enhance natural communities. Communities with exceptional quality and/or rare frequency as identified from previous surveys should be restricted from harvest activities. All activities in natural communities should function to preserve community characteristics. These activities include protection of Aspen and Butternut stands, the favoring of mast-producing trees and the use of snag retention methods**;**

Wildlife found at EAFR is diverse due to the mix of forests, riparian and open areas. Ongoing scheduled surveys on the Range include mammals, birds, amphibians and reptiles. Continued, coherent, standardized monitoring will improve understanding of habitat use. Wildlife and wildlife habitat work will be performed in conjunction with forest management activities. Timber sales should be designed to improve or protect wildlife habitat and not to cause undo adverse impact on wildlife populations, particularly those state or federally protected or listed as a species of greatest conservation need; and, provision of special

protection and management leading to the recovery of threatened and endangered species and protect species of special concern. Include species of greatest conservation need as identified by Vermont's Wildlife Action Plan with priority of medium to high.

As the majority of the land is forest, forestry management and timber sales are a significant component of the INRMP. The implementation of these INRMP goals will not be a significant change in management direction for this installation. The future Integrated Natural Resource Management Plans for EAFR include the following species Specific Projects for EAFR:

- Early Successional habitat enhancement (formerly woodcock habitat)
- Mammal Inventory and Monitoring
- Small Mammal Trapping
- Reptile and amphibian monitoring
- Bird Point Counts
- Forestry related programs

7.2 Goals and Objectives

1. Provide special protection and management that lead to the recovery of threatened and endangered species if they occur, and protect species of special concern. This Includes species of greatest conservation need as identified by Vermont's Wildlife Action Plan with priority medium and high.

2. Seek to maintain or increase the level of biodiversity of native species.
Biodiversity of Native species results from a diversity of habitat types. Within habitat types, diversity is proportional to the structural diversity; size and density of trees. The large scale forested landscapes at EAFR are relatively homogeneous, which limits the biodiversity of native species. Forest Management activities can include 5-10 acre patch cuts in areas conducive to large openings. These large openings are limited throughout Vermont and a diverse amount of wildlife over many taxa require early successional growth throughout their life history.

3. Manage to protect and/or enhance rare and unique natural communities as defined from previous surveys.

4. Prevent the degradation of water quality, protect aquatic and riparian habitats, and identify and restore degraded habitats. Increased populations of invasive species over time currently require control methods. These include pulling, cutting, herbicides, fire or a combination. An Invasive Species Management Plan has been established at EAFR. The goals of the plan consist of manual and chemical control/removal of invasive populations, development and distribution of educational/outreach materials within EAFR and adjacent communities and, workshops for EAFR and community members on invasive species identification, removal methods and monitoring.

7.3 Management Measures

1. Connectivity
Habitats utilized by species whose range or life history needs extend beyond a given habitat type require the freedom to move to and from any given habitat. Most mammals, birds, amphibians, and reptiles, require multiple habitat types for reproduction, feeding, or cover. Connectivity between these habitats, unfragmented. Fragmentation may include roads, buildings, or logging operations. Mitigation can prevent the isolation of habitats by retaining or creating certain conditions. Where possible, identify habitats and manage for specific conditions that will prevent the isolation of a given habitat

2. Maintain and Improve Unique Trees and Forest Stands

- Natural Communities: From previous mapped natural communities conduct activities that protect or enhance natural communities. Communities with state status of S1 or S2 should restrict harvest activities due to the rare frequency in the State. Communities with state status of S3-S5 with exceptional quality as identified from previous surveys should restrict harvest activities. All activities in Natural communities should function to preserve community characteristics.
- Aspen: The scattered stands of aspen on EAFR provide summer and winter habitat for both nongame and game species. In flowering stands, catkins provide a food source for many passerines, and dense stands have been shown to provide winter food resources and cover for game species such as ruffed grouse. To improve sprouting and overall stand conditions, aspen root sucker growth can be increased by burning the stands and/or cutting small clearings within or beside them. From root suckers, new sprouts grow and, under optimal conditions, have the potential to reach stem densities of up to 70,000 per acre.
- Butternut: Minimize the harvest of butternut. Given its value as wildlife forage butternut trees will not be harvested or manipulated during timber stand improvement or harvest activities. Nationwide, butternut has declined 70% in the last 30 years.
- Favor mast-producing trees. During all harvest activities, conduct marking and sale planning to favor mast-producing species. These trees provide important food supplies for numerous species of wildlife. Mast producing trees include: red oak, American beech, black cherry, pin cherry, service berry, dogwoods, butternuts, apples, and hawthorn.
- Snag retention: During harvest activities, conduct marking and sale planning to protect dead or dying trees of all species. Given the number of wildlife that utilize snags for nesting, denning, security, and weather avoidance, a minimum of 5(6 or more inches) snags/acre is ideal, and the more snags available, the better. All snags above 20 inches should be protected from harvest damage.

3. Maintain Edge and Open Areas

On the installation, small (< 1 acre) and larger forest openings (3-5 acres) are created through the practice of group selection—a method of regenerating uneven-aged stands in which trees are removed and new age classes are established in small groups. Open areas of regenerating trees and the edge habitat surrounding it typically attract deer and other browsers, often resulting in population growth beyond a desired level. Excessive deer populations can, in turn, inhibit forest regeneration and limit the cover necessary to support military training. Thus far on EAFR, deer browsing has remained mostly under control and has not significantly inhibited native forest regeneration. This is counterproductive to the objective of "maintaining or increasing the level of biodiversity". As our forest mature, the level of diversity decreases. These mature stands are important to have within a landscape, specific species require only mature stands for their life history. With that said, many species use mature stands for part of their life history, while the majority of wildlife will utilize early successional growth resulting from large scale disturbances (logging) during some part of their life history, others will utilize early successional growth for all of their life history.

What lacks in Vermont is large scale early successional habitats, and to keep these a part of EAFR will maintain or increase the level of biodiversity. Deer will use these habitats, but population increases, if any as a result from deer will be minimal, and browse will be minimal. Our winters are just too harsh, and there isn't a lot of wintering areas. Deer populations in the Champlain Valleys are becoming large due to the lack of hunting pressures, mild winters, lack of predation pressures, coupled with the fact that these landscapes provide a tremendous amount of food resources, much more than the uplands of EAFR.

4. Restore Degraded Habitats

Identify, map and Monitor the presence of invasive species. Where appropriate, use approved control methods.

7.4 RTE Management Recommendations

Rare, Threatened, and Endangered Plant Species and Natural Communities of Conservation Priority - Management Recommendations:

1. Poor Fen (Otter Bog)

Avoid actions and activities that would impact the quality or quantity of ground and surface water inputs to the fen.

2. Boreal Acidic Cliff

Avoid rock climbing on cliffs since soils are very thin and erodible, and rare plants have been identified on these sites. If climbing activities are necessary, mark locations of rare plants re-route climbing route away from these sites wherever possible.

3. Montane Yellow Birch-Red Spruce Forest

Avoid management or development activities that would result in fragmentation of these large forest blocks. Conduct timber harvests during winter to avoid disturbance of thin, erodible soils on steep slopes.

4. Dry Oak Forest

Wherever possible, limit regular access to these sites to avoid trampling of plants and erosion of thin soils. Identify locations of rare plants erect a barrier and/or or sign to deter trampling if plants are located near places that are regularly accessed. Avoid timber management of these areas, but if necessary, conduct operations during the winter and use low-intensity, uneven-aged systems in order to protect forest structure and natural species diversity. Consider applying experimental controlled burns to sites with evidence of past disturbance from burning. Monitor burn impacts on natural species composition and regeneration.

5. Mesic Red Oak-Northern Hardwood Forest

On sites where red oak is naturally regenerating, use silvicultural treatments to release advanced regeneration and/or initiate additional regeneration where appropriate. Identify confirmed rare plant sites and avoid disturbance during timber harvest and/or development projects. Set aside as much as possible as a mature forest reserve since there are very few mature examples of this forest type in the state that are free from recent human disturbance.

6. Rich Northern Hardwood Forest

Set aside occurrence on OP Hill as significant example. When conducting timber harvests in other occurrences, consider using The Nature Conservancy's guide, *Managing Rich Northern Hardwood Forests for Ecological Values and Timber Production*. Identify and avoid locations of confirmed occurrences of rare plants during timber harvests and/or development projects.

7. Seep

Avoid any timber harvest or operations and development within seeps and at least a 100 foot buffer around them during all times of year. The wetland soils in seeps may not freeze during the winter and are susceptible to rutting by heavy machinery that can result in significant hydrological disturbance.

8. Beaver Ponds, Meadows, and Wetland

Avoid altering the hydrology of beaver ponds, streams, and wetlands during management and development activities. If human-beaver conflicts arise (i.e. road, trail, or culvert flooding) along existing wetlands that are in good condition and are providing high-quality wildlife habitat, explore alternatives to beaver removal and dam destruction (i.e. baffles to lower water levels).

