DRAFT

Integrated Natural Resource Management Plan
For the

New Hampshire Army National Guard
Training Site
Center Strafford, New Hampshire

&

Edward Cross Training Complex
Pembroke, New Hampshire

&

State Military Reservation
Concord, New Hampshire

2021-2025

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Acronyms and Abbreviations

AASF	Army Aviation Support Facility
BCC	Birds of Conservation Concern
BMP	Best Management Practice
BO	Biological Opinion
BOS	Base Operations Supervisor
CFMO	Construction and Facilities Management Office
CRM	Cultural Resource Manager
CMA	Concord Municipal Airport
DA	Department of the Army
DOD	Department of Defense
DMAVS	Department of Military Affairs and Veterans Services
DNCR	Department of Natural and Cultural Resources
ECTC	Edward Cross Training Complex
eMS	Environmental Management System
EST	Electronic Skills Trainer
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GIS	Geographic Information System
GPS	Global Positioning System
HUC	Hydrologic Unit Code
HQ	Headquarters
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resource Management Plan
IPMP	Integrated Pest Management Plan
ISO	International Organization for Standardization
IWFMP	Integrated Wildland Fire Management Plan
JFHQ	Joint Force Headquarters
KBB	Karner Blue Butterfly
MOA	Memorandum of Agreement
MFR	Memorandum for Record
MOU	Memorandum of Understanding
NEES	North East Ecological Services
NGB	National Guard Bureau
NHARNG	New Hampshire Army National Guard
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NEPA	National Environmental Policy Act

NHDES	New Hampshire Department of Environmental Services
NHDHR	New Hampshire Division of Historical Resources
NHFG	New Hampshire Fish and Game Department
NHGPA	New Hampshire Groundwater Protection Act
NHNG	New Hampshire National Guard
NHNHB	New Hampshire Natural Heritage Bureau
NLEB	Northern Long-eared Bat
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NVCS	National Vegetation Classification Standard
OHRV	Off-Highway Recreational Vehicles
OCS	Officer Candidate School
PIF	Partners in Flight
PLS	Planning Level Survey
PPSOW	Pitch Pine-Scrub Oak Woodland
ROW	Right-of-Way
RPZ	Runway Protection Zone
RTI	Regional Training Institute
SAIA	Sikes Act
SGCN	Species of Greatest Conservation Need
SMR	State Military Reservation
SWQPA	Shoreland Water Quality Protection Act
TAG	The Adjutant General
TASS	Total Army School System
T & E	Threatened and Endangered
TS	Training Site
USC	United States Code
USFWS	United States Fish and Wildlife Service
WAP	Wildlife Action Plan
WFPM	Wildland Fire Program Manager
WNS	White Nose Syndrome

Chapter 1 - Executive Summary

This Integrated Natural Resource Management Plan (INRMP) serves as a guidance document for management of the natural resources at the NH Army National Guard Training Site (NHNGTS) in Center Strafford, New Hampshire, the Edward Cross Training Complex (ECTC), located in Pembroke, New Hampshire and the State Military Reservation (SMR) in Concord, New Hampshire. The ECTC was previously named the Regional Training Institute (RTI) and is also commonly referred to as the Pembroke property or site. All three New Hampshire Army National Guard (NHARNG) facilities are owned and maintained by the Department of Military Affairs and Veterans Services (DMAVS) which was until recently called The Adjutant General's Department. DMAVS and The Adjutant General's Department may be used interchangeably within this plan. This plan will help guide activities on the site in a manner that will promote sustainable use of the land for both its natural resources and military training needs.

The INRMP was developed using an interdisciplinary approach. Information was gathered from various sources to include; NHARNG directorates, NHARNG staff as well as outside federal and state agencies. This INRMP was developed for planning period fiscal year 2021-2025.

The Sikes Act (SAIA) of 1997, 16 U.S. Code (USC) §670a et seq., as amended, requires federal military installations with significant natural resources to develop a long-term INRMP and implement cooperative agreements with fish and wildlife agencies as appropriate. Department of Army (DA) Memorandum dated 25 May 2006 provides guidance on how the Army implements the SAIA. A National Guard Bureau (NGB) Memorandum *Integrated Natural Resources Management Plan Determination for 17 Army National Guard Installations*, dated 02 May 2006 determined the NH National Guard Training Site requires the development of an INRMP in accordance with the SAIA. This INRMP was developed to meet all requirement of the SAIA.

Management goals and objectives will be established for the resources as they relate to current and known potential future activities on the site. The plan will cover a time period of five years, 2021-2025, and will be revised when major changes are proposed to military use of the site or management of the natural resources. Minor changes may be made frequently, when the need arises.

Through successful implementation of this INRMP, all sites will have the ability to sustain the needs of the military mission while preserving the critical natural resources that exist on the site well into the future.

Specific goals for each site are identified below:

New Hampshire National Guard Training Site

GOAL 1: Improve habitat for the federally-endangered small-whorled pogonia within the potential habitat area.

GOAL 2: Manage 50% of the semi-improved portion of the site to provide habitat to support a diverse grassland and early successional bird population.

GOAL 3: Monitor and control invasive species that are potential harmful to natural communities and/or military training on the site.

GOAL 4: Conduct planning level surveys as needed to maintain a foundation for effective planning and decision making.

GOAL 5: Protect ground and surface waters onsite.

GOAL 6: Protect black gum swamp exemplary natural community from upland activities that could potentially have a negative impact on the community and the species dependent on the swamp.

GOAL 7: Ensure protection of natural and cultural resources of value through implementation of this plan in support of military mission requirements.

Edward Cross Training Complex

GOAL 1: Restore and maintain the Pitch Pine scrub – oak woodland (PPSO) exemplary natural community onsite in support of rare flora and fauna.

GOAL 2: Conduct PLS to maintain a foundation for effective planning and decision making.

GOAL 3: Manage Appalachian Oak forest onsite both in support of the habitat and military training needs.

GOAL 4: Improve awareness to reduce risk to natural resources from training and public use of the site.

GOAL 5: Protection of both ground and surface waters onsite.

GOAL 6: Monitor and control invasive species that are potential harmful to natural communities and/or military training on the site.

State Military Reservation

GOAL 1: Restore and maintain pine barrens habitat in support of Karner blue butterfly recovery efforts.

GOAL 2: Conduct planning level surveys as needed to maintain a foundation for effective planning and decision making.

Chapter 2 - General Information

2.1 Purpose

Over the next five years, this plan will provide specific habitat management actions to protect and enhance species habitats in concert with the military mission. Effective management of the natural resources onsite will depend on coordination and communication between the NHARNG, the Department of Military Affairs and Veterans Services (DMAVS), and both federal and state agencies, as necessary, to include NH Fish and Game Department (NHFG), Department of Natural and Cultural Resources (DNCR), and the US Fish and Wildlife Service (USFWS).

There are a variety of resources found onsite that if not preserved could have an impact on the site's sustainable long-term use. This plan will cover both current conditions and management of the following resources: ecosystems, vegetation, fish and wildlife, threatened and endangered species, wetland and water resources.

2.2 Authority

This INRMP has been prepared pursuant to the following laws, regulations, and directives:

- **Sikes Act of 1997, 16 U.S. Code §670 (SAIA, as amended).** This requires all military installations with significant natural resources to develop long-term INRMP and implement cooperative agreements with fish and wildlife agencies as appropriate. Section 313 of the National Defense Act of 2012 amended the Sikes Act to include state-owned National Guard installations.
- **Department of Defense Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*, 18 March 2011.** This instruction develops policy for management of natural resources integrated with military mission on lands managed or controlled by the Department of Defense (DoD).
- **Army Regulation (AR) 200-1, Environmental Protection and Enhancement, 13 December 2007.** Provides direction for management of natural resources on lands used by the military.
- **State of NH Endangered Species Conservation Act, NH RSA 212-A:1-15.** The Act states that other state departments shall assist and cooperate in the

conservation of endangered and threatened species and the actions of the agency shall not result in the destruction or modification of their habitat.

- **State of NH Native Plant Protection Act of 1987, NH RSA 217-A:1-12.** Provides for protection of plant species determined to be endangered or threatened in the state of NH. The Act states that state agencies shall assist in ensuring actions by the state do not jeopardize the continued existence of any plant species or exemplary natural community.
- **Endangered Species Act of 1973**. Protects and helps recover species it determines to be imperiled nationwide, as well as the ecosystems upon which they depend. It is unlawful to take a species listed under this Act. The Endangered Species Act is administered by the US Fish and Wildlife Service.

2.3 Responsibilities

The following list details each involved agency and their role at the sites involved.

The Army National Guard Installations and Environment (ARNG-IEZ):

- Provide technical guidance and support
- Review and approve this INRMP
- Review and approve Endangered Species Act formal consultation
- Involvement in programming, funding, and reviewing implementation projects set forth in the INRMP

Department of Military Affairs and Veterans Services (DMAVS):

- The operation and maintenance of all DMAVS State-owned facilities
- Implementing the force structure, budget, projects and construction at all State-owned DMAVS facilities
- Ensuring NHARNG compliance with all environmental laws

The Department of Military Affairs and Veterans Services Environmental Branch:

- Development and implementation of objectives identified within this plan
- Coordination with federal and state natural resource agencies for activities that have potential to impact the natural resources of the site
- Conducting necessary natural resource surveys to maintain current information to guide natural resource management of the site
- Identifying environmental compliance requirements and providing guidance to the Base Operations Supervisor (BOS) and ECTC Manager
- Developing and providing environmental awareness training and material to NHARNG units

- Development, update and implement the NHARNG Integrated Wildland Fire Management Plan (IWFMP)
- Implement and oversee environmental mitigation requirements as required by National Environmental Policy Act (NEPA) documentation

NHARNG G3, Plans Operations, and Training

- Oversee the military training operations at both the ECTC and NHNGTS
- Makes decisions on the current and future military training activities at both sites

ECTC Manager:

- Overseeing the daily operations of the ECTC, including site tenants
- Coordinate with other key players of the organization to see that tasks laid out in this plan are accomplished to best support the mission and resources onsite

Base Operations Supervisor (BOS):

- Oversees daily operations of the NHNGTS
- Coordinate with other key players of the organization to see that tasks laid out in this plan are accomplished to best support the mission and resources onsite

Construction and Facilities Management Office (CFMO):

- Responsible for maintenance and upkeep of NHARNG buildings and grounds
- Advisor to the Adjutant General on all aspects of the State's real property, including acquisition and disposal of land
- Oversee the NHARNG Environmental Branch

US Fish and Wildlife Service (USFWS):

- Provide guidance and technical assistance relating to federally protected rare, threatened and endangered species to the NHARNG Natural Resource Manager
- Cooperation in development and implementation of this plan. Participates in annual review requirements to ensure effective management of federally rare and listed species

NH Fish and Game Department (NHFG):

- Provides guidance and technical assistance relating to state protected rare, threatened and endangered species to the NHARNG Natural Resource Manager
- Cooperation in development and implementation of this plan. Participates in annual review requirements to ensure effective management of state rare and listed species

New Hampshire Department of Natural and Cultural Resources (DNCR):

- Providing guidance in management of New Hampshire rare plants and natural communities found on NHARNG sites

2.4 Management Philosophy

The NHARNG manages its natural resources in a manner that ensures a sustainable use of lands while meeting the military operations and training needs of the organization. The NHARNG strives to conserve and protect the natural diversity of sites under its control to ensure the long-term sustainable use of lands. An interdisciplinary approach was used in the development of this plan through coordination with both internal and external stakeholders. Various directorates within the NHARNG were consulted both in development and final review of this plan. Interested outside agencies, such as the USFWS, NHFG and NH Natural Heritage Bureau (NHB) were also consulted throughout the development of this plan. These same stakeholders will have an active role through implementation of this plan.

The NHARNG's natural resource management philosophy takes an ecosystem approach to resource management, rather than a species specific approach. This ensures protection and enhancement of the biodiversity on a regional level, rather than a single resource or species. This approach also allows for the preservation of the ecological services the resources each site provide, both to the installation and surrounding community.

2.5 Conditions for Implementation and Revision

In accordance with DoD, DA, and NGB policy the NHARNG will annually review the INRMP internally, and in cooperation with the USFWS Field Office and NHFG. On an annual basis the NHARNG will invite the USFWS and NHFG to a meeting where discussion of implementation of the previous year's projects will be discussed, as well as plans for the upcoming year's projects. Other interested agencies, such as the NH Natural Heritage Bureau, may also attend, but at a minimum the USFWS local field office and NHFG are expected (but not required) to attend. If a meeting is not able to be held, although preferred method, the NHARNG will provide a written summary of project

status as well as any modifications to the plan to both USFWS and NHFG for review and concurrence.

This annual review will provide a basis for evaluating plan implementation and progress toward meeting desired goals. The purpose of this meeting is to mutually agree to update, revise, or maintain the current INRMP, and will also allow for minor changes/updates to be made to the document to keep it current. If it is mutually determined that major changes/updates are needed the NHARNG will initiate a large-scale revision in cooperation with all stakeholders. Major changes include, but not limited to, changes in military use of the land or additional rare species requiring additional and/or significantly unique management from what is currently being implemented.

Chapter 3 - Installation Overview

3.1 Location and Area

This plan covers natural resource management at three facilities managed by the NHARNG; the NHNGTS, ECTC and SMR (**Figure 1**). Each of these facilities has unique natural resources that require management to ensure protection while meeting the military mission. All three sites are owned by the NH DMAVS and are for use for military readiness of the NH Army National Guard.

3.1.1 Location Description of the NHNGTS

The 104-acre NHNGTS is located centrally in Center Strafford, a rural community in Strafford County in east central New Hampshire (see **Figure 2**). The NHNGTS is located along New Hampshire (NH) Route 126, just west of the intersection with NH Route 202A, adjacent to the Hall Library and 0.25 miles from the Strafford Elementary School. The surrounding last is mostly agricultural and residential.

The NHNGTS is comprised of maintained lawns and open grassy fields in the southern portion of the site, and forested uplands and wetland areas in the northern portion of the site. Wetland vegetation communities are found within the vicinity of the large wetland complex in the north-central portion of the site. Total acreage of land use types is provided in **Table 1: Land Cover at the** and is depicted in **Figure 4**.

Table 1: Land Cover at the NHNGTS

Land Cover Type	Acres
Forest	45
Grasslands – Semi Improved	25
Buildings, Roads and other developed Infrastructure	15
Wetlands	20
Total	105

3.1.2 Location Description of the ECTC

The ECTC is a 220 acre State-owned, partially undeveloped, parcel located at 722 of Riverwood Drive in Pembroke, New Hampshire in Merrimack County. The ECTC was previous called the RTI, so use of the terms in this document may be used interchangeably. The three parcels that comprise the site were purchased by the NH

DMAVS in October 2009. The site was purchased to relocate the NHARNG's Regional Training Institute (RTI) schoolhouse operations, previously located at the NHNGTS.

During development of the Environmental Assessment under NEPA for purchase, construction and operation of the Pembroke ECTC the NH Fish and Game Department had concerns for impacts to several priority wildlife species known to occur onsite as well as other species which have potential to occur onsite. To offset effects to species onsite the NHARNG agreed to develop and implement an INRMP that delineated sensitive biological resources onsite, provided continued monitoring of sensitive biological resources and a mechanism to allow NHFG authority to conduct restoration and habitat management in designated areas onsite (NHARNG, July 2009). The NHARNG then developed, with in-house staff, the Conservation Plan for the NHNG RTI (NHARNG, 2014-2018). The whole installation complex including buildings and property was renamed as the Edward Cross Training Complex in May, 2017. The 2014-2018 Conservation Plan continues to be implemented until the final approval and signature of this consolidated INRMP.

The ECTC is located approximately three miles from the NHARNG SMR, which serves as the Headquarters for the NH National Guard. It is located less than a mile southeast of the Concord Municipal Airport (CMA). See **Figure 3** for a location map.

This site is comprised of a mix of varied terrain including dense woods, hills, wetlands, power line easement and river corridor. It is bound on the north and west by the Soucook River, the Concord Municipal Airport (CMA) lying immediately adjacent to those boundaries. The land immediately to the south and east are owned by commercial businesses. The site and surrounding areas are zoned C-1 for Commercial/Light Industrial use (Town of Pembroke, 2004). Total acreage of land use types is provided in **Table 2: Land Cover at the ECTC** and depicted in **Figure 5**.

In October of 2011, construction began on the approximately 20 acre ECTC building complex. Construction activities were completed in the fall of 2016 and schoolhouse operations began in spring of 2017. The ECTC serves as a schoolhouse for the NHARNG 195th Training Regiment.

In March 2019, the construction of the approximately 8 acre Pembroke Readiness Center began. Construction activities are planned to be completed and housed by late 2020. An environmental assessment was completed for the Readiness Center, where environmental impacts and conservation measures can be found. The INRMP is considered a mitigation measure and best management practice associated with the construction.

During the summer 2019, an abutting parcel approximately 5 additional acres in size was purchased. The parcel will be converted to a parking lot likely in the year 2020, but is considered forest by this plan.

Table 2: Land Cover at the ECTC

Land Cover Type	Acres
Forest	162
Buildings, Roads and other Developed Infrastructure	20
Wetland	13
Power Line ROW	24
Total	220

3.1.3 Location Description of the SMR

The SMR is located in Concord, NH, the state capital, in the area known as Concord Heights, approximately one mile east of the downtown area. It can be accessed from the north/south by Interstate 93, or from the west by Interstate 89. The site is bound by a mix of residential development and industrial use. The Concord Municipal Airport lies immediately adjacent to the southeast and is owned by the City of Concord for public use.

The SMR has served as the National Guard headquarters since 1885. Today the 43 acre site is largely developed with 13 buildings serving both state and military functions of the NH National Guard. Its 15.2 acres is permanently protected as habitat restoration area as part of mitigation requirements (see **Section 3.5.2** for detailed information). One building, Camp LaBonte, is used exclusively by the NHFG for captive rearing activities related to Karner blue butterfly (*Lycaeides melissa samuelis*) recovery efforts.

Total acreage of land use types is provided in **Table 3** and depicted in **Figure 6**.

Table 3: Land Cover at the SMR

Land Cover	Acres
Buildings, Roads and other Developed Infrastructure	29
Habitat Restoration Area	15
Total	44

3.2 Installation History

3.2.1 NHNGTS Site History

The site was first developed in 1833 as a boarding school under the name Strafford Union Academy. In the early 1900s, the school changed names to the Austin Cates Academy and underwent several improvements over the course of the century. In 1985 the property was sold to the State of New Hampshire and was subsequently leased to the NHARNG. The majority of the existing buildings onsite were constructed by the Austin Cates Academy, but have since been renovated by the NHARNG. Four additional buildings have been constructed since the site was purchased by the state – three Electronic Skills Trainer (EST) buildings and a maintenance shed. One building, maintenance shed, was removed in 2012 and replaced with a newer building to meet current needs of the site.

3.2.2 ECTC Site History

Prior to the DMAVS's purchase of the land in 2009, the land was privately owned and mainly undeveloped. Historically forestry operations have occurred on the site, as well as gravel excavation at nearby locations. Forestry operations may have included varying levels of logging activity, and dirt access path construction. The site historically has been used for local public recreation activities such as all-terrain vehicles, paint ball, small caliber rifle and pistol target practice, camping, hunting and fishing (NHARNG, July 2009).

Eversource Energy (formerly Public Service of NH) maintains a 265-foot electric power transmission corridor as well as a 10-foot wide gas line easement for Keyspan Energy Delivery New England. The site falls within the 100 and 500-year Federal Emergency Management Agency (FEMA) flood plains, as well as the Town of Pembroke and City of Concord wellhead protection areas.

3.2.3 SMR Site History

The land that the SMR occupies at the intersection of Loudon and Airport roads, and just north of the Concord Municipal Airport, has been used for military training since at least 1797. The site also served as the Merrimack County Agricultural Society fairgrounds during the late 19th century. The NH Militia used the site for their annual musters, and the small, level grounds were suitable, but not ideal for training purposes (Ayling 1882). Between 1882 and 1883 the grandstand and other small buildings were demolished, creating sufficient space for drills and brigade training to take place (Ayling 1883). Additional land was added to the fairgrounds in 1884, and the grounds enclosed by a fence (Ayling 1884). When the National Guard was formed in 1878, they continued to use the site for training (NHSVC 2003). In 1885, the State of New Hampshire entered into a 99 year lease with the City of Concord for use and development of the fairgrounds on which the National Guard trained (Deed Book 1885). One year later, the Arsenal (Building B) was constructed, which represented the first permanent building at the new state campground (Joslin 1997), (e2M 2001). A plan dated 15 December 1885 shows the 36.59 acre parcel acquired by the City of Concord from the Merrimack County Agricultural Society, with the arsenal located along the perimeter. By 1896, additional land adjacent to the SMR was acquired by the State, expanding the campground to the east and the south (Ayling 1896). By 1906, more land had been added at the northeast corner of the campground (Ayling 1906). The State formally acquired ownership of this property in 1959 (Deed Book 1959), (Louis Berger Group Inc. 2006). Soldiers who trained at the SMR were called to active duty and served in the Civil War, the Spanish-American War, World War I, World War II, the Berlin Crisis, Vietnam, Desert Storm, and the Global War on Terror, including Operation Enduring Freedom (2001-2014), and Operation Freedom's Sentinel (2015 - present) in Afghanistan and the Iraq War (2003-2011).

3.3 Military Mission

The NHARNG has a unique mission in that is serves both federal and state mission requirements (State of New Hampshire, 2017).

The state mission statement is as follows:

"To provide the state and its political subdivisions with operationally ready units and personnel to protect life and property and to preserve the internal security of the state when ordered by the Governor. The New Hampshire National Guard, along with other state agencies, assists the State Office of Emergency Management in time of natural disaster. The Guard may also be called upon to assist the New Hampshire State Police during civil unrest, or the NH Fish and Game Department for search and rescue operations."

The federal mission statement is as follows:

“To provide the Departments of the Army and the Air Force with operationally ready units and personnel in support of the Total Force, and for war or national emergency as ordered by the President; upon declaration of war by the Congress; or as otherwise specified by federal law. The New Hampshire National Guard continues to provide support to federal and state law enforcement agencies with counterdrug operations around the state. National Guard personnel and resources have been primarily assigned to reconnaissance and surveillance missions associated with NH's efforts to interdict and eradicate illegal drugs.”

Operations at all three facilities support the NHARNG in both their state and federal mission requirements. Funding for activities and personnel are a mix of both federal and state funds through direction of The Adjutant General.

3.3.1 Military Mission of the NHNGTS

The NHNGTS mission is to provide a site and facilities to support units of the NHARNG in the execution of their training plans. The NHNGTS provides academic facilities and a small tactical training area for Inactive Duty Training and limited Annual Training requirements for units of the New Hampshire National Guard (NHNG). The NHNGTS also serves as an alternative assembly area for local NHARNG units in the event of mobilization. In addition, the site is available with limited resources to support all branches of the military, as well as other community-based groups, such as law enforcement agencies and youth groups.

Field training exercises take place in both the semi and un-improved lands of the NHNGTS. Training activities routinely conducted onsite are as follows:

- Driver training along established gravel roads
- Blank and pyrotechnic use
- Vehicle refueling within paved parking areas with use of secondary spill containment
- Helicopter landing zones (no helicopter refueling)
- Tactical water purification training
- Live fire with existing baffled range
- Land navigation by foot
- Patrolling by foot

- Movement to contact activities
- Ambushes
- HIMARS crew drills (no firing)

3.3.2 Military Mission of the ECTC

The 195th Training Regiment is the primary military tenant of the ECTC and relocated activities from the NHNGTS in 2017. The Regiment also maintains control and oversees the day-day operations of the site. The mission of the 195th Training Regiment is to provide motivating and professional education and individual doctrinal training to all students in order to provide a local, cost effective, and high quality training and meet the needs of the whole Total Army School System (TASS). On order, the 195th Regiment mobilizes and deploys within the State of New Hampshire or elsewhere to support the Governor of New Hampshire and other local, state, and federal agencies for Homeland Defense. Courses include 92Y Supply, Command Post Training and Officer Candidate School (OCS) at Fort Benning, GA, all have accreditation standards which must be met by the 195th Training Regiment (NHARNG, July 2009).

The remaining undeveloped portion of the site will provide land for training for the 195th Training Regiment, as well as other NHARNG unit exercises to include the following:

- Land navigation by foot, including orienteering, terrain association and basic and advanced compass work with sufficient relief and vegetation cover;
- Patrolling by foot and marching;
- Movement to contact activities;
- Ambushes (both hasty and deliberate types);
- Basic field craft (digging training positions);
- Physical fitness training (Fitness tests, calisthenics and hand-to-hand wrestling);
- Tactical tasks
- HIMARS crew drills in preparation of firing (no HIMARS firing will take place).

The source of this information is primarily taken from the 2009 Environmental Assessment for Construction and Occupation of the Regional Training Institute (NHARNG, July 2009).

3.3.3 Military Mission of the SMR

The SMR serves as the Headquarters for the NH National Guard and employs approximately 400 state and federal personnel. Activities conducted at the various shops located at the SMR include federal fiscal and contracting duties, state business operations, construction and facility maintenance, logistics, maintenance of tactical vehicles and equipment as well as various military Headquarters (HQ) functions. The installation also serves as a duty location for various military units. The NHFG occupies one building, Camp LaBonte, to conduct captive rearing operations for Karner blue butterfly recovery efforts. The building is currently located with the habitat restoration area with a Memorandum of Understanding (MOU) for its use. Light military training activities may be conducted within the habitat area with prior written Environmental office approval and where it does not conflict with habitat management activities.

3.4 Surrounding Communities and Land Use

3.4.1 Land Use in Center Strafford

Strafford is a small rural residential community in Strafford County and is typical of the surrounding region of New Hampshire. The entire town is zoned as Agricultural-Residential District (Town of Strafford, 2013). Towns surrounding Strafford including Farmington, Barnstead, Barrington, Northwood and Pittsfield, are also residential communities similar to Strafford. According to the 2010 US Census the population of Strafford was 3,964 with a land area totaling 51.4 square miles (Census Bureau, 2010). The closest largest city closest to the NHNGTS is Rochester, with a population of 29,752 and is about a 15 minute or 10 mile drive.

Surrounding land use is a mixture of old farmland/open fields, forested wetlands, single-family homes, and minor municipal development (e.g., Hill Library). The proximity of the site to municipal town buildings, Strafford Elementary School and Hill Library, has the potential to limit certain types of training activities on the NHNGTS.

The town of Strafford has approximately 6,800 acres of conservation lands. Protection is a mixture of ownership and conservation easements, with a large portion of the protected lands in the town protected by the Blue Hills Foundation, a non-profit land protection. **Figure 4** depicts the surrounding land use and nearby conservation lands.

3.4.2 Land Use in Pembroke

Pembroke is a moderate size town in south central New Hampshire with a mixture of both residential and commercial development. According the 2010 Census, Pembroke had a population of 7,115 with a land area totaling 23 square miles (Census Bureau, 2010). Pembroke lies about 5 miles southeast of Concord, 15 miles north of Manchester and 30 miles north of the MA/NH border. Surrounding communities include: Concord,

Bow, Allenstown, Epsom, and Chichester. With the exception of Concord, these are mostly towns of similar size and population.

According to the 2004 Pembroke Master Plan (Town of Pembroke, 2004), the Pembroke land use is primarily undeveloped (41%) and residential (39%). The ECTC falls within the commercial land use area which comprises about 8% of the town. The site also falls within the Commercial/Light Industrial zoning district for the town. The primary zoning for the town is Rural/Agricultural- Residential at 68%, while Commercial/Light Industrial accounts for just 7% of the towns land area (Town of Pembroke, 2004).

The site is situated at the end of Riverwood Drive and is surrounded by other commercial development to the south and east, and mainly undeveloped CMA land to the north and west. This property boundary follows the Soucook River, and also acts as the boundary between Concord and Pembroke.

The Eversource Energy owns and maintains a 265-foot power line ROW that bisects the property from north to south. Immediately adjacent to that is a 10-foot wide gas line easement held by Key span Energy Delivery New England. This easement currently is managed for vegetation using mechanical equipment on a 4-year rotation, on average. It should be noted that the proposed Northern Pass utility expansion project's primary route runs concurrent with the existing power line right-of-way through the property. At this time the Northern Pass does not anticipate the need to expand the existing easement width.

3.4.3 Land Use in Concord

Concord is the state capital of New Hampshire located in Merrimack County. It is a small, mostly developed city in south central NH, about 15 miles north of Manchester and 40 miles north of the MA/NH border. According to the 2010 Census the population was 42,695 (though it is estimated to have decreased since) and encompasses 64.25 square miles (Census Bureau, 2010). Surrounding towns include Boscawen, Bow, Canterbury, Hopkinton, Loudon, Pembroke and Webster.

The development according to the Concord Master Plan (2008) is about 29% residential, 8% commercial/industrial, 49% vacant and undeveloped, and 14% other. As well as 2,368 acres of water (Board, 2008). The SMR falls within the Institutional District, with the surrounding area having a mixture of Industrial, Residential and Commercial districts.

The SMR is located in an area locally known as the "Concord Heights". It is immediately adjacent to the State of NH state office park east. This office park serves as the HQ for many state departments, such as Department of Transportation, Health and Human Services, Department of Environmental Services and NH Fish and Game Department.

The population statistics of the municipalities and counties in which the INRMP installations occur is shown in Table 4.

Table 4: NHARNG Population Statistics

	Population 2010 Census	Population 2000 Census	Population 1990 Census	% change, 1990-2010
Strafford	**3,991**	**3,626**	**2,936**	**26.4**
Strafford County	**123,146**	**112,233**	**104,233**	**15.4**
Concord	**42,695**	**40,687**	**36,006**	**18.6**
Pembroke	**7,115**	**6,897**	**6,561**	**8.4**
Merrimack County	**146,445**	**136,225**	**120,005**	**22.0**

Source: http://quickfacts.census.gov/

3.5 Local and Regional Natural Areas

3.5.1 Local and Regional Natural Areas near the NHNGTS

The area surrounding Center Strafford includes many waterbodies, wetlands, and pockets of forested land. Several state forests recreational areas and conservation easements are located in the area (see **Figure 2**).

Blue Job State Forest. This state forest occupies approximately 284 acres north of Center Strafford, in the town of Farmington, and is located approximately 4 miles northeast of the NGTS. Blue Job Mountain, for which the forest is named, is one of two dominant peaks in the area at 1,356 feet above mean sea level (ft. AMSL). Blue Job State forest has similar Hemlock-Hardwood-Pine, and Wet Meadow/Shrub Wetland habitats as NHNGTS.

Bow Lake. Bow Lake is located approximately 2.5 miles southwest of the NHNGTS and occupies approximately 1,160 acres. Recreational activities at the lake include swimming, boating, and fishing. Bow Lake is bound to the north by the Evans Mountain/Parker Mountain forest block which contains numerous conservation easements as discussed below.

Conservation Easements. Numerous conservation easements are in place on lands in the immediate vicinity of the NHNGTS. Bear-Paw, the Blue Hills Foundation, and the Town of Strafford are active in combining efforts to conserve valuable wildlife habitat in

Strafford County. The forested portion of NHNGTS is situated within a larger, 7,000-acre unfragmented forest block identified as “Barn Door Gap.” The 6,828-acre Evans Mountain/Parker Mountain block is contiguous to the Barn Door Gap block and south of NHNGTS. Together these form one of the largest contiguous unfragmented forest blocks in southern New Hampshire. Large, unfragmented forests of this size are rare in the rapidly developing southeast and south-central regions of the state.

The following is a list of conservation easements in the immediate vicinity (e.g. within 1-mile) of the NHNGTS. These were chosen for highlight due to their immediate proximity and similar habitat to NHNGTS. Numerous other conservations easements are located in the Barn Door Gap and Evans Mountain/Parker Mountain forest blocks that are not mentioned below. Many of these conservation blocks may also have similar habitat to that found at NHNGTS. Their locations are depicted on **Figure 2**.

- Strafford School District Easement – 290 acre forested conservation easement with wetland complex approximately 0.25 mile northeast of NHNGTS
- Natural Resource Conservation Service – A 82 acre conservation easement east of the NHNGTS
- Cournoyer Easement – A 55-acre forested conservation easement approximately 0.25 mile southeast of NHNGTS
- Blue Hills Foundation Land – A grouping of three contiguous forested property with wetland complexes totaling approximately 278 acres approximately 0.5 mile west of NHNGTS. Blue Hills Foundation also owns additional large tracts of land throughout the town.
- Weidman Lot – Town Forest – A 75-acre forested conservation easement with a wetland complex approximately 0.5 mile southwest of NHNGTS.
- James H. Edgerly Jr. Lot – Town Forest – An approximately 75-acre forested conservation easement approximately 0.5 mile southwest of NHNGTS.

3.5.2 Local and Regional Natural Areas near the ECTC and SMR

Both the ECTC and SMR lie within the greater area known as the Concord Pine Barrens macro site. This 400+ acre habitat management area serves as the site for the reintroduction of the Karner blue butterfly and maintain the Concord Pine Barrens through habitat management. In 2000 with a Biological Opinion (BO) issued by the USFWS to the Federal Aviation Administration (FAA) for specific development projects at the Concord Municipal Airport (CMA). The NHARNG was included in this BO for construction and operation of the Army Aviation Support Facility (AASF) located on the property of the CMA. The BO addressed impacts from construction of the AASF, to include impacts to pine barrens and the Karner blue butterfly. As mitigation for construction of the AASF the NHARNG agreed to “restore and permanently protect”

15.2 acres of pine barrens habitat in support of the Karner blue butterfly on the SMR (NHARNG, December 2000).

Two variants of pine barrens are found within the state of NH, Ossipee and Merrimack Valley. The Concord macro site (and ECTC) fall within the Merrimack Valley variant, which historically stretched from Canterbury to Nashua, New Hampshire (NHNHB, January 2012).

A total of 434 acres of the Concord pine barrens are protected, 404 on the adjacent CMA and 30 in the USFWS Karner Blue Butterfly Easement (NHFG, 2007). The CMA land is protected under the Concord Municipal Airport Development and Conservation Agreement which was set up for the “purpose of managing the airport lands in a manner that provides and enhances essential habitat for the federally- and state-listed threatened endangered species of Lepidoptera, such as the Karner Blue Butterfly.” (City of Concord, November 2009). **Figure 3** depicts the surrounding conservation areas.

Chapter 4 - Physical Environment

4.1 Climate

4.1.1 Climate at the NHNGTS

Center Strafford is located in the southeastern portion of the state, its location in the tall hills of the Parker Mountain range make it slightly cooler and windier than might be expected in other towns of the seacoast region of NH.

Table 5: Average Temperature and Precipitation for Rochester Area

(2000 – Current)

	Mean Temperature (°F)	Normal Precipitation (inches)
January	24.1	2.02
February	26.3	2.47
March	34.3	3.32
April	45.8	3.70
May	56.2	3.56
June	65.2	4.16
July	71.0	3.69
August	69.6	3.35
September	62.1	3.33
October	50.3	4.51
November	39.6	3.50
December	29.4	3.31

SOURCE: http://www.nrcc.cornell.edu/wxstation/nowdata.html (NOAA, 2015)

4.1.2 Climate at the ECTC and SMR

The ECTC is located in the south-central part of the state with weather patterns that are typical for this part of the state. NH has a wide range of climate ranging from warm summers to cold snowy winters. A monthly summary can be seen in **Table 6** below. The

monitoring station is located across from the SMR at the CMA, and given the proximity of both sites, the climate can be considered essentially the same.

Table 6: Average Temperature and Precipitation for the Concord Area (2000 – Current)

	Mean Temperature (°F)	Normal Precipitation (inches)
January	21.9	2.63
February	24.5	3.11
March	33.2	3.36
April	45.3	3.70
May	56.6	3.73
June	65.3	4.34
July	71.0	3.79
August	69.3	4.10
September	61.7	3.70
October	49.5	4.78
November	38.3	3.30
December	27.7	3.93

SOURCE: http://www.nrcc.cornell.edu/wxstation/nowdata.html (NOAA, 2015)

4.2 Landforms

The entire state of New Hampshire is located within the New England physiographic region as defined by US Geological Survey (USGS). This region is divided into three sections that tend to parallel the Atlantic Coast: White Mountain, Seaboard Lowland, and New England Upland (Fenneman & Johnson, 1946).

4.2.1 Landforms at the NHNGTS

Strafford County is situated between coastal lowland hills and plains, and the White Mountains. Strafford County occurs within both the New England Upland section, which

contains much of east central New Hampshire, and along the western edge of the New Hampshire Seacoast region. The area is characterized by hilly topography with elevations ranging from below 1,000 ft. AMSL to over 3,000 ft. AMSL. Narrow valleys are intermittent and usually contain running streams or lakes (Flanagan, Nielsen, & Coles, 2011)

The NHNGTS facilities sit atop a small hill that rises up from NH Route 126. The land generally slopes northwest toward the forested and wetland region of the property (see **Figure 7**). However, the highest elevation on the property is located towards the middle and is approximately 650 ft. AMSL. The lowest elevation is at the northeastern corner of the property and is approximately 465 ft. AMSL. A few small drainages are cut into the forest floor that flow into the wetland complex to the north.

4.2.2 Landforms at the ECTC and SMR

Pembroke and Concord lie in the south central portion of the state, in the transition zone between the gently rolling coastal lowlands and the White Mountains. The ECTC lies along the banks of the Soucook River, about 4.5 river miles upstream of the convergence with the Merrimack River. The elevation ranges on the site from 224 to 356 feet above sea level, with the highest point along the power line easement.

The terrain of the site is varied, with a generally higher terrace sloping down to the banks of the Soucook River. Two dry ravines bisect the southern terrace, one forming the site's southernmost boundary. A high knoll with a small pocket wetland below sit just north of the high terrace, likely formed by the historic route of the river thousands of years ago. The majority of the site has deep sandy soils with the exception of one area of bedrock outcrop along the northern third of the power line easement. **Figure 8** depicts the contours of the site.

The northern banks of the Soucook River are generally steep sloping to the river's edge. The river is fast moving during times of high flow and erosion of the sandy river banks can be seen along many portions of the river. The river banks on the western portion of the site exhibit a wide sandy floodplain which then steeply rises to the upper terrace.

The SMR is located in the relatively flat Concord heights area. There is little elevation change on the SMR, which was largely influenced by military alteration and activities. **Figure 9** depicts the contours of the site.

4.3 Geology

4.3.1 Geological Setting of the NHNGTS

The NHNGTS is underlain by Binary Granite of Late Devonian Age (330-290 million years ago) (Stewart, 1961). This intrusive igneous rock, a component of the New Hampshire Plutonic series, is a medium grained, gray granite composed of orthoclase, microcline perthite, quartz, muscovite and biotite. The surrounding metamorphic bedrock is part of the Jenness Pond member of the Littleton Formation. This rock is of early Devonian age and is composed of thinly bedded andalusite and pseudo-andalusite schist, quartz-mica schist and pyrrhotitic schist (Stewart, 1961).

During the early Devonian period approximately 330 million years ago, alternating layers of mud and sandy mud were deposited in a shallow inland sea. Folding and recrystallization of these sediments followed and are represented by the Littleton Formation. Intrusions of molten lava occurred during the late Devonian period and formed the Binary Granite bedrock underneath the NHNGTS. From 290 to 210 million years ago, erosional forces dominated geologic activity. During the Permian period (210-175 million years ago), additional intrusion of molten lava formed the components of the White Mountain plutonic series that are also represented in the bedrock of the region. Erosional events again dominated geological activity from 175 to 60 million years ago. The Tertiary period, from 60 to 1 million years ago, was marked by uplifting of the rocks and renewed erosion. Much of the last million years was dominated by the glaciers of the Pleistocene epoch. The glaciers eroded the landscape and deposited glacial till, sand, gravel, and clay. The last twelve thousand years has seen minor erosion of these glacial deposits and the development of the soils and forests that exist in the region (Stewart, 1961).

4.3.2 Geological Setting of the ECTC and SMR

The Pembroke (Riverwood Drive) site is underlain by the Concord Granite (Late Devonian in age), a gray two-mica granite, locally grading to tonalite. This rock is a unit of the New Hampshire Plutonic Suite. As is true for most of the granite rocks of New Hampshire, this bedrock unit is dense and crystalline (NHARNG, July 2009).

With regard to surficial deposits, the site is underlain by Glacial Lake Hooksett deposits, consisting of sand, gravel, silt and clay. These deposits are moderately to well stratified and as much as 100 feet thick (Koteff & Pike, 1998). The deposits were graded to and deposited in Glacial Lake Hooksett by meltwater from the nearby ice margin (NHARNG, July 2009).

Bedrock beneath the site consists of eugeosynclinal deposits of the Devonian series of the Paleozoic Era. Depth to bedrock is greater than 60 inches below ground surface (NHARNG, Final Environmental Assessment for Land Aquisition, Construction and

Operation of New Hampshire Regional Training Institute 195th Training Regiment, July 2009).

Ground surface elevations at the ECTC range between approximately 224 feet above mean sea level (AMSL) on the western portion of the site and approximately 356 feet AMSL on the northeastern portion of the site. A topographic high is located in the central eastern portion of the site (NHARNG, July 2009).

The SMR is underlain by Concord Granite, which is Late Devonian in age (about 365 million years old). The bedrock is a two-mica granite which grades locally to tonalite (Lyons, Bothner, Moench, & Thompson Jr., 1997).

Glacial lake and glacial stream deposits were laid down in Glacial Lake Hooksett during deglaciation of the Suncook quadrangle by meltwater chiefly at or near the margin of the continental ice sheet as it retreated from the region (NHARNG, Final Environmental Assessment for Land Aquisition, Construction and Operation of New Hampshire Regional Training Institute 195th Training Regiment, July 2009).

Glacial Lake Hooksett was contained by a drift dam in the Merrimack River valley about 4.2 mi south of the quadrangle border and its water level was controlled by a nearby bedrock spillway at an altitude of about 295 ft. Lake Hooksett expanded northward with ice retreat in the Merrimack Valley and continued into the Loudon quadrangle. However, the ice sheet continued to occupy most of the Merrimack Valley, restricting Lake Hooksett to the eastern part of the valley. Because of postglacial uplift of 4.74 c/mi, Lake Hooksett was about 350-360 C in altitude at the north end of the area. After further retreat of the ice margin north of the Suncook quadrangle, the drift dam containing Lake Hooksett failed and the lake level lowered about 15-20 ft. to the level of older Lake Merrimack, which was controlled by a bedrock spillway in Nashua, NH at about 175 ft. When the ice in the Merrimack Valley retreated from the region north of Concord area, glacial Lake Merrimack occupied that portion of the Merrimack Valley. The altitude of the lake at the Concord Airport, determined by a temporary exposure of a topset/foreset contact in the Soucook delta just to the west of the quadrangle, was 395 ft. (NHARNG, Final Environmental Assessment for Land Aquisition, Construction and Operation of New Hampshire Regional Training Institute 195th Training Regiment, July 2009).

4.4 Soils

4.4.1 Soils at the NHNGTS

According to the Soil Survey of Strafford County, New Hampshire (NRCS, 2013) the NHNGTS contains five soil series, comprised of nine soil map units. Soil units are depicted in both **Table 7** below and **Figure 13**.

The Cantonment Area is primarily Paxton series soil, a well-drained fine sandy loam with a hardpan layer at 16 to 36 inches. This hardpan layer restricts movement of water from the surface, and creating a high potential for water erosion. The natural vegetation of this area has been removed and is currently short herbaceous vegetation being managed by mowing. The removal of the natural vegetation has led to an increase of wind and water erosion potential for the area. The Paxton series found on the site also have both farmland of local and statewide importance as well as prime farmland. The site contains approximately 25 acres of prime farmland and 13 acres of soil of statewide importance, which occur within the cantonment and open field portions of the site.

The forested and wetland portion of the site contains Gloucester, Paxton, Whitman, and Woodbridge series soils as well as some mucky peat. The soils of the forested portion closest to the open combat training range are Paxton series. These soils are well drained and have a much lower potential for erosion due to the natural forested vegetation. The soils of the northern forested portion of the site are primarily Gloucester series with Whitman series, and muck and peat in the wetlands. Gloucester series soils are excessively drained soils with a potential for erosion. This portion of the site maintains its natural vegetation and no development is planned in the near future. Erosion control and soil conservation are important natural resource issues at the NHNGTS because of the highly erodible and potentially highly erodible soils found on the installation (see **Table 7** – information from Natural Resource Conservation Service (NRCS)). Gloucester, Paxton, and Woodbridge soils are all classified as highly or potentially highly erodible, due primarily to their sandy content and in some cases the presence of a hardpan layer. Sediment resulting from erosion affects surface water quality and aquatic organisms.

Table 7: Soil Units at the NHNGTS (NRCS)

Soil Symbol	Soil Classification	Drainage Class	Total Acreage	% of site
GtD	Gloucester extremely stony fine sandy loam, 8-25% slope	Somewhat excessively drained	34.49	32.29%
Wa	Whitman very stony fine sandy loam	Very poorly drained	4.95	4.7%
Mp	Freetown and Swansea mucky peats, 0-2% slopes	Very poorly drained	4.52	4.3%

PdB	Paxton fine sandy loam, 0-8% slopes, very stony	Well drained	14.86	14.2%
PbC	Paxton fine sandy loam, 8-15% slope	Well drained	12.66	12.1%
PbB	Paxton fine sandy loam, 3-8% slope	Well drained	23.59	22.5%
PdD	Paxton fine sandy loam, 15-25% slopes, very stony	Well drained	6.86	6.6%
WsC	Woodbridge fine sandy loam, 8-15% slopes, very stony	Moderately well drained	.57	0.5%
PdC	Paxton fine sandy loam, 8-15% slopes, very stony	Well drained	.15	0.1%
WgB	Woodbridge fine sandy loam, 3-8%	Moderately well drained	2.06	2.0%

4.4.2 Soils at the ECTC

According to the Soil Survey of Merrimack County, New Hampshire (NRCS, 2013) the ECTC contains four soil series, comprised of seven soil map units. Soil units are depicted in both **Table 8** below and **Figure 14**.

The soils common to this area are the result of the glacial outwash formed millions of years ago. With the exception of the wetland soils, these soils typically consist of sandy soils that can be hundreds of feet thick and very dry and nutrient poor. Water very rarely pools in these soils, but rather readily soaks into the ground. Erosion can only be seen in isolated areas of soil disturbance from recreation vehicles or other ground disturbing activities, mainly along the power line easement and existing trails. A ridge of bedrock outcrop lies along the power line easement on the slope up from the river.

Table 8: Soil Units at the ECTC (NRCS)

Soil Symbol	Soil Classification	Drainage Class	Total Acreage	% of site
2A	Suncook Loamy Sand	Excessively drained	8	4%
26A	Windsor Loamy Fine Sand, 0-3% Slopes	Excessively drained	5.8	3%

26B	Windsor Loamy Fine Sand, 3-8% Slopes	Excessively drained	61.75	29%
26C	Windsor Loamy Fine Sand, 8-15% Slopes	Excessively drained	30.61	14%
26E	Windsor Loamy Fine Sand, 15-60% Slopes	Excessively drained	51.63	24%
313A	Deerfield fine Sandy Loam, 0-5% Slopes	Moderately well drained	30.85	14%
325A	Scarboro Mucky, Fine Sandy Loam, Very Stony, 0-1% Slope	Very poorly drained	26.06	12%

SOURCE: NH NRCS Soil Data Mart, October 2013 (NRCS, 2013)

4.4.3 Soils at the SMR

According to the Soil Survey of Merrimack County, New Hampshire (NRCS, 2013) the SMR contains two soil series, comprised of four soil map units. Soil units are depicted in both **Table 9** below and **Figure 15**.

Soils of the SMR are primarily urban with a long history of previous disturbance from human use. The primary area where the soils have not been significantly disturbed is within the habitat restoration area. These areas have historically had human use, although lower impact use such as parade and camping grounds.

Table 9: Soil Units at the SMR (NRCS)

Soil Symbol	Soil Classification	Drainage Class	Total Acreage	% of site
26A	Windsor Loamy Sand, 0 to 3 Percent Slopes	Excessively drained	.17	0.4%
300B	Udipsamments, 0 to 6 Percent Slopes	Excessively drained	5.97	13.5%
598B	Windsor-Urban Land Complex, 0 to 8 Percent Slope	Excessively drained	13.86	31.5%
699B	Urban Land, 0 to 8 Percent Slope	N/A	24.06	54.6%

4.5 Hydrology

4.5.1 Hydrology of the NHNGTS

The NHNGTS falls within the Cocheco River watershed (Hydrologic Unit Code (HUC) 10)) and the Nippo Brook-Isinglass River Sub-watershed (HUC12), both of which ultimately drain to the Atlantic Ocean (**Figure 10**). The surface water hydrology in the vicinity of the NHNGTS generally flows southeast via a small tributary to the Mohawk River; from there it flows south where it joins the Isinglass River (**Figure 18**). In addition to streams and tributaries, Center Strafford is situated near many lakes and ponds including Kenneth Hill Pond to the north and Bow Lake to the west.

In general, glacial stratified-drift aquifers, made up of layers of sand, gravel, clay and silt overlaying bedrock, are the primary source of groundwater for this region of the state. Less productive bedrock aquifers also provide a valuable source of groundwater to some rural water users (including the NHNGTS), without access to large community water systems.

Drinking water at the NHNGTS is currently served by two public water supply wells, located in the southern portion of the cantonment area on the NHNGTS. The water system on-site is classified as a transient non-community water system, as defined by NH Code of Administrative Rules Env-Ws 302.02. The southern portion of the site also falls within the wellhead protection area for the Strafford School, a public water system (PWS ID 2215010). The wellhead protection area is depicted in **Figure 16**.

Wetlands of the NHNGTS are primarily in the forested portion of the site. Jurisdictional wetlands on the site were delineated by Gove Environmental in 2015. Several vernal pools were also identified by the Natural Heritage Bureau during the 2004 floristic inventory as well as the amphibian survey in 2016. Wetlands are discussed in further detail in **Section 5.5 Water Resources at the NHNGTS**.

The FEMA National Flood Insurance Rate Map (FIRM) for the area indicates no 100-year floodplains exist within the parcel.

Storm water near the buildings and driveways generally flows northward down the grassy slope towards the wetland or southward towards a drainage swale which runs parallel to Rt. 126. Storm water from the open field generally flows north toward the forested portion of the site. There is a small retention basin along the northeastern boundary of the field which drains much of the surface water runoff. The storm water system in the developed portion of the site consists of a few small diameter culverts under the driveways and seven catch basins.

Generally both groundwater and surface water quality at the NHNGTS is of high quality. Drinking water supplied to the site is tested bi-annually as required by NH Department

of Environmental Services (DES) Administrative Rule 8 302.02. Since testing began in 1995 two samples have showed elevated levels of coliform bacteria. The two samples were recorded in December of 2018 along with June 2019. Coliform was found in the NHARNG's compliance testing sampling location, and in a well when retested. Although total coliform present was very low, the system was chlorinated following the upset. Surface waters onsite are also of high quality, with no known contamination or siltation occurring.

4.5.2 Hydrology of the ECTC

The ECTC falls within the Merrimack River Watershed (HUC8) and the Soucook River sub-watershed (HUC10), both of which ultimately drain to the Atlantic Ocean (**Figure 11**). Surface water hydrology in the vicinity of the ECTC generally flow into the Soucook River.

The largest surface water on the site is the approximately two mile segment of the Soucook River which forms the northern and western site boundary (**Figure 19**). The Soucook River runs 24 miles from its headwaters in Loudon, at the convergence of Gues Meadow Brook and Bumfagon Brook, to its outlet into the Merrimack River at the town boundary between Concord and Pembroke. Though the banks of the Soucook are largely undeveloped, most of the land bordering the Soucook River is currently zoned for commercial use, and it is estimated that significant areas of this commercially zoned land will face development pressure in the near future (Town of Pembroke, 2004).

The banks of Soucook River along much of the northern central boundary of the site are steep, sandy banks with evidence of continued scouring from times of high flow. The river is shallow and winding with a rocky bottom and pockets of deep water along the northern boundary. The river makes a tight bend along the northwest peninsula of land, becomes deeper with a wide sandy floodplain along the banks downstream.

As delineated by the FEMA the land surrounding the Soucook River has a high to moderate flood potential with both 100-year (Zone AE) and 500-year (Zone X) flood zones extending along all portions of the river (FEMA, 2014). During times of high rain, mainly spring months, the river will commonly rise and flood its banks in much of the low-lying floodplain areas. Areas of scouring along the sandy river banks can be seen from past high water events.

The portion of the Soucook River (pictured to right) bordering the NHARNG site is generally a slow flowing shallow river during the summer months, while is moderately deep and swift moving in the spring. During flooding events the river will commonly flood its banks, extending into the low-lying floodplain area. Along the portions of the site where the bank is steep, evidence of natural erosion and scouring can be seen. Ice jams commonly pile up in the spring months due to the meandering and winding path of the river. Debris, mainly fallen trees; are washed downstream and commonly pile up, which can make navigation with a boat difficult during much of the year.

The entire length of the Soucook River is a 4th order stream and therefore subject to NH Shoreland Water Quality Protection Act (SWQPA), RSA 483-B. In an effort to protect the states surface water the SWQPA restricts or prohibits certain activities within 250 feet of the Soucook River. The Act mainly pertains to construction, vegetation removal and pesticide/herbicide application. Approximately 60 acres of upland along the river fall within the jurisdiction of the SWQPA.