8. Vernal Pools

Vernal Pools are very sensitive to changes in hydrology and temperature caused by disturbance to forest soils and canopy cover. During any management or development projects, ideally, a 600 foot closed-canopy buffer would be maintained around all pools on EAFR with the closest 100 feet being a more protective no-cut buffer. If this level of protection is not feasible, disturbance to the pool should be minimized by leaving as much of a closed-canopy buffer around the pool as is possible. When possible, minimize rutting around the pool that would alter the hydrology and impede amphibian migration by conducting forest management activities during the winter when the ground is frozen. Without repeat trips to pools throughout a season, or perhaps even in consecutive years, it is difficult to know whether a water body truly functions as a vernal pool over the long- term. Consequently, additional vernal pools research on EAFR, if conducted, should include observation and measurement of pools at regular intervals throughout the spring and summer. Much of the field effort in this study was devoted to searching for vernal pools over an extensive area with rugged terrain. Now that pools have been identified, however, much more time should be focused on observing hydroperiod and dependent animal populations. In particular, additional effort should be devoted to identifying all observed amphibian life to the species level. Identified pools should be examined in 2-3 consecutive years to gauge annual variability.

9. Montane Spruce-Fir Forest

Timber harvest operations in this natural community should be avoided due to the high erodability and vulnerability of soils. If unavoidable, they should be conducted with great care so as not to disturb vulnerable soils.

10. Boreal Calcareous Cliff

Avoid rock climbing on cliffs since soils are very thin and erodable, and rare plants have been identified on this site. If climbing activities are necessary, mark locations of rare plants re-route climbing route away from these sites wherever possible.

11. Northern Hardwood Talus Woodland

These natural communities are often non-productive due to Site IV soils, which make them poor sites for timber management. If timber harvests must be conducted, care should be taken not to disturb fragile soils on the sites. Where possible, designate and concentrated access to climbing cliffs through talus communities to minimize disturbance of plants and soil.

12. Hemlock-Northern Hardwood Forest

Consider setting aside more remote, mature examples of this natural community to naturally develop toward old growth.

13. Northern Hardwood Forest

Tailor silvicultural treatments in this community and its variants to retain and promote a composition of native species that is natural to each area. Avoid perpetuating existing species and species proportions that are likely relics of past human land use (i.e. pine plantation) and are not well-suited to the site. Consider setting aside an area of this common forest type as a reserve to develop into an old growth forest. In general, human activities, such as forest management, are compatible with protecting the ecological integrity of these communities. However, since human disturbance is virtually ubiquitous in this community type throughout the state, it would be interesting, and perhaps valuable, to have some areas that are allowed to naturally develop and evolve.

14. Semi-rich Northern Hardwood Forest

Where appropriate, use silvicultural treatments that work toward maintaining or restoring natural species

composition of the mature forest stage, favoring white ash, sugar maple, black cherry, and yellow birch, basswood, and red oak. Identify rare plant sites and avoid disturbing these areas during forest management or development activities.

15. Hemlock Swamp

During timber harvest and development projects, take precautions to protect wetland soils and hydrology (i.e. limit harvests to winter when conditions are solidly frozen, avoid road or trail construction near wetlands that has the potential to alter ground and surface water input quality and/or quantity). During timber harvests, avoid disturbing large stumps, downed logs, and standing dead trees wherever possible, and leave as much downed, dead woody material on site as possible.

16. Hemlock-Hardwood Swamp

During timber harvest and development projects, take precautions to protect wetland soils and hydrology (i.e. limit harvests to winter when conditions are solidly frozen, and avoid road or trail construction near wetlands that has the potential to alter ground and surface water input quality and/or quantity). During timber harvests, avoid disturbing large stumps, downed logs, and standing dead trees wherever possible, and leave as much downed, dead woody material on site as possible.

17. River Cobble Shore

Protect riparian areas along the channels and tributaries within the watershed upstream of these river communities to minimize sediment input, reduce the risk of introduction and/or spread of invasive species, and reduce the velocity and power of flood waters. This area has been included in the Invasive Species Management Planning to provide a watershed-wide plan for controlling invasive species along the Lee River. Wherever possible, VTARNG plans to avoid permanent development within the Lee River floodplain, and to allow river channels to migrate within the river corridor over time.

18. Sugar Maple-Ostrich Fern Riverine Floodplain

Consider options for restoring degraded sections of floodplain forest and take opportunities to protect intact sections from degradation. This area has been included in the Invasive Species Management Planning to provide a watershed-wide plan for controlling invasive species along the Lee River. Wherever possible, VTARNG plans to avoid permanent development within the Lee River floodplain, and allow river channels to migrate within the river corridor over time.

19. Boreal Talus Woodland

Minimize disturbance of these sites, particularly if it is necessary to go through talus to access climbing routes on cliffs above. Construct trails to concentrate disturbance and minimize erosion.

20. Montane Yellow Birch-Sugar Maple-Red Spruce

Consider setting aside at least one example of this natural community (perhaps the most remote one) to be excluded from timber management since most of examples of this natural community have been impacted by logging. Retain some large-diameter legacy trees of yellow birch and red spruce during silvicultural treatments within these communities.

21. Red Spruce-Hardwood Swamp

During timber harvest and development projects, take precautions to protect wetland soils and hydrology (i.e. limit harvests to winter when conditions are solidly frozen, and avoid road or trail construction near wetlands that has the potential to alter ground and surface water input quality and/or quantity). During timber harvests, avoid disturbing large stumps, downed logs, and standing dead trees wherever possible, and leave as much downed, dead woody material on site as possible.

7. 5 Wildlife Management

Management of game species on EAFR is accomplished through a cooperative plan between VTARNG, USFWS, and the VTANR Department of Fish and Wildlife. Management of non-game species is primarily conducted in-house with informal agreements with VTANR Department of Fish and Wildlife, Non-Game and Natural Heritage and Program and contract consultants. Wildlife found at EAFR is diverse due to the mix of forests, riparian areas and open areas. Ongoing scheduled surveys on EAFR include mammals, birds, amphibians and reptiles.

In 2008, contractors produced a report of EAFR's habitat suitability of Vermont's state and federally list species, species of concern, and species of greatest conservation need. This report outlined management and monitoring priorities for species likely to be present on EAFR. This report identified priorities such as eastern small footed bat surveys, Bicknell's thrush surveys, wood turtle surveys, and many others. Continued, coherent, standardized monitoring will improve management and put EAFR in a good position to deal with issues that may negatively affect wildlife and wildlife habitat on EAFR.

Early Successional habitat enhancement (formerly woodcock habitat)

Many wildlife species use early successional habitat for some part of their life history needs. 8 species identified as Vermont Species of Greatest Conservation Need will benefit from the creation, enhancement, promotion, and retention of early successional habitat and habitat features for wildlife using early successional habitat. Techniques can include progressive clearcutting, brush hogging, burning, or other operations that increase habitat available to early successional species. Early Successional habitat is limited on the range and those areas that are present, are maturing to a point that will be no longer suitable for many early successional species.

Table 6
VT SGCN's Requiring Early Successional Habitat

Common Name	Scientific Name	State Status	SGCN Priority Level
American woodcock	*Scolopax minor*		Medium Priority
Ruffed grouse	*Bonasa umbellus*		Medium Priority
Chestnut-sided warbler	*Dendroica pensylvanica*		Medium Priority
Brown thrasher	*Toxostoma rufum*		Medium Priority
Black-billed cuckoo	*Coccyzus erythropthalmus*		Medium Priority
Rufous-sided towhee	*Pipilo erythophthalmus*		High Priority
Vesper sparrow	*Pooecetes grammineus*	State SC	High Priority
Field Sparrow	*Spizella pusilla*		Medium Priority
Source: Northern Stewards, 2007.			

Bat Inventory and Monitoring

All of Vermont's 9 bat species are either state, or federally listed, considered rare or listed as a priority species in Vermont's Wildlife Action Plan. Three pregnant State Threatened Eastern Small Footed bats was observed during an inventory at Camp Johnson (2007), the most ever caught at any location in Vermont. Continued monitoring of bat species is important to gauge population status, habitat use, habitat availability and potential impacts of activities on the range.

Annual Acoustic Monitoring

- Using ultrasonic recorders to record bat calls. Analyze bat calls and ID from sonogram. At least 20-60 recording nights at various locations
- Mist net trapping every 5 years. Wing banding individuals with VTFWD bands.

Mammal Inventory and Monitoring

Large landscape level monitoring methods including tracking surveys, motion sensor cameras and sign interpretation is required to gain a general understanding of habitat use. Tracking transects have been monitoring for the last 2 years and should continue to develop landscape level population and habitat use trends. Motion Sensor cameras have been used since the summer of 2010. The following list is a list of species to monitor.

Small Mammal Trapping

Little information is available regarding small mammal use of the properties. Many of the following species are likely present though exist in localized areas and in low frequency. The long tailed shrew, pygmy shrew, have been added to species present at EAFR during 2010 inventories. Continued monitoring of small mammals is important to understand wildlife use of National Guard properties and how activities will affect habitat and populations.

Reptile and amphibian monitoring.

Amphibians and reptiles populations are declining throughout the world. Vermont's populations are not different. Very little work has been done in the past to adequately sample for amphibians and reptiles likely to be present. It is important to continue to monitor habitats their use by amphibians and reptiles. Surveys will target species of concern (SC) and should include vernal pool surveys, drift fence surveys, night time spot light surveys, egg mass ID and road kill observations, funnel trapping

Bird Point Counts

In the past, general surveys were conducted to assess species present/absent by visiting all habitat types at least once on the Range. Many birds found on EAFR are rare or listed in Vermont's Wildlife Action Plan as a priority for conservation. Continued monitoring of bird populations, specifically SGCN's and R, T, E's will benefit the VTNG greatly in anticipating impacts on bird populations from activities.