An isolated horseshoe-shaped wetland can be found in the central undeveloped portion of the site. This 13 acre pocket of wetland is the major wetland area on the site and has a small perennial stream that drains to the floodplain system along the Soucook River along the western boundary. This wetland is dominated by Eastern hemlock (*Tsuga canadensis*) on the western end, and Red maple (*Acer rubrum*) in the central and eastern portions. There is another intermittent stream that drains the ravine on the southern portion of the property (Wilkes & Peter, 2016). However, it has been predominantly dry recently. The natural hydrologic regime along the banks of the Soucook River provide a floodplain community in the western portion of the site. The vegetation in these wetland communities are a result of the continued seasonal flooding of the river (NHNHB, January 2012). Multiple vernal pools are known to exist onsite and are further discussed in Section **5.3.2.3 Amphibians and Reptiles at the ECTC**.

A majority of the ECTC lies within the Pembroke Water Works wellhead protection area (**Figure 17**). This area falls under the jurisdiction of the Town of Pembroke's Aquifer Conservation District which regulates land use and activities within the area for protection of public drinking water. Pembroke Water Works operates a public water supply well just north of the ECTC (Route 106 Pump Station) and a well field south of the site (Route 3 pump station) known as Concord Well #2 and Concord Well #3. These well fields are located within a stratified drift aquifer area with deposits consisting mainly of sand and gravel-sized particles which offer large percentage of pore space between grains, making it very efficient at storing and transmitting ground water. Stratified drift

aquifers are commonly located in the lowlands and river valleys, and often yield large quantities of groundwater for supplying community and municipal water systems. Because course grained stratified aquifers are typically well drained deposits, aquifers such as that which lies in the area of the ECTC present a high potential for contamination from hazardous substance releases to impact the ground water resource. For this reason, the use of such areas is highly regulated by the municipalities, such as the Town of Pembroke. The New Hampshire Groundwater Protection Act (NHGPA) and NH Code of Administrative Rules Part Env-Wq 401 Best Management Practices (BMPs) classify water sources and regulate land use in surrounding areas.

The New Hampshire Groundwater Protection Act (NHGPA) RSA 485-C was passed by the state legislature in 1991 to protect the natural quality of groundwater resources of the state for drinking water supply. This is accomplished by assisting local groundwater protection efforts and by establishing procedures and standards for the classification of groundwater and providing consistent protective management of groundwater potentially affected by regulated contaminant use and storage. Under this Act, all groundwater may be classified into one of four classes, and class GAA is the most protected class. GAA classification requires a higher level of protection because it contributes groundwater to a public water system and represents an area of high value groundwater for present or future groundwater supply. From this Act, the New Hampshire Department of Environmental Services (NHDES) adopted NH Code of Administrative Rules Part Env-Wq 401 Best Management Practices (BMPs) for the Protection of Groundwater which apply to all potential contaminant sources regulated in the State. These BMPs are simple practices required under state rules to prevent the release of gasoline, oil and other substances that may contaminate groundwater. These practices include basic “good housekeeping” practices, such as cleaning up spills, labeling and closing of containers, use of funnels or drip pans, and structural controls, such as berms or secondary containment to prevent releases to the ground.

The wellhead protection area for the Town of Pembroke Water Works municipal wells was reclassified as “GAA” under the NHGPA program. This reclassification provides the local entity with the necessary authority to enforce BMP rules within the protected area. Through this process, the Town of Pembroke would have the authority to inventory and manage potential contamination sources through periodic inspections of facilities such as the ECTC and education.

4.5.3 Hydrology of the SMR

There are no surface water resources located on the SMR. It lies within the Merrimack River Watershed (HUC8) and the Concord Tributaries sub-watershed (HUC10), depicted in **Figure 12**. The Merrimack River watershed drains 5,014 square miles from the White Mountains in northern New Hampshire to its delta into the Atlantic Ocean in northern Massachusetts.

Local stormwater generally infiltrates onsite into the deep underlain sandy soils. The SMR has a managed stormwater system onsite to deal with stormwater collection and distribution. Stormwater from impervious surfaces, mainly building roofs and pavement, flow through a series of catch basins which carry the water through a municipal stormwater system, ultimately draining to the Merrimack River offsite.

Chapter 5- Ecosystems and the Biotic Environment

5.1 Ecosystem Classification

All three sites are located in the US Ecosystem Region - Humid Temperate Domain – Hot Continental Division – Eastern Broadleaf Forest (Oceanic) Province. This ecoregion ranges from Maryland north to Maine and is contained between the Appalachian Mountains to the west and the Atlantic Ocean to the east. Tall broad-leafed trees dominate the landscape, which provide a dense canopy during summer and then shed their leaves in winter. During spring, herbs create a seasonal groundcover (Bailey, Avers, King, & McNabb, 1995).

At a finer scale, the NHB and U.S. Forest Service have further defined ecological regions based on physical environmental conditions. All three sites fall within the Lower New England Section, and Gulf of Maine Coastal Plain. This ecological region is mainly defined by the moderately deep tills deposited by glaciers, resulting in rolling topography (Sperduto & Nichols, 2012).

5.2 Flora

5.2.1 Historic and Current Vegetation Cover at the NHNGTS

The current vegetation has changed little since the NHARNG purchased it in 1985. The only major alteration has been the construction of howitzer pads on the lower slope in 2003 and the development of the leech field in 1993. These development projects resulted in the conversion of approximately 10 acres of mixed pine and hardwood forest to open field.

In 2003 the NHB conducted a vegetation mapping and floristic inventory of the NHNGTS (NHNHB, 2004). Their inventory broke the site into three general categories: developed areas, cultural (human modified and actively managed) vegetation, and natural vegetation. Within these three areas, vegetation was further classified into nine categories using the NHNHB New Hampshire Natural Communities Classification (see **Figure 20**). Natural communities are recurring assemblages of plants and animals found in particular physical environments. The NHNHB has classified the state's natural communities to allow effective communication between parties for evaluating the ecological significance of certain areas within the landscape. Natural communities are based on plant species composition, structural layers these species form, and the specific physical environment (NHNHB, 2012). The NHB natural communities and equivalent National Vegetation Classification (NVC) Standard communities that occur on the NHNGTS are summarized in **Table 10**. For a complete list of plant species identified on the NHNGTS, refer to **Appendix B**. The federally threatened small-whorled

pogonia can also be found onsite, described in section **5.4.1.7 Rare Plants at the NHNGTS.**

Table 10: Vegetation Communities at the NHNGTS

NVC Communities	NHNHB Natural Community	Corresponding Habitat Type per NH WAP (2015)	Acres within NHNGTS
Acer rubrum – Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus Forest	Red maple/sensitive fern swamp	Temperate Swamp	3.0
Acer rubrum – Nyssa sylvatica – Betula alleghaniensis /Sphagnum spp. Forest	Black gum – red maple basin swamp[1]	Marsh and Shrub Wetland	2.3
Alnus incana – Viburnum recognitum / Calamagrostis canadensis Shrubland [Provisional][2] **Vaccinium corymbosum – Rhododendron viscosum – Clethra alnifolia Shrubland[2]**	Highbush blueberry – winterberry shrub thicket	Marsh and Shrub Wetland	2.8
Calamagrostis canadensis – Scirpus spp. – Dulichium arundinaceum Herbaceous Vegetation	Tall graminoid emergent marsh	Marsh and Shrub Wetland	8.1
Orchard Grass (*Dactylis glomerata*) – Sheep Sorrel (*Rumex acetosella*) Herbaceous Vegetation	No equivalent	Grassland	21.2

Tsuga canadensis – Fagus grandifolia – Quercus rubra Forest	Hemlock – beech – oak – pine forest	Hemlock-Hardwood-Pine Forest Vernal Pool (inclusions)	47.9
Developed	No equivalent	No equivalent	16.8
Hedgerow	No equivalent	No equivalent	2.4
[1] Exemplary natural community occurrence **[2] The description of these NVCS communities were combined to provide a single discussion based on their similarity and the equivalent NHNHB Natural Vegetation Community classification**			
Source*:* NHNHB 2004			

For the purposes of the NHNHB survey (NHNHB, 2004), areas classified as developed included buildings, parking lots, paved roads, and new construction and totaled 17 acres. The culturally modified vegetation areas include approximately 26 acres of mowed fields and hedgerows that border the property and certain portions of the unpaved road network within the property. Vegetation in this area consists primarily of native and non-native turf grass that is mowed regularly (see **Section 5.1 Ecosystem Classification**). Vegetation in this area was classified as Orchard Grass – Sheep Sorrel Herbaceous Vegetation; there is no equivalent natural community name. This National Vegetation Classification Standard (NVCS) association includes the mowed fields north of the Cantonment Area and is dominated by native and non-native grasses that have been planted sometime in the past (NHNHB, 2004). This area is routinely mowed and consists of fields dominated by graminoids and forbs, especially orchard grass (*Dactylis glomerata*), northern crab-grass (*Digitaria sanguinalis*), common timothy (*Phleum pratense*), clover (*Trifolium* spp.), and sweet vernal grass (*Anthoxanthum odoratum*). Scattered throughout the field or in localized patches are herbs such as wood sorrel (*Oxalis stricta*), wild strawberry (*Fragaria virginiana*), cinquefoil (*Potentilla simplex*), yarrow (*Achillea millefolium*), black-eyed Susan (*Rudbeckia hirta*), and evening primrose (*Oenothera biennis*), among other species.

The remaining 64 acres were characterized as natural vegetation and further classified using the NVCS developed by The Nature Conservancy (Grossman et al. 1998; Anderson et al. 1998). Natural vegetation areas within the NHNGTS were found to

include one upland forest and five wetland NVCS communities. Two of these NVCS communities were classified as the highbush blueberry – winterberry shrub thicket natural community. For ease of discussion and to highlight relevance to the NHNGTS, the following NHNHB natural community types are used to further describe the site's vegetation:

- Hemlock – beech – oak – pine forest
- Black gum – red maple basin swamp
- Highbush blueberry – winterberry shrub thicket
- Tall graminoid emergent marsh
- Red maple/sensitive fern (*Onoclea sensibilis*) swamp

The following information is taken directly from the NHB 2004 Vegetation Mapping and Floristic Inventory for each of the natural communities on the site (NHNHB, 2004). Vegetation communities have changed little since this survey was conducted.

Hemlock – Beech – Oak – Pine Forest

The NVCS equivalent is Eastern Hemlock – American Beech – Northern Red Oak Forest. This upland forest type covers a majority of the NHNGTS, with just under 40 acres. It is classified as a single matrix forest type and is a mosaic of hardwood-dominated areas, conifer-dominated areas, and mixed canopy areas. Deciduous areas are dominated by red oak (*Quercus rubra*), American beech, paper birch (*Betula papyrifera* var. *papyrifera*), black birch (*B. lenta*), red maple (*Acer rubrum*), and a small amount of white pine. Common understory species include witch hazel (*Hamamemlis virginiana*), lowbush blueberry (*Vaccinium angustifolium*), and occasional highbush blueberry (*V. corymbosum*) or mountain maple (*Acer spicatum*). Typical herbs in this forested area include bracken fern (*Pteridium aquilinum*), club mosses (*Lycopodium* spp.), wild sarsaparilla (*Aralia nudicaulis*), pink lady's-slipper (*Cypripedium acaule*) and starflower (*Trientalis borealis*). Conifer-dominated areas have a preponderance of either white pine or *Tsuga canadensis* (hemlock) in the canopy. Some stands are pure hemlock, which have relatively low plant diversity within them. American beech and mountain maple are occasional in the canopy and shrub layer. Herbs are very sparse, but most commonly include partridge-berry (*Mitchella repens*), downy rattlesnake-plantain (*Goodyera pubescens*), wintergreen (*Gaultheria procumbens*), trailing arbutus (*Epigaea repens*), Indian pipes (*Monotropa uniflora)*, and Canada mayflower (*Maianthemum canadense*). Mixed canopy areas tend to have any or all of the species mentioned above in various proportions.

Small patches within the forest that are generally smaller than a minimum mapping unit (<1 ac.) add to the local species diversity already mentioned above. Several local areas within the forest have some enrichment indicators including white ash (*Fraxinus americana*) and sugar maple (*Acer saccharum)* in the canopy, red elderberry

(*Sambucus racemosa* ssp. *pubens*) and northern spicebush (*Lindera benzoin*) in the shrub layer, and Christmas fern (*Polystichum acrostichoides*), northern lady fern (*Athyrium filix-femina*), and jack-in-the-pulpit (*Arisaema triphyllum*) in the herb layer. Other localized patches of diversity occur in small, damp swales or along intermittent streams. These areas tend to have dense fern cover of interrupted fern (*Osmunda claytoniana*) and New York fern (*Thelypteris noveboracensis*), plus goldthread (*Coptis* var. *groenlandica)* and abundant peat moss (*Sphagnum girgensohnii*). Lastly, a small rock outcrop area occurs just south of the large central wetland complex that just opens the forest canopy. The overhanging canopy trees here include white pine, red oak, and red maple. Witch hazel forms a sparse shrub layer. Herbs are likewise sparse, but include typical species like bracken fern, rock polypody (*Polypodium virginianum*), poverty oat-grass (*Danthonia spicata*), wintergreen (*Gaultheria procumbens)*, Canada mayflower (*Maianthemum canadense*), downy rattlesnake-plantain (*Goodyera pubescens*), starflower (*Trientalis spp.*), and pink lady's-slipper (*Cypripedium acaule*). Nonvascular species are abundant and include a strong component of moss (*Dicranum scoparium*) and lichen (*Cladina rangiferina*), with lesser amounts of other mosses (*Leucobryum glaucum*, *Polytrichum commune*, *Pleurozium schreberi*). Potential vernal pools are also embedded within the forest as described above.

The presence of early as well as late successional species in the canopy shows this it is a second growth forest. Rock walls and other vegetative indicators, like ground juniper (*Juniperus communis* var. *depressa*), suggest it has been used for pasture in the past. Most of this forest has not been actively managed although a gravel training road was constructed in 2013 which provides access from the managed field to the northern end of the property.

Black Gum – Red Maple Basin Swamp

The NVCS equivalent is Red Maple - Blackgum - Yellow Birch / Peatmoss species Forest. This black gum - red maple swamp has a sparse canopy of black gum (*Nyssa sylvatica*; 10-15% cover) and red maple (*Acer rubrum*; 10%) with a very dense tall shrub layer, consisting predominantly of highbush blueberry (*Vaccinium corymbosum*; 45%), that forms dense, tall hummocks. Additional shrubs include abundant winterberry (*Ilex verticillata*; 20%) and frequent mountain holly (*Nemopanthus mucronatus*; 5%) and male-berry (*Lyonia ligustrina*; 5%). There are small openings in the tall shrub and canopy layers dominated by Sphagnum mosses and occasionally with abundant leather-leaf (*Chamaedaphne calyculata*; 5%), three-seeded sedge (*Carex trisperma* var. *trisperma*), or cinnamon fern (*Osmunda cinnamomea*). Additional, scattered herbaceous species include Rudge’s sedge (*Carex debilis*) and tawny cotton-grass (*Eriophorum virginicum*), with swamp candles (*Lysimachia terrestris*) and lesser bur-reed (*Sparganium americanum*) occurring in wet hollows.

The swamp is surrounded by forested upland (CEGL006088—*Tsuga canadensis – Fagus grandifolia - Quercus rubra* Forest). It occurs in the northeast corner of the NHNGTS, which has not been actively managed in the over 30 years. The forest to the south and east has been selectively logged more recently and there are woods roads along the property boundaries on the north and east sides. There are additional small basins with black gum within 200-500 meters of this occurrence, although the basin at the NHNGTS is the largest.

This natural community is identified as exemplary according to element occurrence specifications developed by NH Heritage (Sperduto et al. 2000). Overall the quality of the occurrence is fair (C rank). It is relatively small in size (2.7 ac.; size rank=C), is surrounded by partially disturbed forest some of which is not high quality due to recent logging (landscape context rank=B), and is a younger forest with a lower proportion of old trees (6 trees > 20 in. dbh) (condition rank=C). All size classes are represented in a moderately diverse, layered canopy, but there are relatively more young trees (2-12 in. size class).

Highbush Blueberry – Winterberry Shrub Thicket

This natural community is equivalent to two NVCS communities. The first, Gray Alder – Southern Arrowwood / Bluejoint Shrubland [Provisional], was observed along the shrubby swamp area on the north end of the large wetland complex. This is a patchy mosaic of sparse red maple woodland, mixed shrubland, and open herbaceous areas intermixed with snags and downed logs amidst tall sedge thatch hummocks (NHNHB 2004). Red maple is sparse in the canopy, eastern meadowsweet and steeple-bush (*Spiraea* spp.), northern arrowwood (*Viburnum dentatum* var. *lucidum*) are common shrubs, with buttonbush (*Cephalanthus occidentalis*) and coastal water willow (*Decodon verticillatus*) occurring in the wettest areas. Herbaceous openings exhibit a variety of bulrush, sedges, iris, reeds, and other herbaceous species.

The second NVCS community, Highbush Blueberry - Swamp Azalea - Coastal Sweet-pepperbush Shrubland, follows Mohawk Brook that drains the large central wetland complex (NHNHB 2004). Vegetation along the small, shallow basin is dominated by a dense tall shrub layer of highbush blueberry and winterberry, with some speckled alder *Alnus incana* spp. *rugosa*, and red elderberry (*Sambucus racemosa* spp. *pubens*), with limited openings with herbaceous plants such as blue-joint (*Calamagrostis canadensis*), drooping sedge (*Carex crinita*), and American water horehound (*Lycopus americanus*). Vegetation occurs primarily on tall hummocks over wet hollows.

Tall Graminoid Emergent Marsh

The NVCS equivalent is Bluejoint - Bulrush species – Three-way Sedge Herbaceous Vegetation. This herb-dominated marsh occurs in two interconnected areas near the center of the undisturbed area on the NHNGTS. A small pool of open water has

abundant lesser bur-reed (*Sparganium americanum*), common arrowhead (*Sagittaria latifolia*), and yellow pond lily (*Nuphar variegata*); these species also line the slow stream channel flowing from the north end of the basin to the old beaver dam on the east side. The remainder of the marshy area consists of a variety of additional species that form patches of local dominance, including a variety of aquatic grasses, bulrush, sedges, rushes, and other herbaceous plants.

Red Maple/Sensitive Fern Swamp

The NVCS equivalent is Red Maple - (Green Ash, White Ash) / Northern Spicebush / Skunk-cabbage Forest. South of the central wetland complex an intermittent seepage occurs along the gradual downslope. This small seepage area is dominated by canopy species such as red maple, white ash (*Fraxinus americana*), and some yellow birch (*Betula alleghaniensis*). The shrub layer includes northern spicebush (*Lindera benzoin*), red elderberry, and abundant witch hazel. Underlying the shrub layer is a diverse herb layer, including poison ivy (*Toxicodendron radicans*), a variety of ferns (*Osmunda* spp., *Thelypteris* spp.), water pennywort (*Hydrocotyle americana*), water-hemlock (*Cicuta maculata),* spotted touch-me-not (*Impatiens capensis*) and variety of other herbs.

Mixed native/non-native grass

This association comprises the mowed fields north of the buildings at the NHNGTS. It is dominated by both native and non-native grasses, all of which having been planted sometime in the past. Portions are mowed annually to provide suitable habitat for a variety of nesting grassland bird species, while other areas are routinely mowed to facilitate military training activities. The fields are dominated by graminoids and forbs, especially orchard grass (*Dactylis glomerata*), northern crab-grass (*Digitaria sanguinalis*), common timothy (*Phleum pretense*), sweet vernal grass (*Anthoxanthum odoratum*), and clover (*Trifolium spp.*). There is a large diversity of additional herbs in this area, some of which are weedy and tend to occur along the unpaved roads, like tumble-grass (*Eragrostis spectabilis*), red sorrel (*Rumex acetosella*), butter-and-eggs (*Linaria vulgaris*), and awnless brome-grass (*Bromus inermis*). Other species are more discrete in their occurrence and are found scattered throughout the field or in localized patches. These include showy yellow wood sorrel (*Oxalis stricta*), wild strawberry (*Fragaria virginiana*), old-field cinquefoil (*Potentilla simplex*), European yarrow (*Achillea millefolium*), black-eyed Susan (*Rudbeckia hirta*), and biennial evening primrose (*Oenothera biennis*) among many others.

5.2.2 Historic and Current Vegetation Cover ECTC

Prior to the purchase of the 215 acres of land by the NHARNG in 2009 the property was forested. Evidence of selective timber harvest activities can be seen on the site, likely most recently around the 1980's. Construction of the ECTC began in fall of 2011 in the southeast corner of the property, east of the power line easement. In mid-2019, an additional 5-acres of forest was purchased on the eastern side of the property. It is dry Appalachian oak forest.

In the summer of 2011 the NH Natural Heritage Bureau (NHB) conducted a natural community and floristic survey of the entire ECTC (NHNHB, January 2012)). This survey resulted in the identification of nine natural community types: Dry Appalachian oak forest, Pitch pine – scrub oak woodland, Hemlock – white pine forest, Red maple – Sphagnum basin swamp, Temperate Minor River Floodplain System and Disturbed area. Information below is taken directly from the NH Natural Heritage Bureau report (NHNHB, January 2012). **Figure 21** depicts the vegetation communities' delineated onsite during the NHB survey. Minor modifications to the data were made to reflect the land cleared for construction of the ECTC barracks and training building in fall of 2011, this area is now depicted as disturbed. The NHB natural communities and equivalent National Vegetation Classification (NVC) Standard communities that occur on the NHNGTS are summarized in **Table 11**: Vegetation Communities at the ECTC. **Appendix B** contains the complete table of species identified during the survey.

Table 11: Vegetation Communities at the ECTC

NVC Communities	NHNHB Natural Community	Acres Within ECTC
Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium Forest	Dry Appalachian oak forest	126.3
Pinus rigida / Quercus ilicifolia / Lespedeza capitate Woodland	Pitch pine - scrub oak woodland	15.8
***Pinus strobus - Tsuga canadensis* Lower New England / Northern Piedmont Forest**	Hemlock - white pine forest	2.6
Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum spp. Forest	Red maple - Sphagnum basin swamp	10.7

Laurentian-Acadian Floodplain Forest	Temperate minor river floodplain system[1]	19.8
Acer rubrum - Prunus serotina / Cornus amomum Forest	Red maple floodplain forest	
Calamagrostis canadensis - Doellingeria umbellata - Spartina pectinata Herbaceous Vegetation	Herbaceous riverbank/floodplain	
Alnus incana - Cornus (amomum, sericea) / Clematis virginiana Shrubland	Alder - dogwood - arrowwood alluvial thicket	
Carex torta - Apocynum cannabinum - Cyperus spp. Herbaceous Vegetation	Cobble - sand river channel / Mesic herbaceous river channel	
	Disturbed Area	45.0
	Total Area	220.2

[1] *This natural community is comprised of the Red maple floodplain forest, Herbaceous riverbank / floodplain, Alder – dogwood –arrowwood alluvial thicket and Cobble – sand river channel. According the NHNHB this system was diverse with each community consisting of a relatively small area and therefor were not mapped separately.*

Dry Appalachian oak forest (DAOF)

This is the dominant community on the ECTC, occupying roughly 80% of the upland acreage on the site. Due to the intensive history of logging on the site, the composition of this community is quite variable, but white oak (*Quercus alba*) is almost always present, and often dominant. White pine (*Pinus strobus*) is also frequently dominant or codominant, particularly in areas where the canopy was opened by timber harvesting. Other frequent tree species in this community include black oak (*Quercus velutina*), red oak (*Quercus rubra*), and red maple (*Acer rubrum*). Scarlet oak (*Quercus coccinea*) and pitch pine (*Pinus rigida*) are occasional. On mesic soils, such as the slopes above the Soucook River and on the central hill, eastern hemlock (*Tsuga canadensis*) is an important component. In areas where disturbance has been more recent or more intense, aspen (*Populus spp*) and gray birch (*Betula populifolia*) dominate.

Like the tree canopy, the density of the shrub layer varies considerably across the site, but scrub oak (*Quercus ilicifolia*) and American hazelnut (*Corylus americana*) are both

frequent in the tall shrub layer. Heaths are abundant in the low shrub layer, particularly lowbush blueberry (*Vaccinium angustifolium*) and wintergreen (*Gaultheria procumbens*), although hillside blueberry (*Vaccinium pallidum*), black huckleberry (*Gaylussacia baccata*), and dangleberry (*Gaylussacia frondosa*) are also common.

The herbaceous layer in this forest type is sparse, but species that are typically present in low abundance include bracken (*Pteridium spp.*), rough-leaved rice grass (*Oryzopsis asperifolia*), distant sedge/ Pennsylvania sedge (*Carex lucorum*/ *C. pensylvanica*), wild sarsaparilla (*Aralia nudicaulis*), and starflower (*Trientalis borealis*).

Pitch - pine scrub oak woodland (PPSOW)

This is the only exemplary natural community occurrence at ECTC, and represents an extension of the larger Concord Pine Barrens complex that occurs across the river. It is found on sand flats adjacent to the Soucook River on the northern part of the site. It is characterized by an open canopy of pitch pine (*Pinus rigida*) above dense thickets of scrub oak (*Quercus ilicifolia*). Pitch pine is the dominant tree in this community, but white pine (*Pinus strobus*), white oak (*Quercus alba*), and gray birch (*Betula populifolia*) are also present.

Within the woodland structure, there are significant openings (up to 0.25 acres) completely dominated by the heath shrubs lowbush blueberry (*Vaccinium angustifolium*), hillside blueberry (*Vaccinium pallidum*), and black huckleberry (*Gaylussacia baccata*), often to the exclusion of other species.

As it is currently mapped, this community occurrence is roughly 15 acres in size, despite its historically larger extent. **Figure 21** depicts the historic PPSOW area, as determined by the NHNHB. To the east, between the power line right–of–way and the private property holding, is a small patch of *pitch pine - scrub oak woodland* about 1.5 acres in size. Prior to the clearing and grading of the adjacent property, this patch was likely part of a continuous occurrence along the Soucook River.

Additionally, to the south of the mapped community boundary, there are scattered large (12-18” dbh) pitch pines, but they are surrounded by a dense growth of early successional species like aspen (*Populus spp.*), gray birch (*Betula populifolia*), and black cherry (*Prunus serotina*).

NHNHB ranks the quality of rare plant and community populations, known as “Quality Ranks”, to give more detail on the overall condition of the community. These ranks are based on size, condition and landscape context of the community. The quality ranks range from A (excellent) to D (poor). In the NHB database this natural community occurrence has an overall quality rank of “C” meaning that is considered to be in fair condition. This low rank is due to a combination of small size and its context in a heavily managed landscape. However, because this natural community type is imperiled in the state (rarity rank S1S2), all occurrences that are considered viable (C rank or better) are considered exemplary.

Hemlock – white pine forest

This forested community is found on steep slopes that are somewhat more mesic than surrounding areas, and probably have less of a fire history. It is characterized by dominance of eastern hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*), with few other species in the canopy or understory. At the ECTC, the sole occurrence is on steep north and northwest-facing slopes in the center of the property. There exists another small gradation of dry Appalachian oak forest into Hemlock-white pine forest on the eastern slope of the central knoll. Small patches of mature eastern hemlock can be found on the steep slopes of central high knoll and above the river on the western side of the ECTC, but at less than 1 acre, they are too small to be considered occurrences of a natural community type.

Red maple – Sphagnum basin swamp

Outside of the riparian communities in the floodplain system, this is the only significant wetland area on the ECTC property. This community occurs in an isolated, horseshoe-shaped basin that wraps around the southern base of central high knoll.

Although this occurrence is not particularly large (13 acres), it has considerable variability in species composition and structure. Likely, this is due in part to both site conditions and management history. Cut stumps can be found throughout the wetland, creating a significant canopy gap across a portion of the swamp.

In the western end of the basin, eastern hemlock (*Tsuga canadensis*) is the dominant tree in the canopy, with lesser amounts of red spruce (*Picea rubens*) and red maple (*Acer rubrum*). Mountain holly (*Ilex mucronata*) is abundant in the tall shrub layer, and herb cover is sparse. In the central and eastern portions of the basin, red maple is dominant, with scattered white pine (*Pinus strobus*) and red spruce (Picea rubens). Mountain holly and speckled alder (*Alnus incana* subsp. *rugosa*) are frequent in the Temperate minor river floodplain system shrub layer, along with highbush blueberry (*Vaccinium corymbosum*) and winterberry (*Ilex verticillata*). Cinnamon fern (*Osmundastrum cinnamomea*) is abundant in the herb layer, and skunk cabbage

(*Symplocarpus foetidus*) is frequent. In the northeastern end of the basin, the tree canopy is open as a result of timber harvesting. As a result, a well-developed shrub layer has formed; dominated by mountain holly and highbush blueberry, along with saplings of red maple, red spruce, white pine and eastern hemlock.

Temperate minor river floodplain system

This natural community system is comprised of a diverse set of natural communities associated with the hydrologic regime of the Soucook River. The setting includes low and high floodplain terraces, sandy riverbanks, and cobble and sand river channels. Because of their inherently small sizes and dynamic nature, these communities were not mapped separately, but are described here individually.

Red maple floodplain forest

Both low and high variants of this community type occur in this system. The low variant is restricted to a backwater area in the southern part of ECTC. The canopy is dominated by red maple (Acer *rubrum*), with scattered American elm (*Ulmus americana*). The shrub layer is sparse, but the herb layer is lush and diverse, with sensitive fern (*Onoclea sensibilis*) dominant. Other frequent herbaceous species found in this layer include lady fern (*Athyrium angustum*), skunk cabbage (*Symplocarpus foetidus*), inflated sedge (*Carex intumescens*), drooping woodreed (*Cinna latifolia*), and Jack-in-the-pulpit (*Arisaema triphyllum*).

The high variant occurs on terraces and levees adjacent to the river channel, and is significantly drier than the low variant. The canopy is thinner than the low variant; red maple (*Acer rubrum*) is still the dominant species. However, species typical of the surrounding uplands are also frequent, including white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), and black cherry (*Prunus serotina*). The herbaceous layer is dominated by rough goldenrod (*Solidago rugosa*), and Pennsylvania sedge (*Carex pensylvanica*) is frequent. Creeping vines are also common and include Virginia creeper (*Parthenocissus quinquefolia*), dwarf raspberry (*Rubus pubescens*), and fringed bindweed (*Fallopia cilinodis*).

At the northwest corner of the ECTC close to the peninsula, there is an unusual expression of the high variant in which red maple (*Acer rubrum*) is codominant with basswood (*Tilia americana*), a tree species typically found in rich mesic settings. The basswood's presence may simply be the result of a nearby seed source that responded to a past disturbance. The species composition is otherwise characteristic of high floodplain terraces, with musclewood (*Carpinus caroliniana*) frequent in the understory, and dense cover of Virginia creeper (*Parthenocissus quinquefolia*) in the herb/low shrub layer.

Herbaceous riverbank/floodplain

This community occurs as narrow strips on open floodplains between the high variant of *red maple floodplain forest* and steep banks leading down to the *cobble - sand river channel* 3-6 feet below. The vegetation consists of a dense herbaceous layer with scattered shrub cover. It is dominated by a mix of graminoid species, particularly deertongue (*Dichanthelium clandestinum*), Pennsylvania sedge (*Carex pensylvanica*), and little bluestem (*Schizachyrium scoparium*), along with other herbs such as Canada goldenrod (*Solidago canadensis*) and rough goldenrod (*Solidago rugosa*). Red osier dogwood (*Swida sericea*) and meadowsweet (*Spiraea alba* var. *latifolia*) are typical shrubs.

Alder - dogwood - arrowwood alluvial thicket

The shrub thicket community occurs as small patches on steep banks above the *cobble – sand river channel*. Shrub cover is very dense and dominated by red osier dogwood (*Swida sericea*). Other shrubs present in lower abundance include speckled alder (*Alnus incana* ssp. *rugosa*), meadowsweet (*Spiraea alba* var. *latifolia*), and the invasive exotic Morrow's honeysuckle (*Lonicera morrowii*). Herb cover is low, but fairly diverse, and includes groundnut (*Apios americana*), deertongue (*Dichanthelium clandestinum*), Virginia wild rye (*Elymus virginicus*), fringed loosestrife (*Lysimachia ciliata*), and the invasive reed canary grass (*Phalaris arundinacea*).

Cobble - sand river channel / Mesic herbaceous river channel

This community consists of sparsely-vegetated deposits of sand and gravel immediately adjacent to the open water of the river. These areas are inundated during high-water events, and have species capable of tolerating a high level of disturbance from flooding and ice scour. Although vegetative cover is low, species diversity can be fairly high. Scattered shrubs can include red osier dogwood (Swida sericea), speckled alder (Alnus incana ssp. rugosa), silky willow (Salix sericea), and eastern meadowsweet (Spiraea alba var. latifolia), as well as tree seedlings from a variety of species. Common herbaceous species include deertongue (Dichanthelium clandestinum), rough goldenrod (Solidago rugosa), shallow sedge (Carex lurida), blue toadflax (Nuttallanthus canadensis), hedge bindweed (Calystegia sepium), groundnut (Apios americana), field horsetail (Equisetum arvense), common mugwort (Artemisia vulgaris), red sorrel (Rumex acetosella), common ragweed (Ambrosia artemisiifolia), and lesser bur-reed (Sparganium americanum).

The mesic herbaceous river channel is similar to the cobble - sand river channel in setting and substrate, but differs in having moderately dense plant cover and moist conditions that often support marsh-like vegetation. Typical herbaceous species include tussock sedge (Carex stricta), monkey flower (Mimulus ringens), common grass-leaved

goldenrod (Euthamia graminifolia), water pennywort (Hydrocotyle americana), fringed loosestrife (Lysimachia ciliata), bluejoint (Calamagrostis canadensis), field horsetail (Equisetum arvense), marsh bellflower (Campanula aparinoides), fowl mannagrass (Glyceria striata), water parsnip (Sium suave), rough goldenrod (Solidago rugosa), and the invasive species purple loosestrife (Lythrum salicaria), among others.

Disturbed area

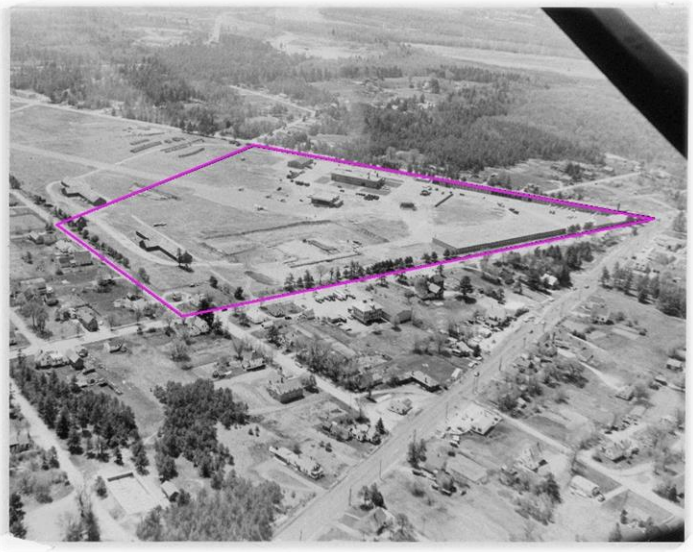
This habitat designation applies only to areas that are maintained in their current condition by repeated anthropogenic disturbance. It does not include forested areas that are subject to occasional timber harvesting operations. At the ECTC, it refers primarily to the power line right–of– way, which accounts for roughly 10% of the property acreage, but also includes the ECTC development area, and the disturbed edges of interior roads within the property.

Because the power line cuts a swath across the landscape that is independent of the underlying ecology, it includes many plant species atypical of the terrain it bisects (steep, narrow ravines, wet depressions, and riverbanks). This managed landscape coupled with topographic variability results in greater species diversity than the natural communities existing on the property. The dominant species in the power line are shrubs and tree saplings, including scrub oak (*Quercus ilicifolia*), gray birch (*Betula populifolia*), pin cherry (*Prunus pensylvanica*), lowbush blueberry (*Vaccinium angustifolium*), and sweet fern (*Comptonia peregrina*). In addition, there are five rare species that occur in the power line, and are dependent on management to maintain this open habitat: branching needle grass (*Aristida basiramea*), buttonbush dodder (*Cuscuta cephalanthi*), spiked needle grass (*Aristida longespica var. geniculata*), sweet goldenrod (*Solidago odora*), and wild lupine (*Lupinus perennis*).

In October 2015 approximately 10 acres of pine barrens management area was mechanically treated with a brontosaurus. In December of 2016 an additional 11 acres were mechanically treated using forestry equipment to further reduce canopy cover and non-desirable tree species. Both treatments were in preparation for prescribed fire activities, mainly to reduce fuel load, construct firebreaks and facilitate pine barrens restoration activities. Prescribed burns have taken place onsite in September 2016, August 2017, and September 2019 totaling approximately 6.5 acres. In November 2019, four pine barrens management area units were mechanically treated in preparation for burning.

5.2.3 Historic and Current Vegetation Cover of the SMR

The SMR has historically been an active military base for the state militia. The site once encompassed portions of the today Concord Municipal Airport. The image to the right depicts the SMR circa 1960, the pink line indicates approximate current installation boundary. Since the issuance of the BO by USFWS in 2000 15.2 acres has been reverted from mixed military use, such as parade grounds, aviation use, military parking, etc. to pine barrens habitat.



Current vegetation on the SMR is limited to the 15.2 acres of pine barrens habitat restoration area, as the remainder of the property is developed and in current use as an active military base. Vegetation management within this area is ultimately driven by the requirements of Biological Opinion (BO) (FAA, 8/18/2000) and Environmental Assessment (NHARNG, December 2000) to restore the entire area to a pitch pine scrub oak barrens natural community. Management in this area has been ongoing since 2000 and is now primarily in sustainment mode.

To meet the intent of the mitigation requirements to restore pine barrens onsite the NHARNG has defined three target vegetation classes within the habitat area; Woodland, Shrubland and Grassland. These target vegetation classes were developed to provide a mosaic of habitat conditions onsite that mimic the natural pine barren system. Due to the site's proximity to the Concord Municipal Airport air space height restrictions, or Runway Protection Zones (RPZ), the habitat is managed accordingly. To comply with the RPZ, the southern end of the SMR is managed as a grassland community, while the northern end is managed as a woodland community. The habitat area was further broken down into units to allow for more specific management, mainly prescribed fire (further described in **Section 7.4.3.6 Exemplary Natural Communities at the SMR**). Target vegetation classes and management units are depicted in **Figure 22**.

Woodland units are dominated by pitch pine (*Pinus rigida*) in the overstory. Many mature trees were initially transplanted from the surrounding Concord Airport while over time areas have been supplemented with saplings grown from locally collected seeds. These transplants and planting primarily took place within the first 10 years of restoration work, and since that time natural seeding has produced additional mature

trees. The shrub and herb cover in these areas is sparse, but the primary species include scrub oak (*Quercus ilicifolia),* choke cherry (*Prunus virginiana*), pin cherry (*Prunus pensylvanica*), little bluestem (*Schizachyrium scoparium*), sweet fern (Comptonia peregrine) and lowbush blueberry (*Vaccinium angustifolium*).

Grassland and Shrubland units are dominated by herb and shrub species including scrub oak, little bluestem, roundhead bush clover (*Lespedeza capitate*), lowbush blueberry, wild lupine (*Lupinus perennis*) and New Jersey tea (*Ceanothus americanus*). Maturing pitch pine are also found throughout these units as they provide some structure and microclimate, although they managed at a lower density then in these units.

The drainage basin found in the northwestern side of the restoration area has been populated with native plants that are more tolerant of moist conditions than most pine barrens species. These plants include winterberry holly (*Ilex veticillata*), American hazelnut (*Corylus americana*), serviceberry (*Amelanchier spp*) and others.

A few non-desirable tree species can be found throughout nearly all habitat units on the SMR. These species are not true invasive species, although they are not desired species in the pine barrens habitat. Due to the dry, sandy and early successional state of pine barrens these species have been able to become easily established, with the potential to out-compete more desirable pine barren species. Tree species include quaking aspen (*Populus tremuloides*), gray birch (*Betula populifolia*) and white pine (*Pinus strobus*).

No formal vegetation survey has been conducted onsite although in 2016 an attempt was made to generate a species list onsite. This was conducted by an employee recording all plant species observed within each management unit. The list can be found in **Appendix B**. Vegetation monitoring (as described in Appendix A) was started in 2018 and will continue annually to guide habitat management activities onsite.

5.3 Fauna

The NHARNG continues to conduct various PLS to maintain current information on species present for effective long term management. Studies primarily focus on species with regulatory status, such as state or federally listed, but may also provide information on other species which are in decline and are at risk for future listing. Information within this document helps the NHARNG focus survey efforts and provide management guidelines. Lists of species with regulatory status can be obtained in multiple places, such as the NH Wildlife Action Plan (2015), Wildlife Species of Special Concern (2017), Rare Animal List for New Hampshire (2020), and the USFWS Information for Planning and Consultation (IPaC) system for federally listed species. The USFWS 5-Year National Listing Workplan is also considered within this INRMP, and lists species under

review for federal protection within the next 5 years. The NH Wildlife Action Plan (WAP) provides a platform to identify rare communities and Species of Greatest Conservation Need (SGCN), along with prioritized conservation strategies, last revised in 2015. Species of Greatest Conservation Need are those with declining numbers, habitat, and other serious threats that need conservation action. Species of Special Concern are those that are considered 'Near-Threatened Species' or 'Recently Recovered Species'. Most Species of Special Concern (SC) are listed on the WAP, but the Wildlife Species of Special Concern list is complete. The full NHFG list of SGCN and Special Concern can be found in **Appendix A**.

Birds are afforded specific protection under the following legislation as it relates directly to bird management with respect to the military mission within the three NHARNG sites:

- Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) "makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations." (USFWS, 2017)
- Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)
- DoD Migratory Bird Readiness Rule (50 CFR Part 21) authorizes incidental take of migratory birds during readiness activities, with limitations.
- Executive Order 13186 generated development of the DoD Memorandum of Understanding between the DoD and USFWS to "promote the conservation of migratory bird populations while sustaining the use of military managed lands and airspace for testing, training, and operation."

Birds are studied by a variety of federal, state, local and non-profit agencies and organizations. Birds often travel great distances between winter and summer breeding, with different habitat requirements for each. Management generally focuses on summer breeding since this is a critical season for protection of the species. For the purposes of this management plan the following lists were consulted to focus management for some species that are experiencing population declines.

- The NHFG Wildlife Action Plan (WAP) (NHFG, 2015) identifies species and natural communities that are both rare and/or may be in decline in NH.
- The USFWS maintains the "Birds of Conservation Concern 2008". (BCC) Table 44, Region 5 (Northeast Region) covers birds found to breed in NH.
- Partners in Flight (PIF) maintains a list of breeding birds that of highest conservation concern at the continental scale.

All lists can be found in **Appendix A**.

Information below provides a summary of all fauna surveys conducted at each site. If a survey was focused on a federally or state listed species, the information can be found within **Section 5.4 Rare, Threatened and Endangered Species.** Flora and Fauna sections for each site will contain the same general subsections, but may contain more detailed sub subsections that are relevant and specific only to that site.

5.3.1 Fauna at the NHNGTS

Fauna that exist onsite depend on three primary habitat types which include the central grassland, forest and emergent marsh central wetland complex. The land surrounding the NHNGTS is very similar, with many of the habitat features extending much beyond the boundaries of the installation. All of the land immediately surrounding the installation is under private ownership, heightening the vulnerability of habitat that extends across and is contiguous to the site. The NHNGTS acts as a part of a larger, contiguous swath of habitat that allows unimpeded movement of fauna throughout the landscape.

5.3.1.1 Mammals at the NHNGTS

Other than for bats, no general mammal surveys have been conducted at the NHNGTS. Most mammals known to occur onsite have been incidentally observed. However, the hardwood hemlock pine forest habitat at the site supports common mammal species such as gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), white-tailed deer (*Odocoileus virginianus*), beaver (*Castor Canadensis)*, white-footed mouse (*Peromyscus leucopus*), black bear (*Ursus americanus*), and coyote (*Canis latrans var.*).

Several species of bat exist onsite. Species include the big brown, eastern red, hoary, little brown, silver-haired, and tri-colored bats. All of them are discussed in more detail in **Section 5.4.1.1 Mammals at the NHNGTS**.

5.3.1.2 Birds at the NHNGTS

The diverse landscape at the NHNGTS, most notably the grasslands and wetlands, provides excellent habitat for birds. While many of the bird species known to occur onsite are common in NH, many are in decline and depend on the open grasslands and early successional habitat found in the semi-improved portion of the site. A total of four bird surveys have been conducted onsite; Natural Resource Consulting Services conducted a general bird survey in 2003 (Natural Resource Consulting Service, 2003), the University of NH conducted a grassland bird survey in 2009 (Weidman & Litvaitis, 2009) and NH Audubon conducted a bird survey in 2014 (NH Audubon, 2014), and NewEarth Ecological Consulting's survey in 2019 (NewEarth, 2019). A common assemblage of species are found at the NHNGTS. Complete results of the most recent bird survey is within **Appendix B**.

5.3.1.3 Amphibians and Reptiles at the NHNGTS

Amphibians and reptiles extensively utilize the large central wetland complex along with the numerous vernal pools at the NHNGTS. Although reptiles and amphibians are seemingly healthy and abundant at the NHNGTS, herpetofauna are at risk from a variety of pathogens that have potential to have severe impacts on their population. Upland habitat is also utilized by herpetofauna at the NHNGTS, although the developed areas are not used as heavily. A variety of amphibian and reptile surveys have been conducted at the NHNGTS, primarily focused on turtles and more recently snakes and salamanders. Survey techniques have utilized visual encounter surveys, pit fall traps, cover boards, minnow traps, hoop traps and auditory surveys.

5.3.1.3.1 Amphibians at the NHNGTS

Table 12 below lists all amphibian surveys as well as the survey techniques used and target species. Information on rare turtles identified at the site is included **Section 5.4.1.3 Amphibians and Reptiles at the NHNGTS**.

Table 12: Amphibian and Reptiles Surveys Conducted at the NHNGTS

Year	Surveyor	Methods	Target species/groups
1999	Karen Colclough (UNH)	Visual, auditory	Frogs and salamanders
2003	Christian Andrews	Visual, auditory, pitfall trap and hoop trap	Frogs, salamanders, turtles
2003	NRCS	Pitfall trap, hoop trap	Turtles
2008	NRCS	Visual, Pitfall trap, cover boards	Turtles and snakes
2009	UNH	Cover boards	Snakes
2013	NH Audubon	Visual, hoop traps	Turtles
2016	NH Audubon	Visual, cover boards, minnow trap and auditory	Frogs, salamanders, turtles and snakes
2017	NH Audubon	Visual, hoop traps, minnow traps	Turtles

The most recent amphibian survey conducted by NH Audubon in 2016 (NH Audubon, 2016) identified 7 vernal pools onsite. This survey generated a comprehensive list of amphibian's onsite, both found during this survey as well as previous studies. **Table 13** was taken directly from the 2016 report and lists all amphibian species onsite. **Figure 23** depicts the location of the vernal pools identified during the 2016 amphibian survey, the 2013 and 2017 hoop trap locations, and cover board locations.

Table 13: Amphibians at the NHNGTS

Common Name	Latin Name	Occur in southeast N.H.?	Observed during surveys			
			2016	2013	2003	1999
Bullfrog	*Rana catesbeiana*	Y	Y			
Green frog	*Rana clamitans melanota*	Y	Y	Y	Y	Y
Northern leopard frog (1,2)	***Rana pipiens***	Y			Y	
Pickerel frog	*Rana palustris*	Y	Y		Y	
Wood frog	*Rana sylvatica*	Y	Y	Y	Y	Y
Mink frog (2)	***Rana septentrionalis***	northern NH				
Gray tree frog	*Hyla versicolor*	Y			Y	Y
Spring peeper	*Pseudacris crucifer crucifer*	Y	Y		Y	Y
American toad	*Anaxyrus americanus*	Y	Y		Y	Y
Fowler's toad	***Bufo fowleri***	not known				
Blue-spotted salamander (2)	***Ambystoma laterale***	Y				
Northern dusky salamander	*Desmognathus fuscus*	Y	Y			
Eastern/red-spotted newt	*Notophthalmus viridescens*	Y	Y	Y	Y	
Four-toed salamander	*Hemidactylium scutatum*	Y				
Jefferson salamander (1,2)	***Ambystoma jeffersonianum***	southwest NH				
Marbled salamander (E)	***Ambystoma opacum***	southern NH				
Mudpuppy *	*Necturus maculosus*	not known				
Northern redback salamander	*Plethodon cinereus*	Y	Y		Y	Y
Slimy salamander **	*Plethodon glutinosus*	southern NH?				
Spotted salamander	*Ambystoma maculatum*	Y	Y		Y	
Spring salamander	*Gyrinophilus porphyriticus*	Y				
Northern two-lined salamander	*Eurycea bislineata*	Y	Y			

E = State Endangered; T = State Threatened, 1 = Species of Special Concern; 2 = Wildlife Action Plan Species in Greatest Need of Conservation
* Mudpuppy may be an introduced species. ** Slimy salamander may be extirpated or not native to NH.
Shaded cells indicate species that do not occur in the region (dark grey), or unlikely to occur on the site due to lack of appropriate habitat (light gray). Information from N.H. Fish & Game Dept. Nongame and Endangered Species Program webpage (http://www.wildlife.state.nh.us/Wildlife/nongame_and_endangered_wildlife.htm).

Vernal pools have been informally surveyed in-house each year in addition to those performed during contracted surveys. The most recent survey was completed in 2020. Vernal pools found onsite support multiple amphibian species. Species typically found utilizing the pools include spotted salamander, wood frog, and the green frog. Insects such as mosquitos also inhabit the pools. All vernal pool surveys will be provided to NHFG and or entered into the NH Wildlife Sightings website Turtles also use vernal pools for feeding purposes in the spring, and may be encountered. Vernal pools are represented in **Figure 36**. For more information about vernal pools found onsite, refer **Section 4.5.1 Hydrology of the NHNGTS**.

5.3.1.3.2 Snakes at the NHNGTS

Snake surveys have been conducted in-house by the use of semi-permanent cover boards, under a permit granted by NHFG. Cover boards are used as a passive technique to identify the presence of snake species at a location. They can also be used as a technique to attempt to capture species of interest for future study. Boards are left for multiple years in the same location, as more individuals may utilize the boards after killing the underlying vegetation. In the summer of 2015 ten half sheets of plywood were placed throughout the site. During the 2016 and 2017 few snakes were observed utilizing the boards, despite many sightings in 2018. The following species of snakes have been observed on the site: garter (*Thamnophis sirtalis*), northern water (*Nerodia sipedon sipedon*), brown (*Storeria dekayi dekayi*), red-bellied (*Storeria occipitomaculata*), and ring-necked (*Diadophis punctatus)* snakes.

5.3.1.3.3 Turtles at the NHNGTS

There has only been one turtle survey completed at the NHNGTS, completed by contractors. Three turtle species were documented during the survey, including the painted turtle, snapping turtle, and Blanding's turtle. The survey and the Blanding's are further discussed in **Section 5.4.1.3 Amphibians and Reptiles at the NHNGTS**.

5.3.1.4 Insects at the NHNGTS

The central wetland complex in addition to the grasslands support a wide variety of insects at the NHNGTS. In 2014 an insect survey was conducted at the NHNGTS by NH Audubon, focused on the insect orders Lepidoptera (butterflies and moths) and Odonata (damselflies and dragonflies) (NH Audubon, 2014). To maximize effectiveness of the survey and comprehensiveness of species observed, it was conducted between the months of May and September. A total of 31 species of butterflies were documented, primarily in the open grassland and along the forested gravel road. The survey also identified 37 species of Odonata and 31 species of Lepidoptera (butterflies). A full species list can be found in **Appendix B**. No federal or state listed butterfly species were identified, although the monarch (*Danaus plexippus,* SGCN/SC) was identified. Please refer to **Section 5.4.1.4** for more information about the monarch.

A total of 37 species of Odonata were detected onsite, including two state listed species. Two boghaunters (*Williamsonia spp.*) were detected onsite in late May, the ebony boghaunter (*Williamsonia fletcheri*) and the ringed boghaunter (*Williamsonia lintneri*). For more information about these state listed species, please refer to **Section 5.4.1.4 Insects at the NHNGTS.**

Although it was not observed during the course of the study, Emerald Ash Borer was confirmed to be present on the property in early 2020. It was suspected to be on the property for a long time in consideration of the widespread presence of the pest, but it

had never been confirmed. The borer was documented during a forestry operation, evidenced by nearly all white ash crowns pitted out by EAB holes.

5.3.1.5 Fish at the NHNGTS

The NHARNG has conducted no surveys to document fish populations that occur onsite. However, fish do occur within the central wetland and stream complex. NHARNG staff has witnessed small fish within the central wetland complex on multiple occasions. During the 2017 turtle survey conducted onsite by NH Audubon, several small sunfish were inadvertently collected via hoop trap. Through communication with NHFG fish biologists, it was determined that the sunfish were native pumpkinseed (*Lepomis gibbosus*). Other fish that utilize clean, warm water environments similar to that of the pumpkinseed may occur onsite as well.

Fisheries surveys have been conducted by NHFG within a small distance downstream of the NHNGTS. Three sites were surveyed approximately a mile downstream of the NHNGTS via electrofishing and seine methods which yielded: American eel, banded sunfish, bluegill, brown bullhead, common sunfish, common white sucker, eastern chain pickerel, fallfish, and largemouth bass (Magee Personal Communication 2019). Some of these species may occur onsite, as the water resource is hydrologically connected. However, the habitat surveyed may be different than what occurs onsite and what was recorded during that survey may be unrepresentative of fish present on the NHNGTS.