Work with other forestry related programs

Wildlife and wildlife habitat work should work in conjunction with Forest management activities. Timber sales should be designed to improve, or protect wildlife habitat and to not cause undo adverse impact on wildlife populations, particularly those state or federally protected or listed as a species of greatest conservation need.

Current Activities that should be continued:

Wood duck boxes

Over 30 Wood duck boxes have been maintained many years placed in wetlands throughout the range and remain very effective in offering nest sites for wood ducks and hooded mergansers. These boxes require annual maintenance and replacement of wood chip bedding in order to be effective as a nest box. (Figure 15 EAFR - Wood Duck Box Locations)

Mast Tree Management

Mast trees such as red oak, American beech, Black or pin (fire) cherry, apple and many other trees, shrubs, and herbs are present and offer exceptional food resources for wildlife. These resources should be promoted in conjunction with forest management activities. Mast tree should also be promoted in areas where forest management is not conducive using small scale activities.

Species Specific Projects

1. *Catharus bicknelli*, Bicknell's Thrush

State Species of Concern (SC) - High Priority Species in Vermont's Wildlife Action Plan (2005)

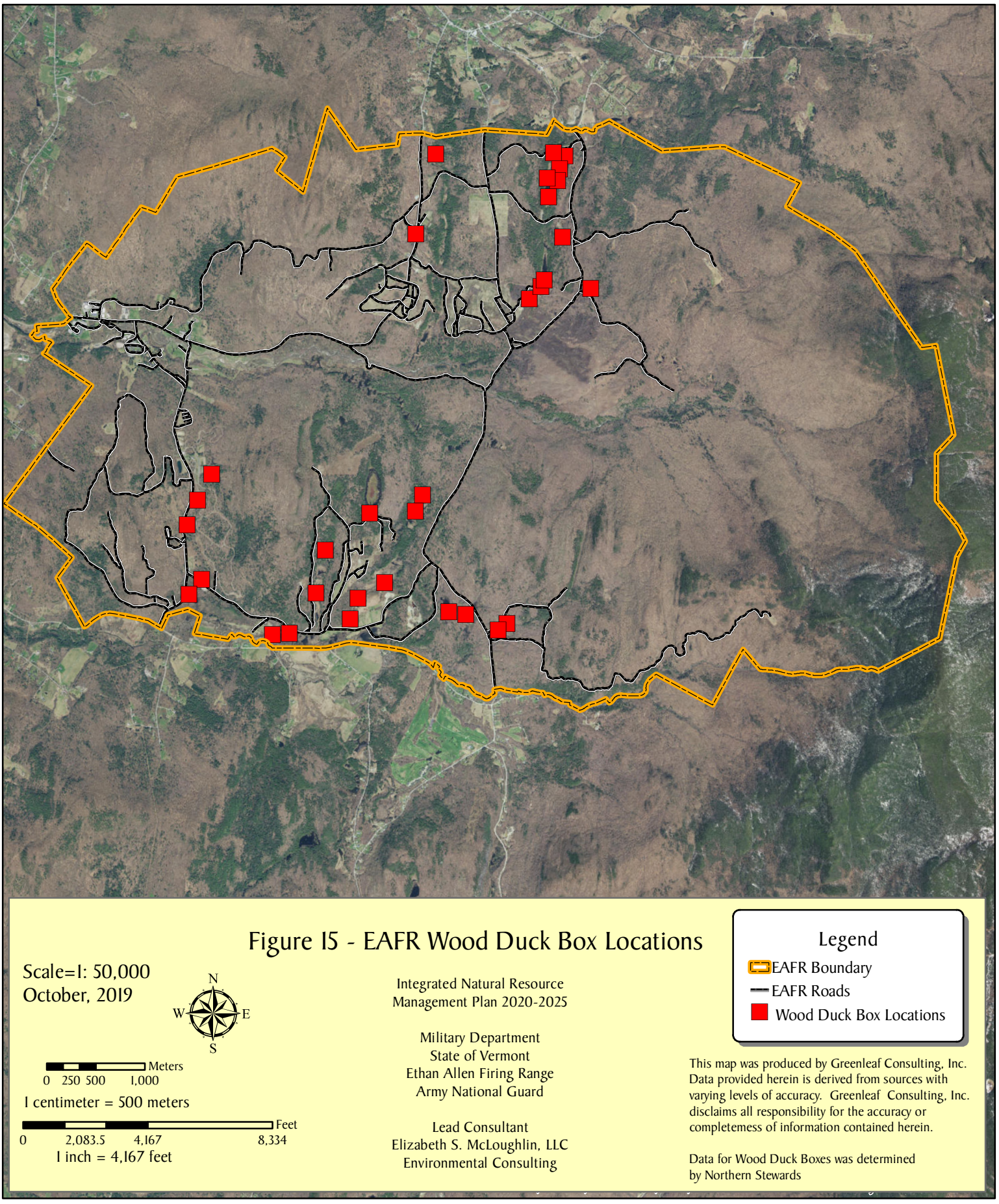


Figure 15 - EAFR Wood Duck Box Locations

Scale=1: 50,000
October, 2019

N
W E
S

Meters
0 250 500 1,000

1 centimeter = 500 meters

Feet
0 2,083.5 4,167 8,334

1 inch = 4,167 feet

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
- EAFR Boundary
- EAFR Roads
- Wood Duck Box Locations

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

Data for Wood Duck Boxes was determined by Northern Stewards

This species requires future monitoring of habitat use and occurrence on EAFR. Throughout its range future habitat loss and population decline is expected from forest management activities, climate change, mercury and acid rain. High elevation activities during May-September can affect breeding success such as air training, excessive and regular foot traffic, firing activities, and management activities. The following projects are recommended for 2011-2016 to prevent undo adverse impacts on the Bicknell's thrush.

- Map Habitat use w/in EAFR and determine elevation limits
- Nest surveys to document breeding success throughout habitat and responses to Range activities
- Annual monitoring of Bicknell's population thrush occurrence for population changes
- Determine appropriate management implication and make recommendations for management

2. *Myotis leibii,* Eastern small footed bat - State threatened (T) - High Priority Species in Vermont's Wildlife Action Plan (2005)

This species is known to roost in rocks, talus, trees with exfoliating bark, hollow trees, buildings and bridges. However, populations are rare and in decline, exacerbated by the White Nosed Syndrome. Within known habitat used by this species, many activities occur including Forest management activities, building modifications, night time activities, and flyovers. The following projects are recommended for 2011-2021to prevent undo adverse impacts on the Eastern Small Footed Bat:

- Continue to monitor eastern small footed bat populations using acoustic surveys
- Determine if bats are roosting anywhere on Camp Johnson using mist net trapping and telemetry surveys
- Investigate and implement appropriate habitat enhancement projects and to monitor benefits from enhancement projects.
- Roost tree release, promotion, roost protection, alternative activities around known roosts, forest management that improves habitat

3. *Myotis lucifugus*, Little brown bat is listed as State endangered (E) - Medium Priority Species in Vermont's Wildlife Action Plan (2005)

This species is known to roost in trees with exfoliating bark, hollow trees, buildings and bridges. However, populations are rare and in decline, exacerbated by the White Nosed Syndrome. Within known habitat used by this species, many activities occur including Forest management activities, building modifications, night time activities, and flyovers. The recommendations for 2011-2021to prevent undo adverse impacts on the little brown bat are the same as those for the Eastern Small Footed Bat, indicated above.

4. *Myotis septentrionalis*, Northern long-eared bat was listed as threatened under the Endangered Species Act on April 2015, however, the designation of a critical habitat for the northern long-eared bat was not considered prudent by the US Fish and Wildlife Service (USF&WS). VTARNG has sought and received concurrence with the USF&WS in its actions at EAFR. USF&W concurs that the potential to impact state endangered bats is minimized by conducting tree removal during winter months (October-April). Therefore, any tree removal will be performed between October and April. This species is known to roost in trees with exfoliating bark, hollow trees, buildings and bridges. However, populations are rare and in decline, exacerbated by the White Nosed Syndrome. Within known habitat used by this species, many activities occur including Forest management activities, building modifications, night time activities, and flyovers. The recommendations for 2011-2021to prevent undo adverse impacts on the little brown bat are the same as those for the Eastern Small Footed Bat, indicated above.

7.6 Forest Management

Forest management is the practice of exercising influence over the ecological processes of a forest in an effort to provide specific sustainable products and amenities from the forest while maintaining its long term health and vigor. The Army forest management program is required to support and enhance the immediate and long-term military mission and to meet natural resource stewardship requirements set forth in federal laws (AR 200-3). Army policy further stipulates that forest resources must be managed for multiple uses, using an ecosystem management approach to optimize the benefits to the installation's natural resources. Ecosystem management provides a framework for holistic management of the resource rather than focusing emphasis on a single aspect or activity such as timber production or game species management.

Forest management enhances EAFR military mission by providing a healthy training area forest over the long term. Practices such as forest product sales, timber stand improvement activities, management of forest access roads, encouragement and protection of regeneration, providing forestry support for cultural and natural resource surveys, and protection against fire, insects and disease provide for sustainment of the forested environment. Conflict of forest management activities with the military mission is avoided by providing for review of management plans and activity schedules by the trainers.