5.3.2 Fauna at the ECTC

The variety of habitats present at the ECTC allow for a variety of wildlife to utilize the site. The Soucook River and power line easement serve as habitat and as an access corridor for species from the surrounding fragmented landscape, while the large block of undeveloped forest meets the needs of woodland species. The proximity of the site to surrounding pine barrens communities allow for habitat continuity for many of the pine barrens specialists. Historically the site has been moderately used by the public, primarily for recreational purposes including hunting and fishing, but also for hiking and swimming. The public still uses the site for recreation, but activities that were common in the past such as motorized vehicles, target shooting and camping have been prohibited by the DMAVS. Although prohibited, these destructive activities still occur on a somewhat regular basis.

Since the DMAVS purchase in 2009 a variety of biological studies have been conducted onsite. The focus of many of these studies has been to identify and/or verify the presence of rare flora and fauna species, although information on more common species has been collected as well. **Section 5.4.2 Rare, Threatened, and Endangered Species and Habitats at the ECTC** discusses the rare, threatened and endangered species that have been documented onsite or in the vicinity of the site.

5.3.2.1 Mammals at the ECTC

No formal broad based mammal survey have been conducted on the site. The generally large unfragmented forest in addition to the bisecting powerline and river corridor allow many large or transient mammal species to roam the site and surrounding undeveloped habitats nearby. Some common mammals that have been documented onsite by NHARNG Environmental staff include the gray fox (*Urocyon cinereoargenteus*), fisher (*Pekania pennanti*), long-tailed weasel (*Mustela frenata*), snowshoe hare (*Lepus americanus*), skunk (*Mephitis mephitis*), gray squirrel (*Sciurus carolinensis*), mink (*Neovison vison*), northern flying squirrel (*Glaucomys sabrinus*), beaver (*Castor canadensis*), and white-tailed deer (*Odocoileus virginianus*), porcupine (*Erethizon dorsatum),* eastern chipmunk (*Tamias striatus*), and eastern coyote (*Canis latrans var.*).

Uncommon mammal species are also known to pass through the site occasionally. Two moose (*Alces alces americana*) NH SGCN, a bull and cow, were documented onsite in September of 2019, bedded down in an aspen grove within a management unit. Moose droppings are occasionally found onsite by NHARNG staff. Bobcat (*Felis rufus gigas*) has also been witnessed onsite by a NHARNG soldier (personal communication), a species that once was in decline but according the NHFG has shown population increase in recent years. Bobcat has been captured twice on game camera (once in 2020 and 2021). Fisher (*Martes pennant)* have been identified onsite, captured on trail camera in 2018. Black bear (*Ursus americanus*) tracks and scat have also been found onsite, but have not been verified.

Bats are common at the ECTC. Further information about the bat population onsite can be found in **Section 5.4.2.1 Mammals at the ECTC.**

5.3.2.2 Birds at the ECTC

The variety of habitat at the ECTC, including forests, floodplain forest, early successional forests, and disturbed areas, provide exceptional habitat for birds. Bird surveys have been completed at the ECTC in 2013, 2015, and 2019 (Thompson A.; November 2013; NH Audubon 2015; NH Audubon, 2019), and were conducted to gather a species list. The studies were conducted over the entire site, covering all major habitats. Survey techniques included point count surveys as well and non-linear transect methods. A total of 73 bird species have been observed throughout the course of the surveys. Species lists from the most recent survey can be found in Appendix B**. Given the diverse habitat that exists onsite and proximity to surrounding supporting landscapes many common as well as declining species were identified. Surveys conducted specifically for rare species are discussed further in Section 5.4.2.2 Birds at the ECTC.**

5.3.2.3 Amphibians and Reptiles at the ECTC

The presence of the Soucook River, the large central wetland, isolated upland vernal pools, and extensive upland forest provide adequate habitat for herpetofauna to persist onsite. Only one formal amphibian survey will have been completed at the ECTC by the date this plan is active. However, a variety of in-house amphibian and reptile surveys have been conducted at the ECTC, primarily focused on turtles and snakes and more recently amphibians. Survey techniques have utilized cover boards, and visual habitat searches. The sections below species present and surveys in further depth.

5.3.2.3.1 Amphibians at the ECTC

There has been one formal amphibian survey conducted at the ECTC, during the 2020 field season. Amphibians that were recorded during the survey, or are otherwise known to occur onsite include the American toad (Anaxyrus americanus), green frog (Lithobates clamitans melanota), wood frog (Lithobates sylvatica), red-spotted newt (Notophthalmus viridescens), northern redback salamander (Plethodon cinereus), gray tree frog (*Hyla versicolor*), pickerel frog (*Lithobates palustris*), bull frog (*Lithobates catesbeiana*), northern two-lined salamander (*Eurycea bislineata*), spring peeper (*Pseudacris c. crucifer*), and the spotted salamander (*Ambystoma maculatum*). Amphibians occurring onsite are also expected to utilize the wetlands onsite for reproductive purposes, including wetlands and moist soils.

Multiple vernal pools have been documented onsite through a combination of NHARNG staff observations and contracted wetland delineations (Zatawski and Ecrement, 2019). These pools provide essential habitat for a variety of amphibians, insects, and crustaceans that require the temporary pool of water for reproduction.

Vernal pools have been informally surveyed in-house each year in addition to those performed during contracted surveys. The most recent survey was completed in 2020. Three have been historically surveyed for fauna by NHARNG staff using the documentation manual developed by NHFG (NHFG, 2016), and support vernal pool obligate species such as fairy shrimp (Anostraca order) and wood frogs (Rana sylvatica), along with other non-obligate species including mosquito larvae (Culicidae family) and waterbugs. All vernal pool surveys will be provided to NHFG and or entered into the NH Wildlife Sightings website. Three additional ‘potential’ vernal pools were identified during the wetlands delineation in 2018. These pools will be assessed if suitable. **Figure 37** depicts the location of the surveyed vernal pools onsite.

5.3.2.3.2 Snakes at the ECTC

Annual in-house snake surveys have been conducted beginning in 2009, after the discovery of an eastern hognose snake onsite. Snake surveys are conducted by the use of semi-permanent cover boards, under a permit granted by NHFG. Cover boards are

used as a passive technique to identify the presence of snake species in an area. They can also be used as a technique to attempt to capture species of interest for future study. Boards are left for multiple years in the same location, as more individuals may utilize the boards after killing the underlying vegetation. Cover boards have also been placed in various habitat features throughout the site. Many of these cover boards have been in place since 2009, although some have been moved and/or replaced since the beginning of this survey method. These boards provide some habitat heterogeneity in the landscape and have been easily incorporated into the snake survey efforts. The cover boards are checked throughout the active season and any snakes encountered are noted and reported to the NHFG as part of the annual snake collection permit.

During the course of the surveys, multiple other species of snake have been documented onsite. Snake species include the garter (*Thamnophis sirtalis)*, eastern milk (*Lampropeltis triangulum triangulum*), redbellied (*Storeria occipitomaculata*), smooth green (*Liochlorophis vernalis*), ring-necked (*Diadophis punctatus*), brown (*Storeria dekayi* dekayi), ribbon (*Thamnophis sauritus*), and the eastern hognose (*Heterodon platirhinos*). More information about state listed and sensitive species such as the eastern hognose and smooth green is included in **Section 5.4.2.3.1 Snakes at the ECTC.**

5.3.2.3.3 Turtles at the ECTC

There has been no formal turtle survey conducted at the ECTC. The snapping turtle (Chelydra serpentine) has been observed onsite in close proximity to the Soucook River. The wood turtle (Glyptemys insculpta) SGCN has the potential to be found onsite, considering the appropriate habitat provided by the Soucook River. Further information about the wood turtle can be found in sections **5.4.2.3.3 Turtles at the ECTC** and **7.4.2.3.2 Turtle Management at the ECTC**.

5.3.2.4 Insects at the ECTC

The presence of early successional habitat and scrub oak provide habitat for a rare set of insects at the ECTC. Lepidoptera surveys have been conducted at the ECTC for 14 years, since 2006. During that time, 52 species of butterflies have been identified to date. A summary of species identified in 2019 can be found in **Appendix B**. Due to the nature of the Lepidoptera survey, a more detailed and complete description of species found onsite can be found in **Section 5.4.2.4 Insects (Lepidoptera) at the ECTC**. Similarly, multiple moth surveys have been conducted at the ECTC. NHFG conducted one survey in 2005 and the NHARNG in 2006 and 2016. The moth surveys are further discusses in **Section 5.4.2.4**.

5.3.2.5 Fish at the ECTC

The Soucook River also provides habitat to a number of fish, insects and aquatic invertebrates. According to NHFG (Magee, 2016, 2019) fish species known in this

segment of the Soucook River are American eel (*Anguilla rostrata*), brown bullhead (*Ameiurus nebulosus*), blacknose dace (*Rhinichthys atratulus*), bridle shiner (*Notropis bifrenatus*), brown trout (*Salmo trutta* – stocked), eastern chain pickerel (*Esox* niger), common shiner (*Luxilus cornutus*), fallfish (*Semotilus corporalis*), pumpkinseed sunfish (*Lepomis gibbosus*), white sucker (*Catostomus commersonii*), brook trout (*Salvelinus fontinalis*), largemouth bass (*Micropterus salmoides*), longnose dace (*Rhinichthys cataractae*), margined madtom (*Noturus insignis*), rainbow trout (*Oncorhynchus mykiss* – stocked), redbreast sunfish (*Lepomis auritus*), spottail shiner (*Notropis hudsonius*), tessellated darter (*Etheostoma olmstedi*) and yellow bullhead (*Ameiurus natalis*). Of these species the American eel and bridle shiner are listed as SGCN, with bridle shiner listed as threatened in NH. These species are discussed further in **Section 5.4.2.5 Fish and Mollusks at the ECTC.**

5.3.3 Fauna at the SMR

The SMR occupies 44 acres in the Concord Heights area, of which only 15 acres present suitable habitat for wildlife. The 15 acres of habitat is considered a pine barrens natural community and is relatively fragmented by roads. Wildlife presence at the SMR is limited by both the small habitat area as well as the surrounding urban land use. The majority of the species found at the SMR are associated with pine barrens, as the habitat onsite is part of the greater surrounding Concord Pine Barren system. These species are discussed in **Section 5.4.3** as many of them are associated with this rare natural community. Other species, such as birds, may utilize the site due to the proximity to the expansive grasslands of the CMA. No water features exist onsite, limiting species to those that do not require water or wetlands nearby.

5.3.3.1 Mammals at the SMR

Few mammals exists onsite due to the small habitat size, surrounding urban landscape and perimeter security fence. Some common mammals that have been documented onsite by NHARNG Environmental staff include skunk (*Mephitis mephitis*), woodchuck (*Marmota monax*), deer mouse (*Peromyscus maniculatus*), gray squirrel (*Sciurus carolinensis*), and meadow voles (*Microtus pennsylvanicus*). Uncommon mammal species are also known to pass through the site occasionally, moving under or through the installation's fence. These species include fisher (*Martes pennanti*) (Personal Communication, Security Guard), racoon (*Procyon lotor*), and pets such as the domestic cat (*Felis catus*). Large mammals are typically precluded from use of the site due to fencing. No formal broad based mammal survey has been conducted on the site, due to its relatively small size. All observations up until current have been incidental. However, an informal game camera trapping survey is being implemented in 2021.

A variety of bats are also known to occur on the SMR, including the big brown, silver haired, hoary, and eastern red bats. Due to listing status, they are all discussed further in **Section 5.4.3.1 Mammals at the SMR**.

5.3.3.2 Birds at the SMR

The SMR's early successional grassland and pitch pine scrub oak woodland provides good habitat for shrubland bird species. Although small, the habitat at the SMR tends to act as a piece or extension of nearby habitats such as the CMA. Birds that nest at the SMR may use adjacent parcels to forage and vice versa. In 2017 NH Audubon conducted a breeding and migratory bird survey of the SMR (NH Audubon, 2017). A total of 29 bird species were detected during the breeding season and some exhibited behaviors consistent with breeding on or near the SMR. For a full list of species detected during the most recent survey, refer to **Appendix B**. Refer to **Section 5.4.3.2 Birds at the SMR** for information regarding rare, threatened, or endangered species found onsite.

5.3.3.3 Amphibians and Reptiles at the SMR

No formal surveys have been conducted, nor are any planned to document the presence of amphibians and reptiles at the SMR. Due to its relatively small size and distance from water, not many amphibians are expected to be found onsite. However, there has been at least one incidental sighting of an amphibian to date. A gray tree frog (*Hyla versicolor)* was documented onsite during the summer of 2018, within the PPSOW management units.

There have been no incidental observations of reptiles at the SMR. However, it is likely that common snakes such as garter or brown snakes may be found onsite occasionally. Smooth green snakes are also a possibility considering the habitat type. Larger snakes and turtles are unlikely to be present onsite due to the lack of suitable habitat and road barriers preventing successful movement and dispersal.

5.3.3.4 Insects at the SMR

Similar to the ECTC, the SMR's early successional habitat and scrub oak provide habitat for a rare suite of insects at the SMR. Specifically, pine barrens habitat at the SMR hosts a variety of butterfly species. There have been many insect surveys conducted onsite, and mostly all were performed in-house with a focus on butterflies. During the 2019 survey year, 28 species were recorded, including multiple rare and protected species. Due to the nature of the Lepidoptera survey, a more detailed and complete description of species and survey methods can be found in **Section 5.4.3.4 Insects (Lepidoptera) at the SMR** or refer to **Appendix B** for 2019 butterfly survey results.

There have only been several formal insect surveys at the SMR, mainly focusing on moth populations. Surveys were conducted in 2000, 2005, 2012, and 2016. These are further discussed in **Section 5.4.3.4**.

Grassland insect species at the SMR are common and abundant, including mantis species, stick bugs, a variety of spiders and other species.

5.3.3.5 Fish at the SMR

Due to the lack of water resources at the SMR, no fish are present.

5.4 Rare, Threatened and Endangered Species

The Endangered Species Act of 1973 is administered by the USFWS and provides protection for all federally listed animal and plant species. Each state also provides legal framework to list and protect species, similar to the framework of the ESA of 1973. The state of NH Endangered Species Conservation Act (NH ESCA) (RSA 212-A) provides protection for all state listed animal species and is administered by the NH Fish and Game Department. The NH Native Plant Protection Act (RSA 217-A) provides protection for state listed plant species and is administered by the NH Natural Heritage Bureau within the Department of Natural and Cultural Resources. Notice should be given to the difference between federally listed species and state listed species, as the state list may include additional species other than those federally listed. Per NH ESCA 212-A:2 IV, the state list must include federally listed species. All three properties considered by this INRMP are owned by the NH DMAVS and therefore all three regulations listed above apply.

NH Fish and Game and NH Natural Heritage Bureau also track species that are not formally listed as endangered or threatened, but may still be regionally or globally rare. These species are not afforded the same legal protections but are still tracked in the NHB database. Species that are afforded NH ‘species of special concern’ (SC) or ‘species of greatest conservation need’ (SGCN) are also discussed in this section. SC or SGCN listed species typically affords the same consideration and protection from the NHARNG as do Threatened or Endangered species.

In addition to species currently listed under the ESA, the USFWS has developed a National Listing 5 year Workplan (USFWS, 2019) to address imperiled species. These species are not yet listed under the ESA, but are planned to be assessed by the USFWS shortly to determine their listing eligibility. Many of the species currently listed in this plan are known to occur in the northeast, and potentially on NHARNG sites. These species are also discussed in this section or in **Section 5.3** as appropriate.

Species afforded protection by the above acts and lists are described in this section. Detailed life cycle information for the species’ listed may not be given within this

document, this information can be found within the 2015 Wildlife Action Plan (NHFG, 2015).

5.4.1 Rare, Threatened, and Endangered Species and Habitats at the NHNGTS

Center Strafford has a matrix of habitats including wetlands, open fields and forest which allows for a variety of rare species to exist. A variety of faunal and floral surveys have been done to determine the presence of rare, threatened and endangered species on the site.

Species discussed above in **Section 5.4** are discussed in the appropriate sections below.

5.4.1.1 Mammals at the NHNGTS

Of the rare mammals that occur at the NHNGTS, bats are of particular concern. Across the nation and throughout New Hampshire, many species are in decline due to a fungus known as White Nose Syndrome (WNS) (*Pseudogymnoascus destructans)*. According to the NHFG WNS primarily impacts bats species which hibernate in caves, and has impacted many of native bat species in NH (NHFG, 2016). Eight species of bats are known to occur in NH, the Indiana bat (*Myotis sodalis*) has historically occurred in the state but it is not known to regularly occur here.

Below is a table of bat species occurring in the state, which includes federal and state status. The table also incorporates the species conservation status as identified in the WAP, Wildlife Species of Special Concern list (NHFG 2017) and the Rare Animal List for New Hampshire (NHNHB 2020). The right-most column of the table notes whether the bat species has been documented (and when) at the NHNGTS.

Table 14: Bats at the NHNGTS

Common Name	Scientific Name	NH/US Status	General Habitat	WNS Impact	Notes	Identified at NHNGTS
Big Brown	*Eptesicus fucus*	SGCN, SC	Forests, Buildings, Caves/Mines	Y	Able to hibernate in buildings as well as caves/ mines	2013, 2015, 2017, 2019
Silver-haired	*Lasionycteris noctivagans*	SGCN, SC	Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2013, 2015, 2017, 2019
Eastern Red	*Lasiurus borealis*	SGCN, SC	Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2013, 2015, 2017, 2019
Hoary	*Lasiurus cinereus*	SGCN, SC	Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2013, 2015, 2017, 2019

Eastern Small-footed	*Myotis leibii*	SGCN, NHE	Rocky outcrops, Caves/ Mines	Y	Considered rare throughout eastern US	No
Little Brown	*Myotis lucifugus*	SGCN, NHE	Forest, Buildings, Caves/ Mines	Y	Over 99% decline in NH due to WNS	Yes, 2013, 2019
Northern Long-eared	*Myotis septentrionalis*	SGCN, NHE, FT(R)	Forest, Caves/ Mines	Y	Awarded federal protection in 2015 from declines from WNS	No
Tri-colored	*Perimyotis subflavus*	SGCN, NHE	Forest, Caves/ Mines	Y	No NH data on summer habitat requirements	2013, 2015, 2019

FT(R): Federally Threatened – listing status under review, NHE: NH Endangered, NHT: NH Threatened, SC: NH Species of Special Concern- NHFG 2017, SGCN: NH Species of Greatest Conservation Need- NHFG, 2015

The NHARNG/DMAVS conducted four acoustic bat surveys in 2013, 2015, 2017, 2019. All acoustic surveys have focused on species in greatest decline, mostly caused by White Nose Syndrome (WNS). Little is known regarding bat populations onsite prior to WNS. Declining species, specifically those in the genus *Myotis*, were the focus of the surveys. Acoustic monitor locations are depicted in **Figure 25.**

A 2013 survey Northern Stewards deployed two acoustic monitors for a total of 50 nights, one in the grassland and one near the wetland. The most commonly recorded species was the big brown bat (43.5%), followed by silver-haired bat (21.5%). The hoary, eastern red, tri-colored and little brown bats were also identified (Thompson A. , 2013a), although is much less density. No federally listed species were documented during this survey. (Reynolds S. , 2014)

A 2015 acoustic monitoring survey was done North East Ecological Services (NEES) to determine the presence of the northern long-eared bat (NLEB) (*M. septentrionalis*), which was listed as federally threatened in April of 2015. Ten acoustic monitors were deployed across the NHNGTS in all habitat types and field survey protocol consistent with the Range-Wide Indiana Bat Summer Survey Guidelines produced by the U.S. Fish and Wildlife Service for the appropriate year the survey was conducted (USFWS, May 2015). The most common bat was the big brown bat (75%), followed by the eastern red (18%). The silver haired, tri-colored and Hoary bat species were also identified (Reynolds S. , 2015). Again, no federally species were documented during this survey.

In 2017 NEES conducted another acoustic survey on the site at 10 distinct locations, 5 of which were identical locations to the 2015 survey. Again, the current USFWS Summer Survey Guidelines (USFWS, May 2017) were used and calls were analyzed using first EchoClass 3.1 then potential Myotis call were re-analyzed using BCID 2.7c. The survey resulted in 18 detector nights and just over 2,400 bat calls. The most commonly recorded species were big brown (51%) followed by the eastern red (22%).

One call was potential for little brown, although the file was not confirmed due to call quality. No federal or state listed species were recorded during the 2017 survey (Reynolds S. , 2017).

In 2019 NEES conducted a survey at 11 distinct locations across the NHNGTS, totaling 11 detector nights. Four of those sites were identically placed in the location of previous survey points. The current USFWS Summer Survey Guidelines (USFWS, May 2017) were used and calls were analyzed using first EchoClass 3.1 then potential Myotis call were re-analyzed using BCID 2.7c. In total, 4,535 total files were collected over the 11 detector nights. The most commonly recorded species was the big brown (53%) followed by the eastern red (26%), and hoary (10%). The results of this survey suggest that myotine bats are likely present at the NHNGTS. However, due to the similarity of call structure between myotine bats, it is difficult to identify specific species of myotine bats. Despite the difficulty of myotine bat identification, the recorded call structures suggest the presence of the little brown myotis at the NHNGTS.

In August 2003, traps were set for New England Cottontail throughout the NHNGTS; no rabbits were observed or captured, and no rabbit scat was observed (Natural Resource Consulting Service, 2003). It was determined the site contained very little suitable habitat for the species given the limited dense shrub vegetation onsite.

5.4.1.2 Birds at the NHNGTS

Although a variety of birds exist due to diverse habitat types, grasslands and open field habitat support an array of regionally rare and declining species at the NHNGTS. According to the WAP grasslands have represented portions in the historic landscape of NH. Grasslands were once rare and in specialized locations, but began to increase as agricultural fields were abandoned. Some grasslands present in New Hampshire today remain as agricultural fields, but many have begun to be reclaimed by forests (NHFG, 2015). This is true of the grasslands that remain at the NHNGTS. The once agricultural fields have remained open through mowing by both the previous landowner as well as the National Guard.

For the past ~20 years the semi-improved portion of the site, and (historically) areas of the improved portion, have been allowed to support a variety of breeding grassland and shrub land bird species through delayed mowing practices. Since about the mid-1990’s the majority of the grasslands have been mowed annually in late July/early August by a local farmer for hay production. The parcel immediately adjacent to the site, and pockets throughout the town, also are managed as active hayfields with varying timing of cutting. This practice, both onsite and in surrounding parcels, has allowed the site to support breeding habitat for variety of grassland and shrub land bird species.

In addition to the habitat onsite, the presence of these species can also be attributed to the surrounding landscape. Development and management activities both onsite and the surrounding landscape have a potential to impact these species over the long term, and periodic planning level surveys hope to capture this information over time.

Of the rare birds found at the NHNGTS, no federally or state listed species have been documented at the NHNGTS other than the Eastern Meadowlark in 2009. However, many NH Species of Greatest Conservation Need were identified along with other rare species. Below is a table of the NHFG Species of Greatest Conservation Need (SGCN), NH Species of Special Concern (SC), USFWS Birds of Conservation Concern (BCC) and PIF Watch List identified at the site during the 2019 bird survey (NewEarth, 2019) and 2014 (NH Audubon, 2014). Incidental observations are reported as well.

Table 15: Birds Identified at NHNGTS Included within SGCN, USFWS BCC, or PIF Lists

Common Name	Scientific Name	Status	Year(s) identified	General Habitat
American kestrel	*Falco sparverius*	SC, SGCN	2009, 2019, 2020**, 2021**	Open areas with short vegetation
American woodcock	*Scolopax minor*	SGCN	2019	Dense shrub forests
Black-billed cuckoo	*Coccyzus erythropthalmus*	SGCN	2014	Early successional shrub
Bobolink	*Dolichonyx oryzivorus*	SGCN, PIF Watch	2009, 2014, 2019, 2020**, 2021**	Tall grasslands
Brown thrasher	*Toxostoma rufum*	SGCN	2009, 2014	Shrublands without mature canopy
Canada warbler	*Cardellina canadensis*	SGCN, BCC	2019	Moist or swampy forests with well developed shrub layers

Chimney swift	*Chaetura pelagica*	SC, SGCN	2019	Chimneys, and in hollow trees infrequently
Eastern meadowlark	*Sturnella magna*	NHT, SGCN	2009	Large grasslands
Field sparrow	*Spizella pusilla*	SGCN	2019*	Early successional shrub, interspersed with mature trees or grassy opening
Purple finch	*Haemorhous purpureus*	SGCN	2014	Variety of forest types
Red-bellied woodpecker	*Melanerpes carolinus*	BCC	2019	Deciduous forests with wetland features, also in coniferous
Scarlet tanager	*Piranga olivacea*	SGCN	2009, 2014, 2019, 2021**	Mature hardwood and mixed forest
Veery	*Catharus fuscescens*	SGCN	2014, 2019	Moist forest with shrub understory
Wood thrush	*Hylocichla mustelina*	SGCN, BCC, PIF Watch	2014, 2019	Hardwood and mixed forest with shrub understory

NHT: New Hampshire threatened, SC: New Hampshire Species of Special Concern, SGCN: NH Species of Greatest Conservation Need BCC: Birds of Conservation Concern, PIF: Partners in Flight Watch List
*Fly over observation. NHNGTS contains habitat that may support species.
**Birds observed incidentally, not from a standardized survey protocol.

According the 2015 WAP (NHFG, 2015) the American kestrel, a species of special concern and species of greatest conservation need, has shown a rapid decline in NH. This species requires open habitat for feeding as well as large trees with nesting cavities for breeding. The species is a regular visitor of the site, seen both in formal surveys and informal observations. The bird is regularly seen during breeding season perching on high branches in the hedgerow as it hunts for prey, although no nesting has been documented onsite. During the 2015 annual INRMP meeting with the agencies the NHFG mentioned the presence of the Kestrel as an important species onsite.

The bobolink (*Dolichonyx oryzivorus*) (SGCN, PIF) has also been regularly observed by bird surveys performed at the NHNGTS, and has been documented displaying breeding behavior onsite. According to the 2015 WAP, the bobolink generally breeds in fields with tall grass with scattered leafy forbs. Although they prefer larger parcels of habitat, they do breed on smaller parcels like the one found at the NHNGTS (NHFG, 2015). They typically eat seeds, but will also eat insects and other invertebrates locally present.

5.4.1.3 Amphibians and Reptiles at the NHNGTS

As stated in **Section 5.3.1.3**, amphibians and reptiles extensively utilize the large central wetland complex, terrestrial upland habitat along with the numerous vernal pools at the NHNGTS. A variety of amphibian and reptile surveys conducted at the NHNGTS have detected multiple rare species onsite. The following sections discuss those rare species.

5.4.1.3.1 Amphibians at the NHNGTS

As reported in **Section 5.3.1.3 Amphibians and Reptiles at the NHNGTS,** the northern leopard frog (*Lithobates pipiens*) (SC) was reported in a survey from 2003 at the training site. It has not been detected since that time and it is unclear if the northern leopard frog actually inhabits the site. No other rare, threatened, or endangered species is known to occur onsite.

5.4.1.3.2 Turtles at the NHNGTS

Surveys have been conducted in 2008, 2013 and 2017 (Natural Resource Consulting Service, 2008) (NH Audubon, 2013) (NH Audubon, 2017) in an attempt to verify turtle species onsite. A variety of methods have been used, to include pit-fall traps, hoop traps and minnow traps as well as the use of visual searches. During the 2017 turtle survey conducted by NH Audubon, four Blanding's turtles (NHE, SGCN) were observed. All were associated with the central wetland complex. No breeding was directly observed onsite, although the report mentions the potential for suitable nesting habitat to exist. According to the WAP the species "require large intact landscapes consisting of a diversity of wetland types and sizes, sandy open areas for nesting, and limited human disturbance" (NHFG, 2015). It is likely the NGTS provides suitable habitat for the species, but the turtle also likely requires the surrounding undeveloped landscape throughout the year.

One spotted turtle (NHT, SGCN) was reportedly observed in a vernal pool during the 2003 amphibian and reptile survey. However, the observation was brief and could not be confidently confirmed by the surveyor. The habitat onsite is appropriate for the spotted turtle, but no other sightings of this species have been recorded. Other turtle species identified through surveys onsite include the painted turtle (*Chrysemys picta*) and snapping turtle (*Chelydra serpentine*), both common species in NH.

The NHARNG has conducted brief visual searches of vernal pools and wetlands to document rare turtle species during the 2018 and 2019 field seasons, although none have been seen.

The Blanding's and spotted turtles are on the USFWS National Listing Workplan 5-Year Workplan, and are being considered for federal protection. Listing decisions are planned for 2023.

5.4.1.4 Insects at the NHNGTS

An insect survey was performed at the NHNGTS in 2014 by New Hampshire Audubon (NHA), with a focus on order Odonata (dragonflies and damselflies) and to a lesser extent order Lepidoptera (butterflies) (NH Audubon, 2014). The list of insects observed during this survey can be found in **Appendix B.** Results are discussed in the two following sections.

5.4.1.4.1 Odonata at the NHNGTS

Two species of boghaunters (*Williamsonia spp.*) were detected onsite during the insect survey in late May 2014, the ebony boghaunter (*Williamsonia fletcheri*) and the ringed boghaunter (*Williamsonia lintneri*) (NH Audubon, 2014). The ebony boghaunter is identified by the NHFG as a species of high responsibility in the northeast, but of low conservation concern. The ringed boghaunter is state endangered and is restricted to wetland habitats containing floating or suspended sphagnum for breeding (NHFG, 2015). Several ringed boghaunter adults were seen flying along the unpaved training road adjacent to the wetlands, in the same area and timeframe where the ebony boghaunter was identified. The surveyor did not identify any evidence of breeding onsite, although suitable breeding habitat exists in wetlands both onsite and immediately adjacent the installation boundary. NH Audubon recommended focused searched in the wetlands containing sphagnum for presence of exuvia to confirm breeding onsite. NHARNG staff unsuccessfully attempted to locate exuvia in the Black-gum swamp in 2015 and 2016, despite adult ringed boghaunters identified both years. Regardless of breeding potential, the relatively high abundance of the species during the 2014 survey (14 individuals) suggests the presence of high quality habitat for the species. The ringed boghaunter was also identified in 2021 during a contracted insect survey, but further details are not known yet.

Since the time of the survey, adult individuals during flight stage have been observed by NHARNG staff in the 2015, 2016, and 2017 seasons. Individuals were not searched for during the 2018, 2019, and 2020 field seasons.

5.4.1.4.2 Lepidoptera at the NHNGTS

During the 2014 insect survey butterflies were also identified throughout the site. Nearly all of the 31 species identified were considered habitat generalists and relatively

common in NH. All butterflies were mainly found in the open field and along the gravel training road. The monarch (*Danaus plexippus,* NH SC, SGCN) butterfly was observed in an open field in September, along with the caterpillar's sole food source of milkweed (*Asclepias spp*). Caterpillars were also observed feeding on milkweed beginning in August of 2017 and 2019-2020, indicating that the NHNGTS provides breeding habitat. The monarch is of national concern and was recently recognized as a candidate species for ESA protections.

Since the 2014 survey, monarch butterflies have been documented every year at the NHNGTS.

5.4.1.5 Fish at the NHNGTS

There are no rare, threatened or endangered fish known to occur at the NHNGTS. No surveys will be conducted per advice from John Magee of NHFG (Personal Communication, 2019).

5.4.1.6 Exemplary Natural Communities at the NHNGTS

The NH NHB tracks and helps protect rare plants and exemplary natural communities throughout the state. For a community type to be exemplary it must be either a rare community type in fair/better quality or a high quality occurrence of a common community (NHNHB, July 2013). During the 2003 floristic inventory NHB identified the Black gum – red maple swamp in the northeast corner of the property to be exemplary. NHB gave the swamp a fair ranking (C rank) due to its relatively small size (2.7 acres) surrounded by a recently logged forest (NHNHB, 2004). **Figure 20** depicts the vegetation communities found onsite, to include the Black-gum – red maple swamp.

5.4.1.7 Rare Plants at the NHNGTS

The federally and state threatened small-whorled pogonia (*Isotria medeoloides*) was first documented on the property in 2004 by NHARNG staff. The same individual plant was again seen in 2006, 2007, 2019-2021 during routine surveys. During the observation years 2004, 2006, 2007 the individual grew only one vegetative stem. The individual observed in 2019 grew two stems and seemed relatively healthy and vigorous. In 2020, the individual displayed two vegetative stems along with one flower. In 2021, four stems were counted and two of those stems grew four flowers. Three capsules seem to be successful and one seems to be aborted. It is unknown whether this four stem occurrence represents one or multiple individuals. The individual seemed to be dormant during the years from 2008-2018. However, this is somewhat typical according to multiple sources. According to the USFWS recovery plan for the species an individual plant can lay dormant for several years without emerging (USFWS, 1992). The report also notes that individuals are much more likely to bloom during the year following successful plant growth. Considering the USFWS recovery plan, the data collected from this individual seems relatively routine.

When the plant was first documented in 2004 the USFWS Field Office was consulted to help determine where else suitable habitat may exist onsite. It was determined that the forested slope between the forest edge and wetland provide potential habitat for the species (depicted in **Figure 26**). Although the entire habitat area is surveyed each year, no additional plants or populations have been documented onsite.

Beginning in 2014 the NHARNG selectively cut trees around the known individual in an attempt to increase light on the forest floor and encourage growth of dormant individuals. In 2015 an additional ~20 trees were removed within the habitat area to again increase light availability. Surveys continue to be done annually throughout the habitat area, although no additional plants have been observed.

During winter 2018-2019, and independent forester was contracted to develop cutting plan to benefit the small-whorled pogonia. The cut was executed in winter 2019-2020. In 2021, small whorled pogonia expert Scott A. Young was consulted with to development short term management goals for the occurence.

5.4.2 Rare, Threatened, and Endangered Species and Habitats at the ECTC

The proximity of the ECTC to the larger Concord Pine Barrens complex allows for many rare pine barren specialist species to inhabit the existing 13 acres of pitch pine - scrub oak community onsite. The majority of the biological surveys to date have focused on the rare natural community and the species that depend on this habitat, as well as the power line easement.

Species discussed above in **Section 5.4** are discussed in the appropriate sections below.

5.4.2.1 Mammals at the ECTC

Acoustic bat surveys were conducted at the ECTC to generate a list of species utilizing the site with a focus on the rare species given the recent decline in bat populations. Methodologies for each of these studies were consistent with the USFWS survey guidelines for detection the presence of the northern long-eared bat (*M. septentrionalis*), a federally threatened species. Four acoustic surveys have been conducted by Scott Reynolds of NEES, one in 2014 (Reynolds S. , 2014), 2015 (Reynolds S. , 2015), 2017 (Reynolds S. , 2017), and 2019 (Reynolds S., 2019). The location of all acoustic monitors is depicted in **Figure 30**. Bat species known to occur in NH along with other relevant information are shown in **Table 16** below. The right-most column shows if and when the species was documented at the ECTC.

Table 16: Bats at the ECTC

Common Name	Scientific Name	NH/US Status		General Habitat	WNS Impact	Notes	Identified at the ECTC
Big Brown	*Eptesicus fucus*	SGCN SC		Forests, Buildings, Caves/Mines	Y	Able to hibernate in buildings as well as caves/ mines	2014, 2015, 2017, 2019
Silver-haired	*Lasionycteris noctivagans*	SGCN, SC		Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2014, 2015, 2017, 2019
Eastern Red	*Lasiurus borealis*	SGCN, SC		Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2014, 2015, 2017, 2019
Hoary	*Lasiurus cinereus*	SGCN, SC		Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2014, 2015 2017, 2019
Eastern Small-footed	*Myotis leibii*	SGCN, NHE		Rocky outcrops, Caves/ Mines	Y	Considered rare throughout eastern US	No
Little Brown	*Myotis lucifugus*	SGCN, NHE		Forest, Buildings, Caves/ Mines	Y	Over 99% decline in NH due to WNS	Unlikely
Northern Long-eared	*Myotis septentrionalis*	SGCN, NHE, FT(R)		Forest, Caves/ Mines	Y	Awarded federal protection in 2015 from declines from WNS	2014, 2015, 2017, 2019**
Tri-colored	*Perimyotis subflavus*	SGCN, NHE		Forest, Caves/ Mines	Y	No NH data on summer habitat requirements	2014, 2015, 2017, 2019

FT (R): Federally Threatened – Listing status under review, NHE: NH Endangered, NHT: NH Threatened, SC: NH Species of Special Concern- NHFG 2017, SGCN: NH Species of Greatest Conservation Need- NHFG, 2015

** All calls attributed to this species had a frequency structure consistent with genus *Myotis*, but were of low quality. Visual inspection of the calls could not rule out the possible presence of the species.

During the 2014 survey a total of 30 sampling locations were selected throughout the site to collect data on a diversity of habitats throughout the site. The 2013 USFWS Range-Wide Indiana Bat Summer Survey Guidelines were used, considered adequate to survey for the presence of northern long-eared bat (USFWS, Revised Range-Wide

Indiana Bat Summer Survey Guidelines, May 2013). All sites were sampled for a single night with a sampling bias toward river floodplains, forest edge and forest trails as foraging and commuting bats are known to associate with these habitat features. The most commonly recorded bats identified were the eastern red (86%), followed by the big brown (37%). Other species identified were the silver haired, hoary and tri-colored bats (Reynolds S. , 2014).

The USFWS survey guidelines requires all *Myotis* calls be analyzed by one or more approved automated acoustic ID programs. NEES analyzed using EchoClass 1.2 and all potential *Myotis* calls were re-analyzed using BCID 2.5c. Two calls were identified as from a Myotis genus and the surveyor felt the northern long-eared bat could not be ruled out. Due to the low number of calls the contractor recommended an additional acoustic survey the following season, rather than conducting costly mist netting.

In 2015 NEES deployed another 20 acoustic monitors, with a focus on the areas with high bat activity and future habitat management and future construction activities. The 2015 USFWS Range Wide Indiana Bat Summer Survey Guidelines (USFWS, May 2015) were followed, the current guidance for northern long-eared bat survey methodologies. The most commonly recorded bats were the big brown (67%) and eastern red (22%) were the most common. Other species identified were the silver haired, tri-colored and hoary bat (Reynolds S. , 2015).

The surveyor again analyzed all calls using EchoClass 3.1 and all potential *Myotis* calls were re-analyzed using BCID 2.7c. After visually analyzing the data a total of 3 calls, site 10 and 12, were found to be consistent with the northern long-eared bat and therefore the species was possibly documented from these two sites. Although both sampling years found a very low density of calls with limited quality the site cannot be ruled out as potentially being utilized by the northern long-eared bat during summer foraging activities.

In 2017 NEES was contracted again and 10 locations throughout the site were sampled. Sampling locations were chosen based 1) Potential calls within the genus *Myotis* during past surveys 2) areas previously showing high bat activity 3) areas where intensive habitat management activities are taking place and 4) areas with potential future projects. Again, the current USFWS Summer Survey Guidelines (USFWS, May 2017) were used and calls were analyzed using first EchoClass 3.1 then potential Myotis call were re-analyzed using BCID 2.7c. The most commonly recorded bats were big brown (43%) and eastern red (32%). Potential *Myotis* calls were consistent with previous call locations, primarily in the southern forested portion of the site (sites 6 and 8) and along the powerline easement (sites 2, 9 and 10). (Reynolds S. , 2017)

In 2019 NEES conducted a survey at 23 sites across the ECTC, for a total of 23 detector nights. The site was surveyed with the intent of detecting potential presence of the northern long-eared bat, and furthering baseline bat population data. Sampling locations were chosen based 1) Potential calls within the genus Myotis during past surveys 2) areas previously showing high bat activity 3) areas where intensive habitat management activities are taking place. Again, the current USFWS Summer Survey Guidelines (USFWS, May 2017) were used and calls were analyzed using first EchoClass 3.1 then potential Myotis call were re-analyzed using BCID 2.7c. The most commonly recorded bats were eastern red bat (43%) and the big brown (30%). Although many recorded calls were attributed to the myotine genus by the software, nearly all were reassigned to other species when manually analyzed. There is very little evidence for the presence of northern myotis at the ECTC (Reynolds S., 2019).

No hibernacula or roost trees were identified during any of the four surveys.

5.4.2.2 Birds at the ECTC

Surveys have been conducted in 2013, 2015, and 2019 at the ECTC, with the intent of identifying rare, threatened or endangered species. The common nighthawk is the only state or federally listed species documented at the ECTC. However, many NH SGCN, SC, or species of interest have also been documented onsite. The following survey descriptions and table discuss these SGCN, SC, and species of interest in further detail.

The first bird survey at the ECTC was conducted in 2013. Nocturnal transect surveys as well as acoustic recordings were utilized in the 2013 survey to target eastern whip-poor-will, common nighthawk and American woodcock. Since all three species were identified in the 2013 survey, a focused nocturnal ground bird survey was later conducted in 2015.

The 2015 survey found both whip-poor-wills and American woodcocks were breeding onsite, but confirmed the common nighthawk was not. Through the use of triangulation mapping survey techniques a potential 8 potential whip-poor-will territories were delineated throughout the site. Territories ranged 0.98 to 7.88 hectares, with the vast majority (53%) within the dry Appalachian oak habitat. Whip-poor-wills were primarily found along the habitat adjacent to the cleared powerline easement, which likely provides suitable habitat for forage of insects (NH Audubon, 2015). During development of the Conservation Plan for the site, NHFG suggested a survey be conducted to determine the presence of the state threatened grasshopper sparrow (*Ammodramus savannarum*). The 2015 survey searched for the species but no grasshopper sparrows were identified, nor was suitable habitat found onsite. This species depends on large grasslands, such as those found on the nearby CMA.

In 2019, a generalized survey with focus on ground nesting species was conducted. Nocturnal surveys were completed in 2019, to further define ground nesting species habitat and territories (NH Audubon 2019). The 2019 survey documented all three species, but only confirmed breeding activity for the eastern whippoorwill. Nine whippoorwill territories were delineated using NH Audubon's triangulation mapping technique, well distributed throughout the site. Territories ranged 0.60 to 2.95 hectares, with the vast majority (59%) within the dry Appalachian oak habitat. **Figure 24** shows territories identified onsite, map developed by NH Audubon.

All three surveys (2013, 2015 and 2019) detected the common nighthawk. However, the surveys only detected the species traveling through the site and documented no evidence of breeding or nesting onsite. Given that nighthawks require a gravel substrate for nesting, very limited suitable habitat exists onsite. Confirmed nests are relatively nearby, primarily on gravel rooftops in urban Concord.

Below is a table of birds identified at the site during the 2013, 2015, and 2019 bird surveys that are present on either the NHFG Species of Greatest Conservation Need (SGCN), USFWS Birds of Conservation Concern (BCC) or PIF Watch Lists (Thompson A. , November 2013) (NH Audubon, 2015) (NH Audubon, 2019). No state or federally listed bird species were identified breeding onsite.

Table 17: Birds Identified at ECTC Included within SGCN, USFWS BCC, or PIF Lists

Common Name	Scientific Name	Status	Year(s) identified	General Habitat
American black duck	*Anas rubripes*	SGCN	2019	Coastal and Freshwater Habitats
American woodcock	*Scolopax minor*	SGCN	2013, 2015, 2019	Dense shrub forests
Bank swallow	*Riparia riparia*	SC, SGCN	2019	Exposed vertical banks along waterways, that experience endless erosion
Black-billed cuckoo	*Coccyzus erythropthalmus*	SGCN, BCC, PIF Watch	2013, 2019	Shrub or sapling dominated habitat

Brown thrasher	*Toxostoma rufum*	SGCN	2013, 2019, 2020**, 2021**	Young forest interspersed with mature trees or grassy areas
Canada warbler	*Cardellina canadensis*	SGCN, PIF Watch	2013, 2019	Forest with well-developed shrub layer, moist
Chimney swift	*Chaetura pelagica*	SC, SGCN	2019	Chimneys, and in hollow trees infrequently
Common nighthawk*	*Chordeiles minor*	SGCN, NHE	2013, 2015, 2019	Ground of Pine Barrens and gravel roof
Eastern towhee	*Pipilo erythrophthalmus*	SGCN	2013, 2019, 2020**, 2021**	Young forest interspersed with mature trees or grassy areas
Field sparrow	*Spizella pusilla*	SGCN	2013, 2019, 2020**, 2021**	Young forest interspersed with mature trees or grassy areas
Ruffed grouse	*Bonsai umbrellas*	SGCN	2013, 2019, 2020**, 2021**	Early successional deciduous and coniferous forest
Prairie warbler	*Setophaga discolor*	SGCN, BCC, PIF Watch	2013, 2019, 2020**, 2021**	Young forest interspersed with mature trees or grassy areas
Scarlet tanager	*Piranga olivacea*	SGCN	2013, 2019, 2020**	Mature hardwood and mixed forest
Veery	*Catharus fuscescens*	SGCN	2013, 2019, 2020**, 2021**	Moist hardwood with abundant disturbance elements

Wood thrush	*Hylocichla mustelina*	SGCN, BCC, PIF Watch	2013	Mixed forest with well-developed shrub layer
Whip-poor-will	*Antrostomus vociferus*	BCC, PIF Watch	2013, 2015, 2019, 2020**	Pine and Oak woodlands with open understory

SC: NH Species of Special Concern, SGCN: NH Species of Greatest Conservation Need, NHE: New Hampshire Endangered, BCC: Birds of Conservation Concern, PIF: Partners in Flight Watch List *Flyover, non-breeding

**Birds observed incidentally, not from a standardized survey protocol.

5.4.2.3 Amphibian and Reptiles at the ECTC

The only formal herpetofauna survey conducted at the ECTC documented no rare species at the ECTC. However, several rare species of reptile have been documented from informal surveys and encounters since the purchase of the property. Reptiles utilize the extensive terrestrial upland habitat at the ECTC. The following sections discuss those rare species.

5.4.2.3.1 Snakes at the ECTC

According to the NHNHB, two state protected snake species had historic records of occurrence in the Concord Pine Barrens: NH threatened northern black racer (*Coluber constrictor constrictor)* and NH endangered eastern hognose snake *(Heterodon platirhinos)*. Habitat features commonly found in pine barrens such as a mosaic of open fields, early successional shrublands as well as the sandy soils provide favorable habitat for both of these species. Despite favorable habitat conditions for both of these snakes at the ECTC, only the Eastern Hognose snake is known to exist onsite.

In June 2009, one female eastern hognose snake (*H. platirhinos*) (shown above) was discovered shedding under a piece of discarded plywood along the powerline easement of the ECTC. After consultation with NHFG, it was decided that this individual would be tracked using telemetry equipment, so more could be learned about the species' range and habitat preference. Since that initial discovery, four additional eastern hognose snakes (*H. platirhinos*) have been located onsite between 2009 and summer of 2011. Each time an eastern hognose was encountered, a NHFG biologist determined the eligibility of the snake to be tracked, and preferred tracking method based on the weight

of the individual with respect to the size of the transmitter. Each snake implanted with a transmitter was tracked by DMAVS environmental staff, both on and off the ECTC. In all cases snakes were tracked until death, loss or staff was unable to relocate a transmitter signal. The table below lists the individuals.

Table 18: Eastern Hognose Snake (*H. platirhinos*) telemetry tracking data between June 2009 and spring 2011 at the ECTC

Snake ID	Sex	Weight(g)	Length (cm)	Initial capture date	Number of times located by transmitter	Notes
H001	**F**	**270**	**62**	**June 2009**	**81**	**Found deceased entangled in fabric erosion netting, August 2010**
H002	**M**	**190**	**54**	**June 2009**	**42**	**Lost transmitter signal in August 2010**
H003	**M**	**150**	**47**	**October 2009**	**5**	**Found deceased from unknown cause, August 2010**
H004	**M**	**270**	**67**	**August 2010**	**1**	**Lost transmitter signal after implantation**
H005	**M**	**210**	**67**	**July 2010**	**22**	**Lost transmitter signal shortly after departure from hibernacula in April 2012**

Telemetry surveys indicated that this rare species utilizes a variety of habitats throughout the active season, mainly April to October. The 2010 snake report written by

NHARNG employee Celine Goulet, noted that “During the breeding season (late April – mid July), frequency of use was greatest in cleared habitat, likely as a response to its sandy, well-drained soils as well as high solar emissivity, features which act to promote ideal incubation conditions. In contrast, as the need of buffering against extreme temperature fluctuations associated with summer and early fall climatic patterns became the dominant selective agent, habitat preference shifted from these cleared areas towards spruce/fir and mixed forests during the non-breeding (mid-July – mid-September) season.” (Goulet, November 2010). Snakes require a variety of habitat features and vegetation cover to meet their needs for regulating body temperature, a hibernacula, nest location, food source and cover from predators. Although each snake tracked spent a portion of its active time on the ECTC, a portion was also spent in habitat outside the site boundaries.

The hognose telemetry surveys also led to the discovery of two critical habitat components, a hibernaculum and a nest site. During the summer of 2010, telemetry tracking led to the discovery of a nest site of H001, immediately adjacent to the ECTC boundary. The departure of H001 from the nest site was observed on June 22, 2010 (see **Figure 28**). The site was observed throughout the remainder of the season which led to the observance of 6 neonates and 47 egg casings in two separate oviposition chambers.

The location of two separate hibernacula of three individuals (H001, H002 and H005) were also discovered through telemetry tracking and habitat searches. Although no hibernacula or nest sites were identified on the NHARNG ECTC, both are known to exist adjacent to the site on private property. One hibernaculum was in very close proximity to the nest site and immediately adjacent to the ECTC. The other hibernaculum was on private property approximately 1 mile south of the ECTC. The male (H005) traveled an estimated 3 miles between July and October and the signal was lost shortly after departing the hibernaculum the following spring.

Since the initial documentation of the eastern hognose, cover boards and habitat searches have been used to survey the snake population onsite. Cover board survey methodology is described in **Section 5.3.1.3 Amphibians and Reptiles at the NHNGTS.** To date, no additional hognose or any black racers have been documented onsite. **Figure 28** depicts the current location of the cover boards on the site.

In June of 2009, two smooth green snakes (*Liochlorophis vernalis*) were located under refuse along the power line easement. After continued snake survey efforts, mainly for

eastern hognose (*H. platirhinos*), two additional smooth green snakes (*L. vernalis*) have been observed. One was observed in 2018 beneath a grassy opening coverboard in the ROW. Another was observed in 2020 on the grassy riverbank within the powerline ROW. According to the WAP, this species prefers lightly forested and grassy habitat; therefore it is most likely to be found along the powerline corridor and possibly within clearings of the pitch pine habitat.

5.4.2.3.2 Turtles at the ECTC

The wood turtle (*Glyptemys insculpta,* NH SC, SGCN) has the potential to be found onsite given the proximity of the site to a slow moving, sand and gravel bottomed river (NHFG, 2015). According the NH WAP, the wood turtle (*Glyptemys insculpta*) is a species of high conservation concern in the northeast and is currently being reviewed for federal protection (NHFG, 2015). During development of the Conservation Plan for the site, NHFG expressed concerns regarding impacts to a potential wood turtle population onsite from habitat management, military training and construction projects. NHFG suggested the inclusion of wood turtle surveys within the conservation plan, to better understand the population size and distribution.

In 2015, the NHARNG partnered with NHFG to conduct wood turtle surveys. NHFG was at the time conducting a statewide survey to identify focal core areas for the species. The NHARNG was identified as a priority site during the 2-year long-term monitoring assessment.

Starting in April of 2015 NHARNG and NHFG staff began conducting monitoring along a 1km segment of the Soucook River following the Long-Term Intensive Monitoring Protocol (Northeast Wood Turtle Working Group, December 2015). Surveys were conducted during both the spring and fall seasons during both 2015 and 2016, and are in progress for 2021. They will continue to be conducted on a ~5 year interval thereafter.

Wood turtles typically use both riverine systems and adjacent uplands throughout its lifecycle. The WAP reports that activity is generally within 300 meters of the stream or river, although females may travel further in search of suitable nesting habitat (NHFG, 2015). **Figure 29** depicts this 300 meter radius at the Pembroke site. Males typically move more often throughout the active season, frequently moving between the open water of the river and the dense floodplain. With the exception of nesting season, females make less movements during the summer months and frequently take refuge under vegetation and leaf litter adjacent to the river (NHARNG).

5.4.2.4 Insects (Lepidoptera) at the ECTC

Pine barrens are known to support a variety of both habitat specific and rare Lepidoptera species. Surveys for moths and butterflies provide critical information on rare and unique species that inhabit the site, but can also serve as an indicator for the

health of the habitat. Surveys are also conducted to capture baseline information to aid in long term management for rare species and natural community onsite. According to the NHFG “These pitch pine-scrub oak woodland specialists [Lepidoptera] serve as indicators of the ecological condition of the community. As the habitat goes unmanaged and reverts to a closed canopy system, populations decline and become increasingly vulnerable to extirpation, a reflection of the loss of vital compositional and structural elements within the community” (NHFG, 2015).

Since 2006, the DMAVS Environmental Office has been conducting annual butterfly surveys along the powerline easement. Surveys have focused almost exclusively on the powerline for three reasons: 1) the presence of wild lupine, the dominant food source of multiple state and federally listed rare butterfly species 2) the proximity to Karner blue butterfly recovery/habitat restoration activities on the adjacent CMA and 3) the variety of nectar and larval plant species that support a variety of butterfly species. **Figure 27** shows the butterfly survey route.