The forest management program at EAFR must also fully comply with all applicable federal laws, policies, and regulations pertaining to forest management. Federal laws, policies, and regulations that have the potential to impact forest management at EAFR include AR 200-3, PL 86-797, Sikes Act, as amended (16 U.S.C. § 670 a through o), 10 U.S.C. § 2665 (Sale of certain interest in land: logs), DoD Inst 7310.5 (Accounting for production and sale of lumber and timber products), Executive Order 11990 (Protection of Wetlands), Endangered Species Act of 1973, as amended (16 U.S.C. §§ 1531 et seq.), and the National Forest Management Act of 1976 (16 U.S.C. §§ 1601 et seq.). EAFR's forestry program has established objectives to ensure that the installation successfully achieves their long-term goals, while maintaining compliance with all federal, state and Army laws, policies, and regulations. The procedures and guidelines that address constraints and restrictions will be observed during timber harvest activities.

7.6.1 Timber Inventory

Forest inventories are the foundation for the development of management and regulation plans. AR 200-3 requires forest stand inventories be conducted and kept current (at least every ten years) to provide for sustained production of forest products.

EAFR is divided onto nine forest management compartments. Forest inventories are scheduled on a rotational basis, with each compartment getting a new inventory at least every ten years. Compartments were delineated based on similarities in species and sizes present as well as physiography and access. Areas containing predominantly sawtimber were inventoried to obtain estimates of timber volume, stand condition, timber types, size classes, and other general information needed for long-term management planning. The estimated allowable harvest based on the inventory's 10-year time span, the statistical summary and other data summaries from the timber inventory are provided in an Appendix.

In addition to gathering timber data, information on ground cover, shrub layers, seedling regeneration, general stand environment, stand location relative to various habitats and specific wildlife parameters (e.g., snags and den trees) are collected. This information provides a view not only of the timber resource, but also of the composition and structure of the stands as they relate to habitats of other plants and wildlife. To identify how conditions change in response to management practices, information from the forest stand inventories will continue to be collected and integrated with other inventories, such as timber harvest areas; timber stand improvement (TSI) areas; riparian, wetland, and water resource buffer zones;

stream corridors; ecological communities; wetlands; steep slopes and highly erodible soils; rare plants; threatened and endangered species; locations of cultural and archeological resources; and soil and water resources.

A GIS database consisting of these data layers will be maintained and updated with each new inventory. Maps built from these data can be used to track temporal and spatial status and trends of the forest resources relative to other ecologically or geologically sensitive resources.

7.6.2 Upper Forested Slopes Forest Management

The upper-forested slope area of EAFR is critical to species whose inhabitance of the Green Mountain Chain is reliant on the maturity of the vegetation, lack of human intrusion and large tracts of undisturbed land. With respect to the latter, EAFR can only be viewed as one small segment of a continuous chain of habitat. These stands of northern hardwood contain a dense understory of witch hobble, red spruce, striped maple and mountain maple. Less common understory vegetation includes mountain ash, winterberry and hazelnut.

Very little disturbance to this area has occurred on EAFR in the last 80 years. Species present are characteristic of late seral and/or climax vegetative communities. If left undisturbed, true climax conditions would be achieved in 50-100 years. Vegetative transition would be to an increasing dominance by northern hardwoods. While the lack of disturbance would affect vegetative communities, little change in the wildlife community would be forecast. Most of the species present today are characteristic of late seral state forests and would remain characteristic of climax forest. No on-going military activities are proposed above 2,200 feet elevation.

The belt of northern hardwoods in which beech predominates between 1,400' and 1,800 feet elevation is critical for many species of wildlife, but are especially critical to black bear. In addition, sensitive species like lynx and marten would benefit from the correlation between a lack of vegetative disturbance and lack of human intrusion, and could become more common if climax vegetative types were allowed to develop in these areas. Any human disturbance of vegetation with this area would be detrimental; therefore, the area will remain as it is today.

The Forest Management Program will continue to monitor the successional changes that are occurring in this area and ensure that very minimal forest cutting activities occur in the lower fringes. The Wildlife Program will monitor beech tree usage by bears, conduct bait surveys for bears and cats, and visually examine usage by other species.

7.6.3 Lower Slope Forest Management

The forested lower slopes run from 1200' elevation to the western boundary of EAFR. Here, northern hardwoods occupy mesic or moderate moisture sites with red oak associations on the more xeric or drier sites. Riparian areas dominated by a hemlock-white pine association with varying amounts of red maple, aspen and paper birch. The understory vegetation within these lower slope forests shows the influence of past land use. Mid-successional reversion of farmlands to forest has increased the species diversity with the appearance of raspberry, wild grape, gray birch, serviceberry, wild apple, crab apple, sumac, blue beech, common juniper, spirea, common barberry, and ironwood. Some of the more common forest herbaceous species present on EAFR include during the spring, May apple, clintonia, trillium, trout lily, wood anemone, spring beauty, Canada mayflower and meadow rue. In the summer, wood sorrel, yarrow, bristly sarsaparilla, false Solomon’s-seal, asters and Solomon’s- seal are present. Common ferns include the ostrich fern, cinnamon fern, interrupted fern, New York fern, hay-scented fern and bracken fern.

There are several areas of special importance to wildlife within the forested lower slopes. These include two areas of mature oak (south slope of Bald Hill and OP Hill), and a conifer corridor connecting the north and south boundary of EAFR at approximately the 900-foot elevation. Acorns, like beechnuts, are a valuable food for wildlife.

An active timber management program on the lower forested slopes continues to improve the diversity of the vegetation and wildlife that are present. The method of management emphasizes a normal distribution of ages of forest stands that provide an optimal sustained supply of habitat ranging from early to late successional stage. Northern Hardwood stands will be managed on a 120-year rotation with an emphasis on a mix of even- and uneven-aged silviculture. At any given time, not more than 12% of the acreage of the northern hardwood will be in regeneration (1-10 years of age). Oak stands will be managed on a 150-year rotation to insure the continued presence of the type. Any silvicultural method that converts oak stands to northern hardwoods will be severely discriminated against. Aspen/Birch stands will be managed on a 60-70 year rotation, preferably with even-aged silvicultural treatments. A very beneficial treatment to favor the woodcock would be the establishment of 10% of the aspen/birch type acreage in the 1-10 year regeneration stage by clear cutting 2-acre blocks.

Management of the softwood on EAFR often cannot be distinguished from riparian area management because most of the wetlands have a softwood border. White pine stands greater than 300' from wetland edges will be managed like northern hardwoods. Softwood stands within 300' of a wetland will be managed solely by individual tree selection uneven-aged management. Rotation ages will be as long as possible, but at least 150 years. No openings greater than 1 acre will be created within softwood forest stands less than 300 feet from wetlands.

The following management measures will be implemented to ensure that the forest management program at EAFR achieves its goals and objectives for timber production, maintain the ecological integrity of the training lands, and comply with all governing policies, regulations, and laws:

- Uneven-aged management will continue as the primary silvicultural system employed at EAFR. For selected wildlife improvement projects, even-aged management will be the preferred harvesting method. The reasons for implementing uneven-aged management are as follows:
- To maintain the proper basal area in the stands to promote full stocking and optimum growth of commercially desirable species.
- To provide continuous regeneration containing three or more distinct age classes, either intimately mixed or in small groups, within the stand; and because uneven-aged management has less impact on the training site and, in most cases, enhances the areas for training by opening up the area, thereby supporting the military mission.
- Generally, single tree selection will continue to be the harvesting method. The single tree selection method creates new age classes in which individual trees of all size classes are removed more-or-less uniformly throughout the stand to achieve desired stand structural characteristics. The focus will be on the removal of individual trees that are commercially mature/overmature, and deformed or damaged. Undesirable species and cull trees will be removed as well.
- Group selection may be employed under specific circumstances. Group selection is a method of regenerating uneven-aged stands in which trees are removed, and new age classes are established in small groups. The maximum width of groups is approximately twice the height of the mature trees. Small openings are created to provide micro-environments suitable for the regeneration of shade-tolerant species, and larger openings (3-5 acres) provide conditions suitable for the regeneration of more shade- intolerant species.
- The Group Selection System will be employed on an as-needed basis for the following reasons:
    - to enhance regeneration of specific shade-intolerant species; and
    - to enhance wildlife habitat and improve biodiversity (i.e., create or increase stands

of aspen, *Populus grandidentata*, for wildlife browse. Selected, small stands are cut to produce prolific stump sprouting, thereby creating browse.).

- Salvage sales will be conducted, as dictated by the military mission, to minimize expense to the installation and to recover the monetary value of the resource.
- Vermont Forestry BMP's will be implemented through Corps of Engineer's timber harvest contractual requirements on EAFR. A record of implemented BMPs will be kept on file in the Natural Resource Manager's Office.

7.6.4 Timber Harvest Planning.

The results of the forest inventory determined that the annual removal of 6.1 MMBF (million board feet) is the theoretical balance between the annual net growths minus estimated mortality. Therefore, under sustained yield principles, a maximum of 6.1 MMBF of timber could be harvested annually at EAFR. Historically, however, annual amounts harvested on EAFR have ranged from 20,000 to 300,000 BF, which allowed forest growth to far outpace the level of harvest. Timber harvests will be conducted annually and the harvest priorities among the stands will be determined based on each stand's variation from the 'average' for factors such as harvest volume per acre, volume per acre, and stocking percentage. During the planning process, stands exceeding the averages will be given highest priority for harvest. To ensure that timber-harvesting operations are compatible with on-going training and mission requirements, EAFR maintains a flexible long-range plan for timber harvests. Although the variability in training schedules can make it difficult to plan activities to the exact year in which a unit will be managed, this flexibility ensures that the goals will be achieved during the life of the plan.

Schedule of Harvest.

Harvest plans follow the Forest Management Plan schedule completed by Greenleaf Forestry, a consulting forester employed at EAFR. The range is divided into 9 forestry compartments, which are further subdivided into stands. Long-range forest management guidelines are based on current timber management and forest ecology principles. The consulting forester, Greenleaf Forestry, has prepared a Forest Management Plan available at the Environmental Offices at Camp Johnson on request. Summaries of forest management options arranged by forest compartment are included in the plan. The following bid sales are scheduled for the period of 2019-2024. The sales listed below are currently scheduled for implementation during the next five years; however, changes in funding, unexpected environmental changes or training priorities may alter the schedule of projects. Some management actions may be delayed or postponed due to these unforeseen circumstances. These sales will follow the bid procedure described in the bid sale process below.

Table 7
2019-2024 INRMP Planned Timber Sale at EAFR

Compartment #	Stand #	Acres to be Cut	Estimated Volume BF/Cords
1	13	14	65,000 / 150
2	2 & 3	59	125,000 / 500
2	7	47	135,000 / 400
5	3	55	30 / 400
5	6	54	30 / 400
5	7 & 10	43	135,000 / 160
7	1 & 3	200	100,000 / 300
Source: GCI, 2017.			

See Figure 16, EAFR - Programmed Timber Sales, for locations of above sale areas.

The above sales will follow the management guidelines listed below. Additionally, if soils are deemed too wet to harvest without environmental damage, timber removal will take place in winter months over frozen ground and snow.

Bid Sale Process. Timber harvest activities involve coordination and consultation with a number of state and federal agencies to ensure EAFR's compliance with all state and federal regulations. The management measures that EAFR will follow during the conduct of timber harvest are provided below. All pertinent environmental documentation will be prepared prior to the Invitation-for-Bids. This documentation includes, but is not limited to the following:

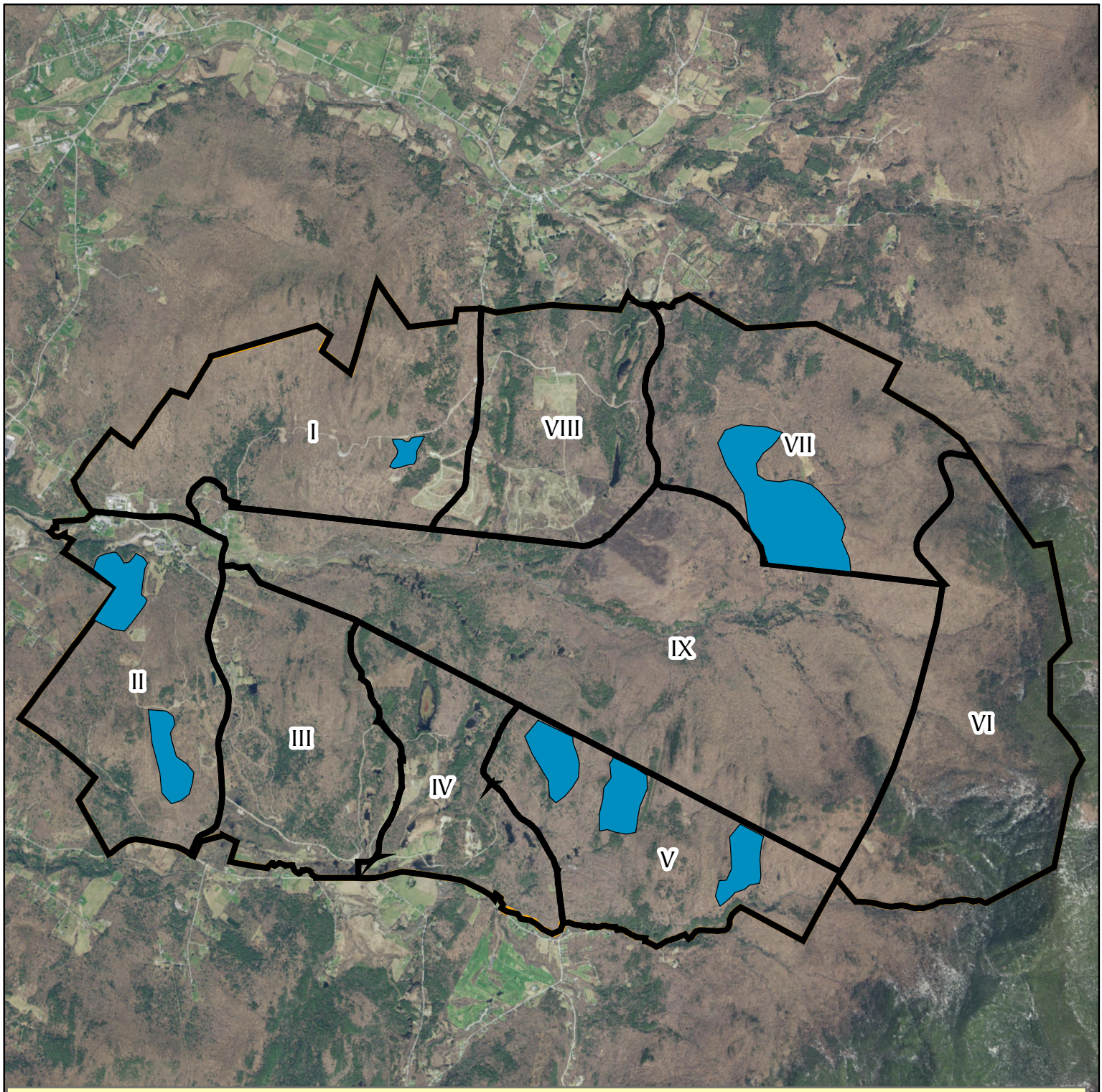
- Compliance with this INRMP
- Report of Availability (ROA) prepared by VTARNG and forwarded to NGB for approval,
- Record of Environmental Consideration -Preliminary Assessment Screening (PAS)

The Vermont Guard USPFO office has the authority to execute and administer timber sales on federally owned DA lands. The installation's Natural Resource Manager will administer the timber sale process, by authority of established MOUs. Generally, no harvest or TSI activities will occur within 100 feet on both sides of a perennial stream and within 50 feet on both sides of an intermittent stream.

Wildlife Damage. Beaver damage has become significant in many of the bottomland timber stands as well as bottomlands that are regenerating to a forest condition. This damage occurs as trunk girdling, tree felling, and flooding which results in limiting access and mortality to species intolerant to flooding. Deer damage to the woodlands is not significant, but damage to plantations is expected. Wildlife damage control can be accomplished by various forms of population control and discouraging wildlife use of sensitive areas. Monitor the location and size of beaver colonies. When necessary and feasible, remove nuisance beavers via trapping.

Invasive Species. An Invasive Species Management Plan has been established for the EAFR with the assistance of the Nature Conservancy of Vermont. Areas where known Rare, Threatened & Endangered (RT&E) species and/or natural communities interfaced with invasive species locations (ISLs) were identified as top priority for treatment. The project focused on species that are characterized as Class B Noxious Weeds by the Vermont Invasive Invasive Plant Fact Sheet Series. They fall under plant quarantine laws and regulations. Sale, transport, and possession of these plants are prohibited. The Class B species treated at EAFR were Japanese Honeysuckle, Common & Glossy Buckthorn, Common Reed, Purple Loosestrife & Japanese Knotweed. Vermont Watch List species treated at EAFR included Japanese Barberry, Spotted Knapweed and Reed Canary Grass. The plan included an evaluation of the efficacy of using nonchemical means to control invasive species. The objective is to minimize herbicide use, but remote locations and species characteristics often make mechanical methods ineffective or impractical.

Erosion Control and Bivouac Areas. Areas that have been disturbed by machinery should be graded, water diversions installed and seeded with appropriate vegetation. Mulching and temporary closing of the road or trail may be required to allow seeded vegetation to become established.
Bivouac areas are located in a number of the timber stands and the damage that is incurred in these areas has so far only been minor. This damage ranges from basal wounds on trees caused by equipment or fires, bullets shot into trees, soil erosion, nails put in trees, soil compaction and root damage due to rutting by military equipment, and trash left on the site. An educational program for users of EAFR should be implemented along with a monitoring/enforcement program to minimize damage to these areas.



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October, 2019

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1 centimeter = 500 meters

Feet
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1 inch = 4,167 feet

Figure 16 - EAFR Programmed Timbersales

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
- EAFR Boundary
- EAFR Compartments
- Programmed Timbersales 2020-25

7.6.5 Reforestation

The main purpose for tree planting is to reforest and stabilize open areas, control active erosion, enhance aesthetics, and improve wildlife cover. Secondary purposes would include controlling species composition, providing wildlife food, increasing land value, and reducing invasion of non-natives. Plantings will focus on species that meet most of the following criteria:
native species, potential value for timber, provides food and cover for wildlife, readily available, difficult to regenerate naturally, and able to thrive on site.