Buttery surveys have focused on the flight time (April to August) of the rare species, but all species encountered are identified and documented when encountered. Butterfly surveys include a mark/recapture method during the flight time of the target species. Surveys are conducted on most working days when weather conditions are appropriate, generally 3-4 times per week. The surveyor slowly walks a predetermined route along the powerline easement, identifying all butterflies encountered. Most butterflies are captured within the net and transferred into a small clear plastic insect box where a positive identification is made. Once the butterfly is identified, using a field identification book, the individual is released. Some butterflies can be identified without capture. The location and species is recorded in the field notebook, as well as general daily field conditions such as weather, cloud cover and temperature. If a state or federally listed species is encountered the wing may be marked with a felt tip marker to aid in future recapture identification.

During these surveys approximately 52 species of butterflies have been identified to date. **Table 19** below lists the rare and tracked butterflies identified onsite, including the Karner blue butterfly *(Lycaeides melissa samuelis*) pictured above, during in-house and contracted butterfly surveys. A summary of species identified in 2019 can be found in **Appendix B**.

Table 19: Rare and Tracked Butterfly species identified during butterfly surveys at the ECTC

Common Name	Scientific Name	Global/State status	Rank	Larval Food Source	Year(s) Identified at ECTC
Edwards' hairstreak	*Satyrium edwardsii*	SC, SGCN	G4 S3	Scrub Oak	2006 - 2021
Frosted Elfin	*Callophrys irus*	NHE, SGCN	G2G3 S1	Wild lupine and potential Wild indigo	None verified*
Karner blue butterfly	*Lycaeides melissa samuelis*	FE, NHE, SGCN	G1G2 S1	Wild lupine	2006, 2009 Flight stage only, no reproduction documented
Monarch	*Danaus plexippus*	SC, SGCN	S5	Milkweeds	2006 - 2010, 2014, 2017, 2019-2021
Persius duskywing	*Erynnis persius*	NHE, SGCN	G5T1T3 S1	Legumes, including Wild lupine	None verified
Sleepy duskywing	*Erynnis brizo*	SC, SGCN	G5T5 S2	Scrub Oak	2008, 2009 - 2012, 2014

Data: NHARNG surveys (in-house and contracted)

SOURCE NHNHB Rare Animal List for New Hampshire, July 2020

* An unconfirmed frosted elfin larvae was observed feeding on a lupine plant in 2016, although no adults were observed

G1 S1 Critically imperiled because extreme rarity (generally one to five occurrences) or some factor of its biology makes it particularly vulnerable to extinction.
G2 S2 Imperiled because rarity (generally six to 20 occurrences) or other factors demonstrably make it very vulnerable to extinction.
G3 S3 Either very rare and local throughout its range (generally 21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction because of other factors.
G4 S4 Widespread and apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
G5 S5 Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.
G4G5 The species may be globally secure (G5), but appears to be at some risk (G4).
G5T1T3 The species may be globally secure (G5), but the sub-species is critically imperiled because of extreme rarity or very rare and local throughout its range, or found locally in a restricted range.
SC Species of Special Concern
SGCN Species of Greatest Conservation Need as identified in the 2015 WAP

The Pembroke ECTC has the potential to support both the Karner blue and frosted elfin. They both feed exclusively on native wild lupine (*Lupinus perennis*) during the larvae (caterpillar) stage of development. Adult butterflies spend time in the surrounding habitat roosting, breeding and nectaring on a variety of flowers. To support a viable population of either species both primary habitat (lupine) and secondary (supporting habitat) must be present. At the ECTC currently a small patch of lupine (~0.4 acres) exists within the power line corridor. Secondary habitat onsite is the power line easement (~21 acres) as well as the Pitch-Pine Scrub Oak Woodland (~35 acres) currently under habitat management (**Figure 31**).

Currently there have been two years with confirmed sightings of the Karner blue butterfly onsite, totaling 3 individuals. These sightings were along the power line easement, but not associated with the known lupine population onsite. It is assumed these individuals were blown in via wind gust from a nearby population within the Concord Pine Barrens. It is likely the species has not yet colonized the site based on results of the annual survey. However there is potential the site could support both the Karner blue butterfly and frosted elfin in the future, as suitable habitat exists onsite.

A variety of rare moth species are associated with the Pitch pine - Scrub oak barrens are known to exist in the greater Concord Pine Barrens complex. The approximately 13 acres of Pitch pine - Scrub oak barren onsite was first documented by the NH Natural Heritage Bureau in 1985. Over time various moth surveys have been conducted within “Sandy Hollow” area as part of the overall Concord Pine Barren Lepidoptera research. David VanLuven was the first to

study moths in the Concord area and conducted moth collections in 1992 for development of the “Site Conservation Plan for the Concord Pine Barrens” (VanLuven, 1994**)**. Since that time the NHFG conducted surveys at the site in 2005 and the NHARNG in 2006 and 2016. As part of the 2012 SMR moth survey, one trap was located onsite to serve as a control to evaluate the success of habitat restoration activities on the SMR. The NHARNG conducts moth surveys on an approximately 10 year interval to access the health of the pine barrens as well as monitor effects of habitat management activities. Moth data is available upon request. **Figure 27** shows a map of ultraviolet moth traps placed on the site during various surveys. The photo above is an ultraviolet light trap, used to collect moths.

The 2012 moth survey conducted by Mark Mello noted the “site is slowly becoming a white pine and oak dominated woodland due to lack of disturbance, including fire suppression and lack of logging/clearing” (Mello, January 2013). This indicates the lack of proper disturbance has led to the decline of pitch-pine dependent moth species. The results of the 2016 survey found “2016 had less than half the average number of individuals taken in other years, and a third fewer species.” when compared to years with a similar sampling size. Don Chandler noted that traps in mechanically cleared areas had the lowest number of species and abundance, while traps located in mature second growth forest resulted in the highest abundance and number of species. Despite the low species count and abundance during the 2016 sampling, pine barren specialists were still identified, primarily in mature pine barren woodlands lacking recent disturbance. Of the 18 pine barrens species historically found onsite, seven were (~40%) were identified in the 2016 samples.

5.4.2.5 Fish and Mollusks at the ECTC

Although there have been no formal surveys at the ECTC, it is reasonable to use the two NHFG fisheries surveys conducted in close proximity to the site as a proxy for the populations found onsite. Two species of state listed fish were found during those surveys, the American eel (SC) and bridle shiner (NHT). Considering the habitat requirements of the American eel, it is likely that the eel inhabits the river along the ECTC boundary quite frequently. Although the bridle shiner is found in the Soucook River, it may not be found in the segment along the ECTC. The shiner requires dense communities of submerged aquatic vegetation for survival (NHFG, 2015), which is not known to occur in the river segment along the ECTC.

Historic records have documented the state brook floater (*Alasmidonta varicose,* NHE) at one location in the Soucook River, although no river wide survey information is available (NHFG 2015). The Soucook River in general provides suitable habitat for the brook floater, which flows clean and well oxygenated over a sandy or gravel substrate. The NHARNG conducted a low intensity ‘rapid assessment’ formal survey for brook

floaters at the ECTC, specifically surveying for the presence and habitat of the mussel (Johnson, 2018). Although none were documented, the survey reported that nearly 30% of the river provides high quality habitat. Other species documented included the eastern pearlshell (*Margaritifera margaritifera*) (NH SGCN), and eastern elliptio (*Elliptio complanat*a). Considering that regional brook floater populations are known to occur at low densities and the 'rapid assessment' survey effort was low, it is possible that a small population is present but undocumented. No additional surveys are necessary, per guidance from NHFG (Doperalski Personal Communication 2020).

5.4.2.6 Exemplary Natural Communities at the ECTC

The only exemplary natural community found at the ECTC is Pitch pine scrub oak woodland (PPSOW), which occurs in the northern part of the site. The 2011 Floristic Survey (NHNHB, January 2012) conducted by NHB identified the PPSOW community currently at approximately 13 acres in size. This community historically was and continues to be part of a larger continuous occurrence along the Soucook River and is considered an extension of the larger Concord Pine Barrens complex (NHNHB, January 2012). The also survey noted that this community is likely only a fraction of its historic extent due to lack of disturbance and management. **Figure 21** depicts the 33 acre historic extent identified by The Nature Conservancy, as well as the current 13 acre extent identified by the NHB 2011 floristic survey.

The NH Division of Forests and Lands, NHNHB tracks and helps protect rare plants and exemplary natural communities throughout the state. For a community type to be exemplary it must be either a rare community type in fair or better quality or a high quality occurrence of a common community in good condition (NHNHB, Rare Animal List for New Hampshire, July 2020). The NHB report noted that this occurrence of PPSOW exhibits an overall quality rank of 'C', meaning that it is considered to be in fair condition. The 'C' rank is due to multiple factors including its 'small size and context in a heavily managed landscape' (NHNHB 2020).

The PPSOW exemplary natural community onsite, locally named "Sandy Hollow", was first identified during a field survey in 1985 by Tom Rawinski of the Nature Conservancy. During that survey, a small patch of wild lupine *(Lupinus perennis)* was identified at this location, as well as a single Karner blue butterfly (*Lycaeides melissa samuelis)* (NHNHB, 2006). When the site was revisited in 1990 and 1991 by The Nature Conservancy, it was noted that the wild lupine (*L. perennis*) was no longer in existence at the site and it was suspected that road construction had buried this small population.

The PPSOW community is a fire dependent community type, meaning that it requires disturbance, primarily fire, to maintain community integrity. Due to increased development, community type decline/fragmentation and fire suppression, the Concord Pine Barrens no longer have the needed fire or disturbance frequency to support critical

plant species. The 2011 Floristic Survey by NHB recommended “regular fires to maintain their structure and species composition. In the absence of fire, the woodland structure will shift to a forested state, dominated by species that are less fire-tolerant, in particular white pine (*Pinus strobus*) and a variety of hardwoods. Essentially, it will come to resemble the dry Appalachian oak forest that dominates the property.” The survey report then goes on to state that prescribed fire would also benefit the Dry Appalachian oak forest community onsite.

To support the restoration and continued long term management of these fire dependent natural communities the NHARNG developed an IWFMP in 2014 (NHARNG, June 2014), which worked in conjunction with the Conservation Plan for the NHNG RTI (NHARNG, 2014-2018). With the current revision of the INRMP the IWFMP was incorporated (as Appendix) to better coordinate prescribed fire activities for habitat management. The IWFMP is a tool used to support these natural communities and works in conjunction with this plan. The plan in its entirety can be found in **Appendix F**. **Figure 31** depicts the areas where the NHARNG is currently managing for both PPSOW and Appalachian Oak forest. Map 7 of the IWFMP depicts the individual fire management units defined on the site.

5.4.2.7 Rare Plants at the ECTC

The 2011 Floristic Inventory done by NHB not only identified natural communities found onsite, but also identified rare plant species (NHNHB, January 2012). This survey identified six New Hampshire rare plant species onsite, and no federally listed plant species. Species and their rankings found during the survey are listed in the table below:

Table 20: ECTC Rare Plants

Common Name	Scientific Name	State Listing	Abundance
Sweet / Licorice goldenrod	*Solidago odora Ait.*	Threatened	Several hundred stems along powerline
Wild lupine	*Lupinus perennis*	Threatened	Clump along powerline
Buttonbush dodder	*Cuscuta cephalanthi*	Endangered	Along powerline growing on rough goldenrod

Hollow Joe-pye-weed	*Eutrochium fistulosum*	Endangered	Two clump along banks of Soucook*
Spiked needle grass/Red threeawn	*Aristida longespica var geniculata*	Threatened	42 stems along powerline
Clasping milkweed	*Asclepias amplexicaulis*	Threatened	Single clump along powerline

Source: NHNHB, New Hampshire Official Rare Plant List, January 2020

*Although only one nother larger, more distributed clump of Joe Pye Weed was identified during 2020 field season along an upstream segment of the Soucook River, along the Powerline ROW.

Figure 32 depicts the location of each of these species, although the legend has been generalized to protect the exact location of these species. Five of the species were new records for the site, only the wild lupine (*Lupinus perennis*) was known to occur onsite prior to the survey. Since this survey was completed, a clump of clasping milkweed (*Asclepias amplexicaulis*) was identified near the lupine patch along the power line easement (pictured to right), and a small population of hollow joe-pye weed was identified along the river bank within the ROW. Nearly all of the species are found along the power line easement.

A small patch of wild lupine (*L. perennis*) can be found growing on a south facing slope of a sandy ravine along the powerline. According to the NHB database, this patch of lupine has been documented at this location since 1990. The NHARNG monitored the area from 2007-2011, 2013-2017, and 2020 and the following number of flowering stems were documented:

Table 21: Wild lupine (*L. perennis*) flowering at the ECTC

2007	2008	2009	2010	2011	2013	2014	2015	2016	2017	2020
369	595	1,429	234	1,171	176	131	205	230	280	460

*Note skipped survey years are indicated by red border lines.

The number of flowering stems has fluctuated over time due to a variety of reasons, but mainly influenced by the mechanical powerline vegetation maintenance. It has been

observed that the number of flowering stems declines as the larger shrubs, such as scrub oak, shade out the lupine. Mammal browsing, such as by deer, have also influenced the flowering stem counts in some years.

The wild lupine (*L. perennis*) historically recorded in “Sandy Hollow” is not known to currently exist. The NHB occurrence records indicated the patch was last recorded in 1985 and was likely wiped out during road construction sometime in the late 1980’s (NHNHB, 2006).The NHARNG has made many attempts to locate the occurrence of the species in this area and to date none have been observed.

5.4.3 Rare, Threatened, and Endangered Species and Habitats at the SMR

Similar to the ECTC, the SMR is part of the Concord Pine Barrens complex and contains 15.2 acres of restored habitat. The majority of the faunal surveys to date have focused on the rare natural community and the species that depend on this habitat.

Species discussed above in **Section 5.4** are discussed in the appropriate sections below.

5.4.3.1 Mammals at the SMR

Acoustic bat surveys were conducted at the SMR to generate a list of species utilizing the site as well as confirm the presence of any rare bat species. During coordination with the USFWS for implementation of the IWFMP it was recommended the NHARNG conduct bat surveys to ensure the protection of any rare bats onsite, primarily the northern long-eared. NEES conducted an acoustic bat survey throughout the habitat restoration area in both 2015, 2017, 2019 utilizing the current USFWS survey guidelines (USFWS, May 2015) (USFWS, May 2017). The location of all acoustic monitors in depicted in **Figure 34**. **Table 22** below describes bat species known to occur in NH including their state and federal status. The right-most column in the table shows if and when each bat species was detected at the SMR.

Table 22: Bats at the SMR

Common Name	Scientific Name	NH/US Status	General Habitat	WNS Impact	Notes	Identified at SMR
Big Brown	*Eptesicus fucus*	SGCN, SC	Forests, Buildings, Caves/Mines	Y	Able to hibernate in buildings as well as caves/ mines	2015, 2017, 2019
Silver Haired	*Lasionycteris noctivagans*	SGCN, SC	Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2015, 2017, 2019
Eastern Red	*Lasiurus borealis*	SGCN, SC	Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2015, 2017, 2019

Hoary	*Lasiurus cinereus*	SGCN, SC	Roost in trees, winter migrant	N	May have wide summer distribution but more research is needed	2015, 2017, 2019
Eastern Small-footed	*Myotis leibii*	SGCN, NHE	Rocky outcrops, Caves/ Mines	Y	Considered rare throughout eastern US	No
Little Brown	*Myotis lucifugus*	SGCN, NHE	Forest, Buildings, Caves/ Mines	Y	Over 99% decline in NH due to WNS	No
Northern Long-eared	*Myotis septentrionalis*	SGCN, NHE, FT (R)	Forest, Caves/ Mines	Y	Awarded federal protection in 2015 from declines from WNS	No
Tri-colored	*Perimyotis subflavus*	SGCN, NHE	Forest, Caves/ Mines	Y	No NH data on summer habitat requirements	No

FT (R): Federally Threatened – Listing status under review, NHE: NH Endangered, NHT: NH Threatened, SC: NH Species of Special Concern- NHFG *2017, SGCN: NH Species of Greatest Conservation Need-* NHFG*, 2015*

During the 2015 survey a total of 10 sampling locations were selected throughout the site. The most commonly recorded bats identified were the hoary bat (43%), followed by big brown (26%). Other species identified were the eastern red (17%) and silver- haired (14%). All species identified are known to roost in trees. The surveyor noted that the sampling area had a “relatively low, but diverse levels of at activity” (Reynolds S. , 2015). He also noted that the habitat found on the site was atypical of bat activity given the low canopy cover found in this early successional regenerating habitat, as well as the surrounding urban environment. No Myotis species were identified during the survey.

During the 2017 survey 10 sampling locations were selected throughout the site, totaling 16 detector-nights. The current USFWS Summer Survey Guidelines (USFWS, May 2017) were used and calls were analyzed using first EchoClass 3.1 then potential Myotis call were re-analyzed using BCID 2.7c. The majority of the bat activity came again from the hoary bay (42%), big brown (25%) and silver-haired (25%). This is very similar to the finding of the 2015 survey. No bats from the Myotis genus were detected.

In 2019 NEES conducted a survey at 10 distinct locations across the SMR. Six of those sites were identically placed, or in close proximity to previous survey points. The current USFWS Summer Survey Guidelines ((USFWS, May 2017) were used and calls were analyzed using first EchoClass 3.1 then potential Myotis call were re-analyzed using BCID 2.7c. In total, 51 total files were collected over the ten detector nights. The most commonly recorded species was the hoary (39%) followed by the big brown (25%), and silver-haired (22%). No federal or state listed species were recorded during the 2019 survey, although all species recorded were NH Species of Special Concern (Reynolds S., 2019).

5.4.3.2 Birds at the SMR

Below is a table of the NHFG Species of Greatest Conservation Need (SGCN), USFWS Birds of Conservation Concern (BCC) and PIF Watch List identified at the SMR during the 2017 bird survey (NH Audubon, 2017). The right-most column also denotes whether breeding evidence was exhibited onsite.

Table 23: Birds Identified at SMR Included within SGCN, USFWS BCC, or PIF Lists

Common Name	Scientific Name	Status	Year(s) identified	General Habitat	Breeding Onsite (Y/N)
American kestrel	*Falco sparverius*	SGCN, SC	2017* (fly over)	Open areas covered by short vegetation	N
Brown thrasher	*Toxostoma rufum*	SGCN	2017	Young forest interspersed with mature trees or grassy areas	N
Field sparrow	*Spizella pusilla*	SGCN	2017	Young forest interspersed with mature trees or grassy areas	Y
Horned lark	*Eremophila alpestris*	SGCN, SC	2017	Sparsely vegetated open lands	N
Prairie warbler	*Setophaga discolor*	SGCN, PIF Watch	2017	Young forest interspersed with mature trees or grassy areas	Y
Vesper sparrow	*Pooecetes gramineus*	SGCN, SC	2017	Dry open areas with patches of open ground	Y

SGCN: NH Species of Greatest Conservation Need SC: Special Concern (NHFG) BCC: Birds of Conservation Concern, PIF: Partners in Flight Watch List
*Fly over observation

The brown thrasher, field sparrow, prairie warbler all breed in shrubby areas while the vesper sparrow prefers open grasslands. Given the close proximity to the Concord Municipal Airport it is likely all of these species breed either on or near the SMR. The survey also included surveys for nightjars, including eastern whip-poor-will (*Antrostomus vociferous*), common nighthawk (*Chordeiles minor*) and American woodcock (*Scolopax minor*). None of these species were detected on or near the SMR.

In addition to those listed, there are several other birds documented onsite that are noteworthy. These species include those that have flown over, were documented offsite, or have visited the site briefly. These species are also not likely to breed on or in nearby areas of similar habitat. They include the American pipit (*Anthus rubescens*) SGCN SC, **bald eagle** (*Haliaeetus leucocephalus*) SC SGCN, bank swallow (*Riparia riparia*) SGCN SC, bobolink (*Dolichonyx oryzivorous*) SGCN, chimney swift (*Chaetura pelagica*) SGCN SC, eastern towhee (*Pipilo erythrophthalmus*) SGCN, grasshopper sparrow (*Ammodramus savannarum*) NHT SGCN, horned lark (*Eremophila alpestris*) SGCN SC, and northern harrier (*Circus hudsonius*) SGCN NHE.

Most notable is the northern harrier, which was documented onsite. However, it was noted in NH Audubon's report in 2017 that the harrier was clearly a migrant. The American kestrel is documented similarly, only once or twice as it was passing through. However, considering that the kestrel has been documented to breed nearby, somewhat frequent use of the site may be likely.

5.4.3.3 Amphibians and Reptiles at the SMR

There are no rare, threatened or endangered amphibians or reptiles known to occur at the SMR.

5.4.3.4 Insects (Lepidoptera) at the SMR

Like the ECTC, the DMAVS Environmental Office has also been conducting annual butterfly surveys throughout the restoration area since 2006. Also like the ECTC, surveys have focused on flight times (April to August) on rare pine barren specialist butterfly species, mainly the Karner blue butterfly (*L. samuelis*) and the frosted elfin (*C. irus*). Surveys at the SMR are conducted to monitor rare species onsite, gauge the success of the restoration activities, and to maintain current information for effective management.

The survey route is conducted throughout the restoration area, focusing on areas with lupine and nectar sources. The general survey route is shown in **Figure 33**. Butterfly survey methods at the SMR are very similar to those conducted in Pembroke (**Section 5.4.2.4)**. The survey route on the SMR focuses on units with lupine and the surrounding secondary habitat. Surveys are conducted on most working days when weather conditions are appropriate, generally 3-4 times per week.

During these surveys a total of 56 species of butterflies have been documented. **Table 24** below list the rare and tracked butterflies identified onsite, including the NH endangered frosted elfin (*Callophrys irus*) pictured to the right. A summary of all butterflies identified onsite during the 2019 field season can be found in **Appendix B.**

Table 24: Rare and Tracked Butterflies Identified at the SMR

Common Name	Scientific Name	Global/State status	Rank	Larval Food Source	Year(s) Identified at the SMR
Frosted elfin	*Callophrys irus*	NH Endangered, SGCN	G2G3 S1	Wild lupine and potential wild indigo	2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
Karner blue butterfly	*Lycaeides melissa samuelis*	Federal and NH Endangered SGCN	G1G2 S1	Wild lupine	2008, 2009, 2010, 2011, 2012, 2014, 2016, 2018, 2019, 2020
Monarch	*Danaus plexippus*	SC, SGCN	S5	Milkweeds	2008, 2015, 2017, 2018, 2019, 2020, 2021
Persius duskywing	*Erynnis persius persius*	NH Endangered	G5T1T3 S1	Legumes, including wild lupine	Not verified
Sleepy duskywing	*Erynnis brizo brizo*	SC, SGCN	G5T5 S2	Scrub oak	2014

SOURCE (NHNHB, Rare Animal List for New Hampshire, July 2020)

G1 S1 Critically imperiled because extreme rarity (generally one to five occurrences) or some factor of its biology makes it particularly vulnerable to extinction.
G2 S2 Imperiled because rarity (generally six to 20 occurrences) or other factors demonstrably make it very vulnerable to extinction.
G3 S3 Either very rare and local throughout its range (generally 21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction because of other factors.
G4 S4 Widespread and apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.

G5 S5 Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.
G5T2T3 The species is globally secure (G5), but the sub-species is somewhat imperiled (T2T3).
G4G5 The species may be globally secure (G5), but appears to be at some risk (G4).
U GU SU Status uncertain, but possibly in peril. More information needed.
SGCN Species of Greatest Conservation Need as identified in the 2015 WAP
Species observed in 2020 only represents half of season.

The existence of the entire 15.2 acres of habitat area onsite is in support of rare Lepidoptera, primarily the Karner blue butterfly and frosted elfin. Restoration activities began about 2000 and today the entire habitat area is a functioning pine barrens habitat capable of supporting a variety of pine barrens Lepidoptera. As described in **Section 5.4.2.4** above, a mosaic of both primary (lupine) and secondary (supporting) habitat exists onsite. Currently lupine exists in patches throughout the 15.2 acres of habitat area, accounting for approximately 3.5 acres of primary habitat. The remaining 11.7 acres of the habitat area is secondary habitat, with a mixture of developing woodlands, shrublands and grasslands. **Figure 22** depicts the desired vegetation classification, while **Figure 35** depicts the distribution of lupine based on the 2016 survey.

Moth surveys have been conducted on the SMR and surrounding CMA by the NHARNG since 1998. NH Fish and Game Department has also conducted moth surveys in the surrounding Concord Pine Barrens to evaluate the success of their own habitat management activities. Surveys initially helped the NHARNG gain information on impacts to species from construction projects and obtain baseline information for species unique to the Concord Pine Barrens. Since the establishment of the habitat restoration area on the SMR the moth surveys are used to evaluate the habitat restoration and management activities toward meeting the ecological objectives. The most recent moth survey was completed in 2016. **Figure 33** shows the locations of all the UV moth trap locations used at the SMR during the surveys. Moth data is available upon request.

5.4.3.5 Fish at the SMR

There are no known rare, threatened or endangered fish at the SMR, nor are they likely to occur at any point in the near future due to the absence of water resources.

5.4.3.6 Exemplary Natural Communities at the SMR

As noted above 15.2 acres of the SMR are dedicated to the restoration of pine barrens habitat since the early 2000's. Although not recognized by NH NHB as an exemplary natural community, all 15.2 acres of woodland at the SMR is a functioning pitch pine – scrub oak woodland. Prior to conversion to pine barrens habitat much of this land was once either developed or managed vegetation, such as lawn. Given the historic wide expanse of pine barrens in the area it is assumed all this land was once native pine barrens, allowing it to be readily converted back to its once natural state.

As part of this restoration, pitch pine, lupine and other essential PPSO species were reintroduced into this community. Once established within the community, these species have significantly benefitted from management activities (mechanical and fire) and have predictably spread throughout the habitat area. The characteristic of the community varies across the SMR, as it is managed for patchiness along with and diverse vegetation structure. The end goal for the habitat area is to serve as a functioning pine barrens ecosystem and extension to the greater Concord Pine Barrens.

In addition to the presence of community characteristic plants, animal species also indicate the health and value of a natural community. The 15.2 acres now supports a wide array of PPSOW dependent fauna, further indicating it is an ecologically functional community.

As mentioned in **Section 5.4.2.6**, PPSOW is a fire dependent community type, meaning that it requires disturbance, primarily fire, to maintain community integrity. Due to increased development, community type decline/fragmentation and fire suppression, the Concord Pine Barrens no longer have the needed fire or disturbance frequency to support critical plant species.

To support the restoration and continued long term management of these fire dependent natural communities the NHARNG developed an IWFMP in 2014 (NHARNG, June 2014), which worked in conjunction with the Conservation Plan for the NHNG RTI (NHARNG, 2014-2018). With the current revision of the INRMP the IWFMP was incorporated (as Appendix) to better coordinate prescribed fire activities for habitat management. The IWFMP is a tool used to support these natural communities and works in conjunction with this plan. The plan in its entirety can be found in Appendix F.