EAFR has no current plans for any major reforestation efforts. Reforestation occurs naturally from existing seed sources and hardwoods regenerate readily. Many of our timber sales are conducted to create forest openings for wildlife habitat, and as such reforestation is not the goal. Reforestation projects on EAFR will take place on a small scale in areas such as old borrow pits, old timber landing areas and other areas on a case by case basis. At no time will such reforestation occur in areas greater than 5 acres.

7.6.6.Wildfire Management

Wildfires can be ignited from weapons firing and ammunition striking in the impact area. While wildfires are a possibility at EAFR, the abundant precipitation and habitat management procedures used by the installation tend to mitigate the situation. VTARNG's maintains an annual prescribed burn program in selected areas to reduce vegetative cover and reduce the risk of wildfires. In addition to VTARNG's firefighting equipment, firefighting services are available through a mutual aid agreement with the Towns of Underhill and Jericho Center.

Wildfire prevention and suppression is a matter of concern for military training and natural resources management at EAFR. Wildfires have several undesirable aspects: they interfere with ongoing training activities, they can make training areas unsuitable for training over the short-term, and they have direct and indirect impacts on habitats and species. There are positive aspects to wildfire from an ecological standpoint, but the current guidance (i.e., AR 200- 3) is to suppress wildfires when they occur. Wildfire prevention and suppression involves minimizing fire occurrence by educating personnel on fire prevention techniques, reducing natural fire fuels, and restricting the types of ammunition and pyrotechnics that can be used based on the level of fire danger, being well prepared for fires, and when necessary, rapidly suppressing and containing the spread of wildfires that do occur.

Reducing natural fire fuels through controlled burning is used as a management tool to prevent the buildup and reduce the quantity of fuel, control undesirable species, improve access, maintain areas in suitable troop training condition, improve wildlife habitat, and enhance appearance. Reducing the fuel load through controlled burning helps to prevent fires from starting, decreases the intensity of fires that do start, and inhibits the spread of wildfires. Controlled burning is also used as a management tool in the grassland habitats to enhance its value for a variety of wildlife species. Prescribed burns conducted to reduce woody growth and improve wildlife habitat will be carefully controlled to prevent their spreading. Regular prescribed burning to aid wildlife, such as woodcock will be performed while accomplishing the existing military mission.

EAFR has established a network of permanent firebreaks around those areas where prescribed burns are conducted. Large areas without firebreaks, and areas particularly prone to wildfires, will be evaluated to determine the need for establishing additional firebreaks. Nearly all of the fires at EAFR result from the use of pyrotechnics during training. Woodland fires will be extinguished as quickly as possible. The person(s) that first notices the fire will contact Range Control and then attempt to control and extinguish it, however, if this is not feasible, the fire will be contained to the extent possible and the Natural Resources Section will be notified immediately. Personnel out on the training areas will be adequately

trained in fire prevention and reporting procedures.

A Integrated Wildland Fire Management Plan (IWFMP) was recently established (2011) for EAFR as is required for Army installations with unimproved grounds that present a wildfire hazard and/or installations that utilize Prescribed Burns as a land management tool. The Prescribed Burn plan for EAFR is a key element in maintaining the military mission of this installation, as well as providing proper environmental stewardship of the land.

The IWFMP is designed to present specific guidance, procedures, and protocols in the prevention and suppression of wildfires on VTARNG training lands. This plan focuses on the use of prescribed fire planning to further reduce the risks of wildfires on the training lands, while maintaining the training lands for military readiness. The plan defines the roles and responsibilities of the offices, departments and agencies involved and actions to be taken within the prescribed burn program and also for wildland fires.

The Prescribed Burn program at EAFR has been performed for approximately 15 years. Thirty fire management units, ranging in size from several acres to approximately 100 acres, have been established for EAFR. These units have been under fire management since 1997, with one or two Prescribed Burns prior to the current burn program, with the objective of reducing hazards, maintaining landscapes, and ecosystem management. Fire management units have been delineated by the presence of firebreaks and/or fuel types. These delineations strive to create units of similar size and similar fuel types. (Figure 17 EAFR - Prescribed Burn Areas)

Approximately 100 acres are burned every year at EAFR. The approximate window for optimum burning to meet management objectives is usually from about April 1st to May 1st. At this time of year, it is typical that only 1-2 days of drying time are needed to meet the burning objectives. Fall burning is not achievable due to relatively high humidity conditions. Summer burning does not provide optimal conditions and is therefore not scheduled in the Prescribed Burn program.

7.6.7 Integrated Pest Management Program

The following discussion is a brief overview of EAFR pest management program, which is described in full in the Integrated Pest Management Plan for VT (December 2010). Pest management priorities at EAFR include control of disease vectors, protection of stored food products, protection of real estate, control of nuisance pests, control of undesirable vegetation, protection of beneficial plants, and control of miscellaneous animal pests (e.g., rodents, birds, bats). The pest management plan for the VTARNG describes the command's pest management requirements, outlines the resources necessary for surveillance and control, and describes the administrative, safety and environmental requirements of the program. The program for the VTARNG relies on building occupants, building administrators, and contracted pest management technicians to control pests. Pests addressed in this plan include weeds and other unwanted vegetation, termites, mosquitoes, and other miscellaneous vertebrate pests such as skunks, raccoons and squirrels. Without control, these pests could interfere with the military mission, damage real property, increase maintenance costs and expose installation personnel to diseases.

7.6.8 Outdoor Recreation and Public Outreach

National Public Lands Day is and event that occurs once a year when volunteers come together to improve the countries largest natural resource – our public lands. These volunteers gather on a Saturday every September to help improve the public lands that they use for recreation, education and enjoyment. National Public Lands Day is a unique public-private partnership involving many federal, state, and local land agencies. These agencies work closely with business partners such and numerous non-profit

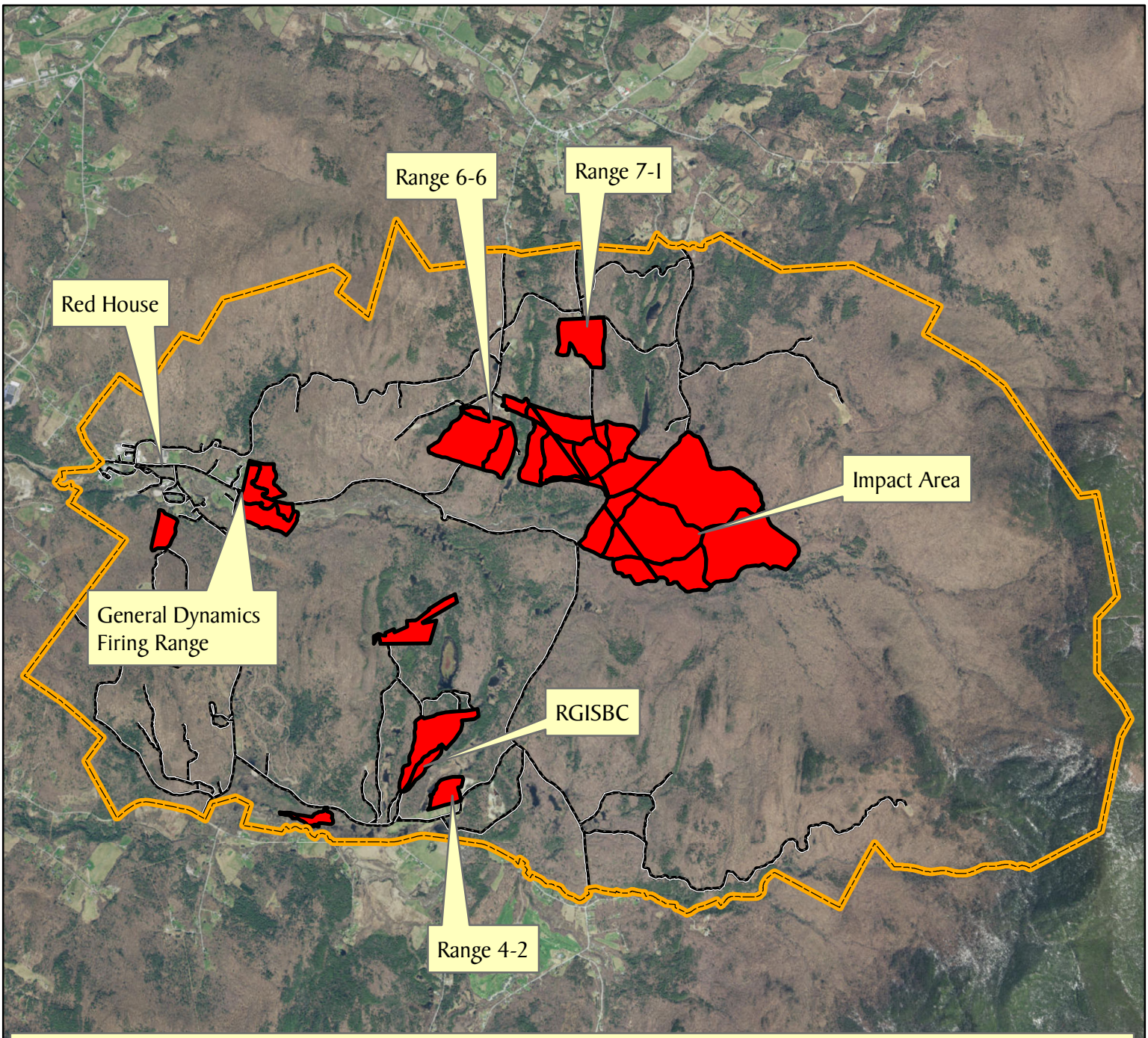

Figure 17 - EAFR Prescribed Burn Areas

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October, 2019

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Meters
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1 centimeter = 500 meters

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Integrated Natural Resource
Management Plan 2020-2025

Military Department
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Army National Guard

Lead Consultant
Elizabeth S. McLoughlin, LLC
Environmental Consulting

Legend
- EAFR Boundary
- Prescribed Burn Areas
- EAFR Roads

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

Data for Burn Units provided by GCI, Inc.

organizations.The National Environmental Education & Training Foundation manages, coordinates, and generates financial support for the program

7.6.9. Sugarbush Program

VTARNG is currently proposing a maple sugarbush operation at EAFR. This operation will add revenue to the army forestry program. The sugarbush operation will take place in compartment 1, stands 8 and 9. This area is east of bald hill and north of castle trail, directly west of Poor Farm Rd. This area would provide easy access to contractors via the Underhill Center gate, away from the more secure areas of the installation. There are two logistical requirements that must be met for a functional sugarbush. The first is electricity and the second is easy access. The sugarbush stands west of Poor Farm Rd would meet both of those requirements, see Figure 18, EAFR - Sugarbush Locations.

Stand data collected during a field cruise of the area in the winter of 2012-2013 estimates that there are 209 acres of operable and suitable sugarbush, enough for 12,900 taps. However, to be prudent, the range forester recommends starting with 4000 taps before expanding to a larger project area. VTARNG has conducted a timber sale of the area to remove mature high quality timber before tapping. No impact to VTARNG training facilities is expected. In addition, the sugarbush contract will provide private label maple syrup that could be used as mementos to visiting dignitaries to further promote VTARNG's good environmental stewardship of the EAFR.

VTARNG will contract the entire operation out to a private entity after a bidding process that would provide the government with the best prices per tap for the operation. The bidding process is being conducted in 2015.The winning bidder will perform the sugaring after a sugarbush lease agreement is establishing with the successful bidder. It takes approximately 1 year for set-up of taps and lines. Current prices per tap are approximately $1.25- $1.50 per tap, for an estimated 5 year contract worth approximately $25,000 to the army forestry program.

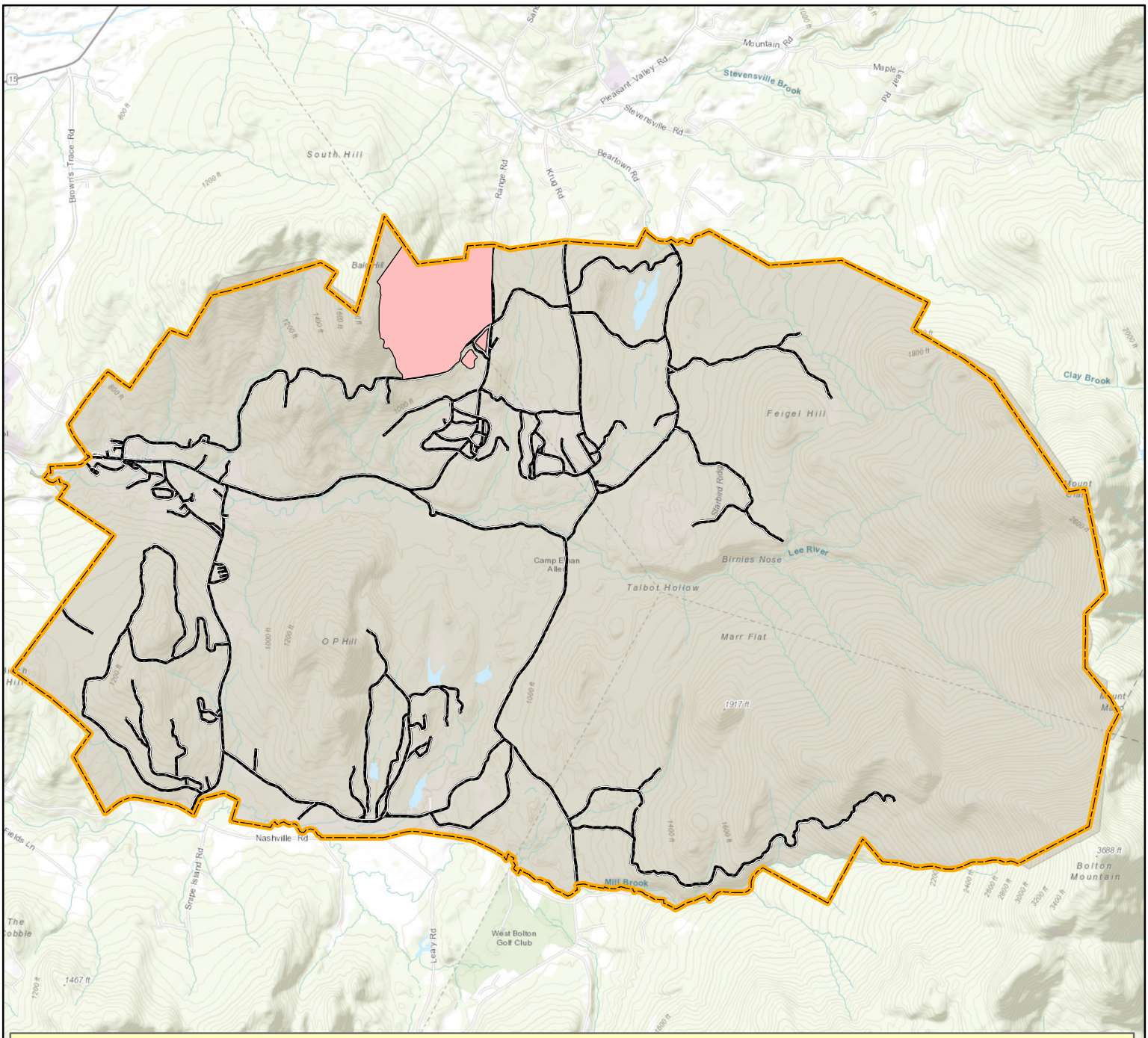

Figure 18 - Proposed Sugarbush

Integrated Natural Resource
Management Plan 2020-2025

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
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Environmental Consulting

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Legend
- EAFR Boundary
- Proposed Sugarbush
- EAFR Roads

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Chapter 8.0 Management Goals and Objectives

Maintaining optimal environmental conditions on the training lands is essential for the success of the military mission at EAFR. The management measures developed and presented herein are based on the current conditions of the resources and the anticipated needs of military mission and activities. The primary mission of EAFR is to provide adequate facilities, training areas, and ranges to maintain the readiness of the Vermont Army National Guard (VTARNG) a division of the State of Vermont Military Department (SVMD) and the Army National Guard (ARNG) for its assigned mission. The Army recognizes that a healthy and viable natural resource base is required to support the military mission. This INRMP helps to ensure that environmental considerations are an integral part of planning activities at EAFR and that natural resources are protected in accordance with Army regulations and policies.

The planned initiatives of this INRMP have been identified by the VTARNG with assistance from Northern Stewards and Greenleaf Forestry, consultants under contract to VTARNG. The primary management initiative is to seek to maintain or increase the level of biodiversity of native species through maintaining a diversity of habitat types proportional to the structural diversity; that is, size and density of trees. While mature stands are important to have within a landscape and specific species require only mature stands for their life history, many species use mature stands for only part of their life history, while the majority of wildlife will utilize early successional growth resulting from large scale disturbances (logging) during some part of their life history, others will utilize early successional growth for all of their life history. Forest Management activities can include 5-10 acre patch cuts in areas conducive to large openings. The creation of early successional habitats as a part of EAFR will maintain or increase the level of biodiversity. Key species identified as Vermont Species of Greatest Conservation Need will benefit from the creation, enhancement, promotion, and retention of early and late successional habitat. Techniques can include progressive clear cutting, brush hogging, burning, or other operations that increase habitat available to early successional species and protection of remote old growth habitat. In addition, most mammals, birds, amphibians and reptiles require multiple habitat types for reproduction, feeding or cover and connectivity between these habitats without fragmentation. Fragmentation may include roads, buildings, or logging operations. This INRMP has identified the need to manage for specific conditions that will prevent the isolation of a given habitat. The fringe areas on the edges of the many range clearings, wetlands, open ledges, and the overgrown pastures also provide a diverse mix of habitats.

Management of game and non-game species on EAFR is accomplished through a cooperative plan between EAFR, USFWS, and the VTANR Department of Fish and Wildlife. The Wildlife found at EAFR is diverse due to the mix of forests, riparian areas and open areas. Ongoing scheduled surveys on EAFR include mammals, birds, amphibians and reptiles.

The future Integrated Resource Management Plans for EAFR include:

- Continue Wood duck boxes
- Invasive Species management
- Management and survey of species of greatest conservation need (SGCN) identified in VTWAP (Wildlife Action Plan)
- Early Successional habitat enhancement (formerly woodcock habitat)
- Mammal Inventory and Monitoring
- Reptile and amphibian monitoring
- Bird Point Counts
- Work with other forestry related programs

Additional management initiatives include:

- Prevent the degradation of water quality, protect aquatic and riparian habitats and identify and restore degraded habitats, including wetlands and Vernal Ponds;
- Identify, map and monitor the presence of invasive species. Where appropriate, approved control methods will be used. Increased populations of invasive species over time will require constant control methods. These include pulling, cutting, herbicides, fire or a combination. VTARNG will consider the implication of various control methods and plan for their implementation;
- Seek to maintain or increase the level of biodiversity of native species;
- Maintain and improve unique trees and forest stands by conducting activities that protect or enhance natural communities. Communities with exceptional quality and/or rare frequency as identified from previous surveys should be restricted from harvest activities. All activities in natural communities should function to preserve community characteristics. These activities include protection of Aspen and Butternut stands, the favoring of mast-producing trees and the use of snag retention methods;
- Continue to survey and monitor for NELB on appropriate habitats and EAFR. Consult with USFWS when appropriate;
- Continue to survey and monitor any state-listed species where they may occur at EAFR;
- Wildlife found at EAFR is diverse due to the mix of forests, riparian and open areas. Ongoing scheduled surveys on the Range include mammals, birds, amphibians and reptiles. Continued, coherent, standardized monitoring will improve understanding of habitat use. Wildlife and wildlife habitat work will be performed in conjunction with forest management activities. Timber sales should be designed to improve or protect wildlife habitat and not to cause undo adverse impact on wildlife populations, particularly those state or federally protected or listed as a species of greatest conservation need;
- Provide special protection and management that lead to the recovery of threatened and endangered species if they occur and protect species of special concern. Include species of greatest conservation need as identified by Vermont's Wildlife Action Plan with priority medium and high.
- Seek to maintain or increase the level of biodiversity of native species;
- Manage to protect and/or enhance rare and unique natural communities as defined from previous surveys;
- Maintain and Improve Unique Trees and Forest Stands of Aspen, Butternut;
- Maintain Edge and Open Areas;
- Maintain connectivity among habitats; and,
- As the majority of the land is forest, forestry management and timber sales are a significant component of the INRMP.

The implementation of these INRMP goals will not be a significant change in management direction for this installation.

Chapter 9.0 Implementation

9.1 Organization, Roles and Responsibilities

The purpose of this INRMP for VTARNG to have a compilation of natural resource materials to allow coherent management of the natural resources of EAFR. VTARNG will implement this INRMP for EAFR with assistance from VTARNG staff, personnel at EAFR, as well as other outside sources of assistance.

The VTARNG's Environmental Program Manager has the primary role and responsibility for the implementation of this INRMP, which is in effect from FY 2019 through FY 2024.

VTARNG's Environmental Program Manager will work with VTARNG staff, including EAFR personnel, and contractors and consultants as necessary. These could be temporary hires, which would be hired with term limitations and could include seasonal employees, university hires, and outside agency reimbursable hires.

Implementation of a number of the projects discussed in this INRMP will require active outside assistance. This outside assistance will come from state and federal agencies and contractors. Using these resources is the most efficient and cost-effective method for acquiring expertise on a temporary basis. Some of the parties will be reimbursed for their assistance, as agreed based on Memoranda of Understanding and contractual agreements, whereas others will supply their assistance in accordance with cooperative agreements.

9.2 Project and Program Priorities

The Office of the Secretary of Defense (OSD) considers funding for the preparation and implementation of this INRMP, as required by the Sikes Act, and the associated NEPA analysis and documentation to be a high priority. However, the reality is that not all of the projects and programs identified in this INRMP will receive immediate funding. As such, these programs and projects have been placed into two priority-based categories: 1) high priority programs and projects and 2) important projects. The prioritization of the projects is based on need, and need is based on a project's importance in moving the natural resources management program closer towards successfully achieving its goal. The time frame during which these projects are to occur is provided in parenthesis following the project description.

High Priority Programs: 1. Bat Surveys – Annual Acoustic Monitoring (NLEB)

Important Projects:
2. Bicknell Thrush Survey
3. Prescribed Burning – Annual
4. Control of invasive species - Ongoing
5. Grasshopper Sparrow Surveys
6. Timber Management through Sales
7. Wooduck Nesting Boxes
8. Bird Surveys
9. Small Mammal Surveys

9.3 Funding Options

Environmental Funds.
The National Guard Bureau Environmental Program provides funds for the work proposed in this INRMP.

The natural resources program at EAFR receives financial support from appropriated funds (e.g., Operations and Maintenance), and funded reimbursements (forestry). The use of funded reimbursements is restricted by Federal law and can be used only for timber management-related expenses. Expenses not directly associated with timber management must be funded from appropriated funds.

Forest Management Projects Funded by Forestry Funds.

Funding for forest management can be generated from commercial timber sales and the sale of other forest products, such as firewood, or from direct appropriated funds from the Operations and Maintenance account. Proceeds from the sale of timber and firewood, which are deposited into the Army Forest Management Program Account, can only be used for activities directly related to the management of the forest ecosystem, such as timber management, reforestation, TSI, inventories, fire protection, construction and maintenance of timber area access roads, purchase of forestry equipment and supplies, disease and insect control, planning (to include actions necessary to maintain forestry compliance with applicable laws and regulations), timber marking, inspections, sales preparation, training of personnel, and timber sales (AR 200-3, Chapter 5-4(a)) (Table 6-1).

EAFR generates forestry funds from commercial timber sales and the sale of firewood.

Integrated Training Area Management Funds.

Funding for the Integrated Training Area Management program is through military training channels, rather than through the environmental program. In addition to maintaining key personnel and natural resources data collection efforts, the ITAM work plan budget will fund a number of projects of major importance to maintaining, preserving and protecting the natural resources at EAFR. The total EAFR ITAM requirement for fiscal years 2019 through 2024 totals $800,000. Of course, this is an estimated value that is subject to adjustment based on changing needs and revised project cost estimates.

Summary of INRMP Implementation Costs.

The average annual costs of implementing this INRMP are total annual costs represent an accurate estimate of the cost from year-to-year can be expected. Variables that have the potential to affect the overall cost of implementation include changes in labor and contract costs, quantity of timber harvested, market value of timber, and the availability of funds. INRMP Plan costs average $5,000 per year. Forestry Costs per year average $60,000 per year and Conservation costs per year are $100,000 per year.

Integrated Natural Resource Management Plan. ($20,000)

This program assists DoD in protecting and enhancing resources while supporting military readiness. A legacy project may involve regional ecosystem management initiatives, habitat preservation efforts, archaeological investigation, invasive species control, and/or monitoring and predicting migratory patterns of birds and animals.

Command Support. VTARNG's Adjutant General and Command hierarchy, including the Post Commander and other personnel in command positions at EAFR fully support this INRMP. VTARNG is dedicated to ensuring the long-term sustainability of the natural resources and the management of those resources necessary to support the military mission. Command support is essential for the implementation of this INRMP. Also, in accordance with AR 200- 3, the Sikes Act, and other federal laws, the commander of EAFR is personally liable for noncompliance with the environmental laws affected by this INRMP and therefore has a personal interest in ensuring the full and complete implementation of the plan. This averages about $75,000 per year based upon program goals and revenue from timber harvest.

Plan Review. VTARNG will conduct a review of this INRMP annually to assess the preceding year's accomplishments. The schedule of activities set forth in this INRMP will be the basis for monitoring plan implementation.

Chapter 10.0 Conclusions

This document reflects the commitment set forth by the Army to conserve, protect, and enhance the natural resources necessary to provide realistic military training for Army National Guard and other military units that utilize EAFR. The primary purpose and objective of this document is to present an implementable INRMP that guides EAFR in meeting mission requirements, achieving natural resource management goals, and complying with environmental policies and regulations.

This INRMP is the final plan that will direct the natural resources management program at EAFR from 2019 through 2024. An ecosystem approach was used to develop the management measures for each resource area. Implementation of the management measures will maintain, protect, and enhance the ecological integrity of the training lands and the biological communities inhabiting them. In addition, the natural resources management measures described in this plan will protect EAFR ecosystems and their components from unacceptable damage or degradation and identify and restore previously degraded habitats.

The benefits of this INRMP are numerous. For the military mission, the natural resources management program, as described in this INRMP, will ensure that the environmental conditions of the training lands continue to provide the blend of open and forested areas that are necessary for realistic military training. From an environmental perspective, implementation of this plan will maintain, protect, and enhance the ecological integrity of the training lands and the biological communities (particularly sensitive, rare, threatened and endangered species) inhabiting them. In addition, the natural resources management program described in this plan will protect ecosystems and their components from unacceptable damage or degradation and identify and restore already degraded habitats. This plan will ensure users of the Range will have an increased awareness of the potential for impacts to occur as a result of their activities. This heightened awareness will serve to minimize the possibility for undesirable impacts, thereby decreasing the effort and costs that must be expended to mitigate.

The total average annual funding necessary to implement this INRMP is estimated at $150,000. The total cost over 5 years of implementing this INRMP is $750,000.

VTARNG support, including EAFR personnel, is essential for the implementation of this INRMP and is required for many of the natural resources management projects described herein. This INRMP has the full support of VTARNG Command and the Post Commander and other personnel in command positions at VTARNG and at EAFR

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