5.4.3.7 Rare Plants at the SMR

Although no formal vegetation survey has been conducted on the SMR, information on rare plants is collected as part of the ongoing habitat management/restoration. Although there are multiple rare plant species that occur at the SMR, state threatened wild lupine is the most notable. Flowering stems of wild lupine have been counted from 2006-2017, and a partial survey was conducted in 2020. **Table 25** below shows the results. In 2016 location (using GPS) and stem count survey was conducted in hopes of gathering more detailed information on the distribution and abundance of the species onsite. NH threatened clasping milkweed (*Asclepias amplexicaulis*) has been seen on the SMR since the early 2000's, shortly after restoration activities began, although no formal survey or count has recorded detailed information. Red threeawn (*Aristida longespica var. geniculate*) has also been documented is disturbed areas onsite, although no formal surveys have been conducted. **Figure 35** shows the distribution of both wild lupine and clasping milkweed.

Table 25: SMR Wild Lupine Survey Information

	2006	2007	2008	2009	2010	2011	2013	2014
Flowering Stems	593	675	1,867	5,839	4,844	3,648	3,998	6,468
# Total Plants	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

	2015	2016	2017	2018	2019	2020
Flowering Stems	1,224*	1,761*	392*	No survey Conducted	No survey Conducted	225 Partial Survey**
# Total Plants	No Data	8,517	No Data	No survey Conducted	No survey Conducted	723**

* Showed signs of significant groundhog browsing ** Only units W9, W10, H1, S5, S6 were surveyed.

NH endangered butterfly weed (*Asclepias tuberosa*) and wild goat's rue (*Tephrosia virginiana*) have also been documented in distinct locations within the habitat area. Through discussions with the NHNHB (Nichols, 2010) it was determined these species were not native populations and were likely introduced through horticultural planting and seeding. Because these were not native the NHNHB suggested the NHARNG remove all plants once identified to limit spread.

5.5 Water Resources

5.5.1 Water Resources at the NHNGTS

The NHNGTS contains wetland areas in the forested portion of the property to the north Wetlands on the NHNGTS were delineated in fall of 2015 by Gove Environmental. This wetland delineation was done in accordance with the US Army Corp of Engineers methods and resulted in the delineation of approximately 21 acres of jurisdictional wetland onsite. Wetlands are shown in **Figure 36**.

Four distinct types of wetlands as described by the USFWS occur on the NHGNTS: Palustrine Broad-Leaved Deciduous Forest (PFO1), Palustrine Scrub Shrub/Palustrine Emergent (PSS/PEM), Palustrine Scrub Shrub (PSS), Intermittent Stream were identified onsite. The PSS/PEM is at the center of the wetland complex (shown to right) and is maintained by long-term beaver activity, which can be seen throughout the wetland complex.

The wetlands found onsite have also been documented and described during contracted surveys. During the floristic inventory conducted in 2004, the NH Natural Heritage Bureau described the wetlands found onsite as they related to natural communities (NHNHB, 2004). NH Audubon also described wetlands on the site while conducting amphibian surveys, as well as identified vernal pools onsite (NH Audubon, 2016). The most recent amphibian survey done by NH Audubon in 2016 identified 7 vernal pools onsite. “The vernal pools that occur onsite are very small features on the landscape, and occur in small isolated basins within upland forest at the site” (NHNHB 2004). Although not all these pools were found to support amphibians at the time of the survey, the topography and hydrology support the presence of these pools. Late winter and spring define the timeframe when the pools are full of water, and are typically dry during the summer and fall.

As further discussed in **Section 4.5.1 Hydrology of the NHNGTS** the site has two active drinking water wells onsite which provide all the potable water to the facilities. These wells are in the southern portion of the property. Activities near these wells are regulated by the NHDES for protection of drinking water onsite. The site also falls within the wellhead protection area for the Strafford School. A third drinking water well was installed during the spring of 2020 and is soon to be active, located near the middle of the property.

5.5.2 Water Resources at the ECTC

Wetland delineations have been conducted onsite three times since the NHARNG purchase in 2009, once by NH Soil Consultants in 2009, again by VHB in 2015, and a third time by Tighe & Bond in 2018. Wetlands were delineated multiple times to ensure an accurate record of wetlands occurring onsite, and to inform future land use decisions. **Figure 37** depicts the wetlands onsite. The site has approximately 20 acres of wetlands as well as 3 verified vernal pools, and 3 'potential' vernal pools. The 2011 vegetation survey conducted by NHNHB (NHNHB, January 2012) described the 13 acre center horseshoe wetland as a dense forested wetland dominated by eastern hemlock (*Tsuga canadensis*), red spruce (*Picea rubens*) and red maple (*Acer rubrum*). The majority of the remaining wetlands onsite are adjacent to the Soucook River in the forested floodplain system dominated by red maple (*Acer rubrum*) in the canopy and a lush herb layer dominated by fern and other herbaceous species.

Of the three verified vernal pools onsite, all of which have obligate vernal pool species. One is shown to the right. All three pools hold water in the spring months and dry up in the summer months with the limited rain and groundwater recharge. **Figure 37** depicts the location of the vernal pools onsite.

The Soucook River is a fourth order stream and forms the north and western boundary of the site. During spring runoff and after large rainfall events the river flows swiftly and can be quite deep. During the summer months the flow is generally much less and can be crossed in several sections by foot with waders. The substrate ranges from cobble rock to sandy bottom as it passes through the site. The banks on the ECTC property are generally low, <20', and are sandy substrate. The elongated piece of land, commonly referred to as "the peninsula", has very shallow banks and commonly gets flooded during years of high snowfall.

As discussed in **Section 4.5.2 Hydrology of the ECTC** a majority of the ECTC lies within the Pembroke Water Works wellhead protection area (**Figure 17**). This area falls under the jurisdiction of the Town of Pembroke's Aquifer Conservation District which regulates land use and activities within the area for protection of public drinking water.

5.5.3 Water Resources at the SMR

There are no water resources located at the SMR, and all soils are well drained.

5.6 Other Natural Resource Information

Information regarding Cultural Resources Protection can be found in **Section 7.12 Cultural Resources Protection**. The NHARNG has conducted surveys at the

NHNGTS, ECTC and the SMR in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 (Public Law 89-655), as amended, 36 CFR Part 800: Protection of Historic Properties and RSA 227-C: Historic Preservation. The intent of these surveys is to document the presence of cultural and archaeological resources to ensure proper protection during both proposed construction and proposed habitat management activities. Further information on these surveys can be found in the NHARNG's Integrated Cultural Resources Management Plan (NHARNG, 2008) or requested through the DMAVS Cultural Resources Manager (CRM).

NH Revised Statutes Annotated (RSA) Chapter 117-C:11, Confidentiality of Archaeological Site Location Information requires that "information which may identify the location of any archaeological site on state land, or under state waters, shall be treated with confidentiality so as to protect the resource from unauthorized field investigations and vandalism". Further this law provides that "such information is exempt from all laws providing rights to public access." Accordingly, in compliance with this law, no specific description of the location of any archaeological resources or maps of the locations of any recorded archeological sites is being provided in this INRMP, and the survey reports are not included as an appendix to this document.

Chapter 6 - Mission Impacts on Natural Resources

6.1 Land Use

6.1.1 Land Use at the NHNGTS

Figure 3 depicts the basic land use of the 104 acre site, with approximately 65 acres of mainly unimproved and wetland, 19 acres of semi-improved and grassland and 21 acres of developed building area. The forested portion of the site is mainly undeveloped with the exception of a gravel road and a recently constructed baffled range. This area is used for soldier field training, primarily in the warmer months. The semi-improved area consists of grasslands with intersecting gravel roads. This area also contains some military training features, such as the MOUT site, railhead trainer, confidence course, and gravel tent pads. The developed portion of the site consist of buildings and associated parking areas that service the facility.

6.1.2 Land Use at the ECTC

Approximately 31 acres of the 220 acre parcel currently houses the ECTC infrastructure. Approximately 23 acres of semi-improved lands consist of the managed power line easement which bisects the property in a north/south direction. The vegetation along the power line easement is managed by utility companies, currently Eversource and Liberty Utilities, on an approximately 4 year rotation. The remaining 166 acres is unimproved and remains mainly forested. Trails run through this area and public recreation such as hiking, hunting and fishing frequently take place in this area. See **Figure 5** for a map depicting the land use of the site.

6.1.3 Land Use at the SMR

With the exception of the 15.2 acres of the habitat restoration area, the remaining 29 acres is heavily developed with buildings, associated parking or lawn. The site serves as the headquarters for the NH National Guard and multiple functions that support the Guard’s mission are conducted from this facility. **Figure 6** depicts the land use of the site.

6.2 Current and Potential Future Natural Resource Impacts

The goal of this management plan is to ensure continuous military training capability for the NHARNG while managing natural resources found onsite. The NHARNG implements an ecosystem management approach which allows for adaptive management of the entire property, allowing adjustments to be made as needed through continued communication and coordination.

If and when the below-referenced reasonably foreseeable future actions are determined to be ready for review, an appropriate level of environmental analysis in accordance

with the provisions of NEPA would be completed by the NHARNG in coordination with the NGB.

6.2.1 Current and Future Impacts to the NHNGTS

Current impacts to natural resources onsite primarily include training and construction activities. Both training and construction activities review potential impacts to the environment, including natural resources, through NEPA. Projects are reviewed to ensure they are in agreement with conservation measures within this INRMP.

Future projects planned for the NHNGTS are as follows:

- Barracks renovation/addition
- Water system upgrades (Initiated 2020)
- Ammunition Storage facility - Within footprint of existing firing range
- Concrete pads for portable toilets
- Live fire shoot-house adjacent to range in northern part or property
- Adjacent parcel land acquisition

6.2.2 Current and Future Impacts to the ECTC

As with the NHNGTS, activities at the ECTC are reviewed for potential environmental impacts through NEPA. Once ready for review the appropriate level of environmental analysis in accordance with the provision of NEPA would be completed. Impacts to natural resources are expected to be similar to that of implementation of the Conservation Plan and Integrated Wildland Fire Management Plan. These activities strive to ultimately improve the natural resources onsite, but in the short term could have a negative impact to some resources onsite.

Future projects planned for the ECTC are as follows (NHARNG, 2017):

- Potential future Readiness Center Construction within northern portion of property
- Addition or alteration to existing Readiness Center, including a controlled humidity storage building for the new RC.
- On-site training - potential construction and operation of a leadership reaction course. In addition units up to the company and battery level could use this land to conduct individual or small unit training and bivouacking (overnighting).
- Development of newly acquired parcel on eastern edge of property, formerly known as 720 Riverwood Drive (Tax Map 632, Lot 18-5). Lot likely to be used as a POV parking lot, Motor Pool, Type-6 Wildland Fire truck storage, and green space.
- Aviation Landing area- center of running track in developed portion of site
- Development of multiple (1-3) camping sites, use by permission only

- Wooden bridge at wetland crossing along existing trail - undeveloped portion of site

Recreational activities by local residents currently pose a majority of impacts to the natural resources of the site. All Off-Highway Recreational Vehicles (OHRVs) commonly utilize the dirt trails along the powerline and in the unimproved portion of the site. The continued use of these trails has caused localized erosion along multiple trail segments. The public also utilize portions of the powerline easement for unauthorized small arms target practice. Multiple items are brought to the site for use as target practice pose risk of environmental contamination such as refrigerators, televisions and general refuse through leaching contaminates into soil and groundwater.

6.2.3 Current and Future Impacts to the SMR

Since the habitat area on the SMR is under permanent protection impacts from construction and training are limited in nature. Training activities are permitted after coordination with environmental staff and therefore have little to no impact to the natural resources. Some habitat management activities have a potential to also cause short term negative impacts, such as prescribed fire and invasive/non-native species removal. The overall goal of these activities is to improve the long-term health of the habitat. Encroachment and surrounding land use also has the potential to negatively impact the habitat area. Vegetation management to meet security and runway protection requirements (i.e. fence line and roadway maintenance) limits effective habitat management is those respective areas.

Future projects planned for the SMR are as follows:

- Secure access point (security gate) realignment- Developed and potential impacts habitat area
- Procurement of adjacent property- Civil Air patrol/ City of Concord/ FAA land in SW corner
- Addition and or alteration to the Combined Support Maintenance Shop
- Addition and or alteration to Concord Readiness Center

6.3 Natural Resources Needed to Support the Military Mission

Both the NHNGTS and ECTC require a mixture of open and forested land to support varied field training activities conducted by the 195th Regiment and other NHARNG units to support the NHARNG mission. Much of the training requires a natural setting to provide a realistic training environment. Realistic training is dependent on a healthy environment with such components as stable trails for land navigation exercises and forested vegetation for concealment. Land management outlined in this plan provides environmental stewardship that is in support of both the military mission and natural resources of the ECTC.

In contrast, the habitat area on the SMR is dedicated to natural resource management as required mitigation for construction of the Army Aviation Support Facility (AASF). Although training activities can be conducted in the area, the primary purpose of the land is for pine barrens habitat restoration activities.

6.4 Natural Resources Constraints to Missions and Mission Planning

Natural resources pose constraints to the military mission, both future development and military use of the land. The following are some constraints natural resources pose on the military mission and mission planning:

- Both the NHNGTS and ECTC have wetlands, including vernal pools and floodplains, which require permits for impact from construction activities. Both sites also have a drinking water wellhead protection area which limit activities that have a potential to negatively impact drinking water.
- State and federal endangered species also pose constraints, primarily timing and location restrictions. Activities need to be conducted outside certain seasons and areas relating to the life history of species. For example, tree clearing outside the pupping season for bats (June and July) or limiting land clearing during the breeding season for nesting migratory birds.
- Endangered and rare species also pose constraints to land use for military mission requirements. The location and effects of construction projects and training must be reviewed in advance to ensure rare species are not impacted due to the project. This may require coordination with outside agencies, such as NHFG and USFWS.
- Coordination with the Cultural Resource Manager (CRM) must be conducted early in the planning process helps ensure protection of cultural resources. Proposed ground disturbing activities associated with the INRMP could require NHPA Section 106 consultation with NH DHR and two federally-recognized tribes, the Penobscot Nation and the Aroostook Band of Micmacs. When necessary, the NHARNG's CRM would initiate the review process under Section 106 of National Historic Preservation Act (NHPA) with the State Historic Preservation Officer (SHPO) at the NH DHR, and consult with the respective Tribal Historic Preservation Officer (THPO) representing each of the above-referenced tribes, to avoid and/or minimize impacts to cultural resources. Archaeological surveys are required for proposed training and construction activities and the NHARNG needs to ensure proper surveys are conducted prior to involving ground disturbance in areas not previously archaeologically cleared. Proposed activities located in the buffer of, and/or immediately adjacent to recorded archeological sites, would require implementation of protective measures.

Chapter 7 - Natural Resources Program Management

The three facilities covered in this plan house a variety of natural resources, as detailed in Chapter 5. The NHARNG recognizes that all these resources are interrelated and constitute the varied and unique landscape of each site. This INRMP proposes an ecosystem approach to managing the natural resources onsite. This allows for comprehensive and effective natural resource management of the site in a manner that is fiscally responsible and timely. This plan is integrated with other NHARNG program plans, such as the ICRMP and IWFMP (NHARNG, Integrated Wildland Fire Management Plan for Concord and Pembroke, June 2014), to ensure resource management takes an integrated, holistic approach. This chapter describes the management of resources referenced in Chapter 5.

Throughout this chapter the terms strategy, technique, action, and measure are all used to describe a physical undertaking or style of management. Although terms are used discretely when possible, many times they are not. This is due to the comprehensive and nuanced nature of natural resource management. The following are definitions for the terms used in this plan to reduce confusion. Strategies are plans or components of plans to achieve management of a resource (to include species-specific strategies), whereas actions are the physical operations being done, and techniques are methods of carrying out actions. Conservation measures are specific restrictions to those strategies, techniques, and actions in order to protect species from adverse impacts. Species-specific management strategies and actions are further described throughout this chapter.

7.1 Natural Resources Program Management

The (NHARNG) will be responsible for the administration of this INRMP. Within the NHARNG, individual directorates will be responsible for implementing various components of this plan, as identified and referenced in Section 2.3 Responsibilities. DMAVS Environmental Office is responsible for management of the natural resources of all three sites covered by this plan. It is essential for military units within the NHARNG to utilize the property in a manner consistent with this plan and to coordinate with the Environmental Office as appropriate.

Beyond their assistance and cooperation in development of this plan, the NHFG and the USFWS will provide continued assistance in the management of the species found on all sites. As additional surveys are conducted onsite and new information becomes available, the NHARNG will seek guidance from NHFG, NH Natural Heritage Bureau and USFWS how to best manage both state and federally protected species and habitats.

7.2 Geographic Information Systems (GIS)

The NHARNG collects and maintains a variety of GIS data for all of the installations under the NHARNG's control. This data is used in a variety of ways to include map making, inventory of real property, future project planning, and for tracking locations of important natural resource features. This data aids in the development of management decisions for the site by depicting the diverse resources and features of the site. **Table 26** depicts the available GIS data that aids in natural resource planning.

Table 26: Available GIS Data

Infrastructure Data / Real Property	Natural Resource Data
Installation boundary	Contour Lines
Easements/ ROW	Soils (NRCS)
Roads/Trails	Wetlands/ Vernal pools
Buildings	Vegetation communities
Parking Areas	Archaeological test sites/ sensitivity
Underground/Aboveground Storage Tanks	Archaeological sites and testing locations
Catch Basins	Drinking water wellhead protection area
Training Areas	Shoreland Protection area
Training Aids	Flood Zones (FEMA)
Digital Ortho-imagery	Prescribed fire burn units
Utility (above and below ground)	Endangered species locations and habitat

7.3 Flora and Fauna Management

Wildlife management at all installations will focus on maintaining and enhancing indigenous wildlife populations in a manner consistent with the military mission and all applicable laws and regulations. Generally speaking, this is based on the ecosystem management strategy mentioned in **Section 7.1**. This primarily involves maintenance and enhancement of natural communities onsite to benefit both flora and fauna. The NHNGTS and ECTC have a mixture of developed, semi-improved and unimproved land

use, and management within these land use areas will differ accordingly. For the SMR, management included within this plan will only cover the 15.2 acres of PPSOW.

Hunting and fishing are not covered in the below sections. Hunting and fishing on NHARNG lands are under the jurisdiction of the NHFG and will be conducted in accordance with all applicable state laws. There are no restrictions regarding the use or access to the unimproved portions of the sites for legal hunting and fishing activities. In the event of a NHARNG scheduled activity which may interfere with the recreational hunting and fishing (such as prescribed fire, or intense military training activities), appropriate signs will be posted to make the public aware. The NHARNG does not intend to restrict these types of activities except when they interfere with active military training or risk the safety of those utilizing the sites.

Please see **Section 7.11** for more information about outdoor recreation, including hunting and fishing on NHARNG lands.

Conservation measures for all fish and wildlife onsite are covered in **Section 7.4 Management of Rare, Threatened, and Endangered Species and Habitats**.

7.3.1 Flora and Fauna Management at the NHNGTS

Much of the management at the NHNGTS is focused on birds and herpetofauna as both ecological guilds are in decline and require the most attention. Management will be based on habitat maintenance and enhancement, along with planning level surveys and monitoring.

In regards of herpetofauna management, the NHARNG plans and operates in consideration of Northeast Partners in Amphibian and Reptile Conservation's (NEPARC) guidance materials. Partners in Amphibian and Reptile Conservation (PARC) is a partnership organization which "is an inclusive partnership dedicated to the conservation of the herpetofauna–reptiles and amphibians–and their habitats" (PARC, 2017). Northeast PARC is a region-focused subgroup of PARC that focuses on species conservation within the northeast. This organization, as well as others, works on identifying pathogens, coordinating outreach and facilitating rapid response to emerging threats. At this time no known pathogens affect species onsite, and continued monitoring and rapid response will be key to protecting the species over the long term.

The arrival of pathogens and pests at the NHNGTS also needs to be considered for management. Currently there is no management strategy in place, other than adaptive management, for pathogens and pests that affect natural resources at the NHNGTS.

The following management actions and strategies will be utilized onsite in support of fish and wildlife (nesting bird, amphibians and reptiles specifically), and to combat emergent and established pathogens. Not all management actions and strategies are

listed in the goals and objectives of **Chapter 8** or the work plan. Actions or strategies considered either too broad or insignificant are not included in the work plan.

- The NHARNG will work cooperatively with both wildlife agencies and Base Operations Supervisor to ensure protection of birds, amphibians and reptiles while conducting military training activities, and routine grounds maintenance onsite. This will take place through the annual meetings, or as needed, with both groups and the NHARNG Environmental Office.
- Limit tree and shrub growth within the grasslands of the semi-improved portion of the site. Conduct either mechanical (mowing) or prescribed fire on a 3-4 year rotation throughout the undeveloped grasslands.
- Conduct planning level surveys for birds on an average 5 year rotation to maintain current information on species utilizing the site. These surveys will collect information throughout the season, including migration as well and documented breeding throughout the site.
- Conduct planning level surveys for amphibians on an average 5 year rotation to maintain current information on species utilizing the site. This may be combined with other surveys, such as turtles, to potentially reduce cost.
- Vernal pool surveys will be conducted biennially (every other year) to maintain current information on the overall health of these pools. Surveys will use the current NHFG documentation form. The NHFG Vernal Pool Documentation Form will be used as the basis for the survey. Results will be reported via the Wildlife Sightings website or directly to NHFG.
- Surveys conducted by in-house staff as well as contractors will follow the PARC guidelines for decontamination during amphibian and reptile surveys. Guidelines can be found on the PARC website: http://parcplace.org/. New materials for cover boards for snakes may be utilized throughout the INRMP cycle to improve detection probability.
- Utilization of conservation measures to reduce unnecessary risk to wildlife onsite. **Table 27** in **7.4.1 Rare, Threatened, and Endangered Species and Habitats Management at the NHNGTS** lists conservation measures, both habitat management and military training, for wildlife found onsite.

7.3.2 Flora and Fauna Management at the ECTC

Much of the management at the ECTC is focused on rare species and associated habitat. The varied habitats that exist onsite play an important role in the diversity of the species along with the overall ecological health of the site. Both the river and powerline corridor allow a diverse group of species to exist onsite as well as pass through the site. The following management for general wildlife species onsite will take place:

- Management of the natural communities that exist onsite, as it will be inherently beneficial to the flora and fauna.

- The NHARNG will work cooperatively with both wildlife agencies and Base Operations Supervisor to ensure protection of birds, amphibians and reptiles while conducting military training activities, and grounds maintenance onsite. This will take place through the annual meetings, or as needed, with both groups and the NHARNG Environmental Office.

- Bird surveys will be conducted on an average 5 year rotation to maintain current information on species utilizing the site. These surveys will collect information throughout the season, including migration as well and documented breeding throughout the site. These surveys will include methodologies to target both daytime and nocturnal species.

- Conduct planning level surveys for amphibians about every 5 years to maintain current information. This may be combined with other surveys, such as turtles, to potentially reduce cost.

- Vernal pool surveys will be conducted biennially (every other year) to maintain current information on the overall health of these pools. Surveys will use the current NHFG documentation form, and be reported to NHFG. Potential vernal pools identified within wetland delineations will be surveyed for amphibians and reptiles.

- Surveys conducted by in-house staff as well as contractors will follow the PARC guidelines for decontamination during amphibian and reptile surveys. Guidelines can be found on the PARC website: http://parcplace.org/.

- Work cooperatively with Eversource (or current powerline and gas line easement holder) to ensure protection of species during routine vegetation maintenance. Maintenance will occur during the dormant season, ideally during frozen conditions, to protect both the rare plants and animals that utilize this corridor. Work to ensure continued clearing of ROW for the benefit of natural resources onsite.

Utilization of conservation measures to reduce unnecessary risk to wildlife onsite. **Table 28** in Section **7.4.2 Rare, Threatened, and Endangered Species Management and Habitats at the ECTC** lists conservation measures, both habitat management and military training, for wildlife found onsite.

7.3.3 Flora and Fauna Management at the SMR

Much of the management in the 15.2 acres of habitat area on the SMR focuses on PPSOW and the rare species which depend on this community. Many more common species, such as birds, also use the site. The following management for general wildlife will take place onsite:

- Maintain a diverse pine barrens vegetation structure throughout the habitat area to include grassland, shrubland and woodland (**Figure 22**). This structure will support a variety of species, including birds that breed either on or near the site.
- Bird surveys will be conducted on an average 5 year rotation to maintain current information on species utilizing the site. These surveys will collect information throughout the season, including migration as well and documented breeding throughout the site.
- Utilization of conservation measures to reduce unnecessary risk to wildlife onsite. **Table 29** in **Section 7.4.3 Rare, Threatened, and Endangered Species and Habitats Management at the SMR** lists conservation measures, both habitat management and military training, for wildlife found onsite.

7.4 Management of Rare, Threatened, and Endangered Species and Habitats

This section provides information about the management of rare, threatened or endangered species that are known to or have potential to occur at each installation. Rare, threatened and endangered species and habitats will include state and federally listed species, and those that have NH species of special concern or species of greatest conservation concern designations. Information included in this section is based on flora and fauna surveys conducted onsite, which primarily focus on rare and declining species. No critical habitat as defined by USFWS exists onsite for federally listed species, however both the pitch pine – scrub oak woodland at the ECTC and SMR as well as the black gum – red maple basin swamp at the NHNGTS are listed as state exemplary natural communities in NH.

7.4.1 Rare, Threatened, and Endangered Species and Habitats Management at the NHNGTS

Management of the rare species onsite will be performed through a coordinated effort with DMAVS/NHARNG, NHNHB, NHFG and USFWS. Activities such as military training, construction and habitat management activities all can have both positive and negative impacts to threatened and endangered species and habitats. The

management actions and conservation measures listed below will serve as guidelines to sustainably protect and promote all species (focus of rare species) onsite in concert with the military mission. The following management strategies and actions will be implemented applying to protection of all rare species and natural communities onsite. The sections below further describe unique management for individual species or species groups.

- Appropriate NEPA review, such as a Record of Environmental Consideration (REC), will be completed prior to all construction, training and habitat management activities not already covered in existing NEPA documentation. Through this evaluation, the NHARNG will consult with the appropriate agency (NHFG, USFWS and/or NHNHB) if the activity is expected to have an adverse impact on state or federally listed species.
- The DMAVS/NHARNG will coordinate with the Training Site Manager annually to address any new training, habitat management and/or construction activities onsite. This coordination will facilitate open communication to address potential conflicts between military activities, grounds maintenance, and endangered species onsite.
- DMAVS/NHARNG will provide awareness training on endangered species to all military units that utilize the site for field training activities. This training will identify species of concern, generalized locations and the protective measures that will be implemented onsite.
- Management of grasslands will be through the use of mowing and prescribed fire on an approximately 3-4 year rotation to suppress the growth of woody vegetation (Oehler, Covell, Capel, & Long, 2006).

Although planned to be beneficial to the natural resources onsite, management activities may have the potential to adversely impact species if not planned properly. Therefore, restrictions to sensitive time periods and areas are implemented for the protection of certain natural resources. Within this plan, these are referred to as Conservation Measures. Conservation measures for species from management activities are included in **Table 27** below.

Conservation measures differ from species-specific management strategies and actions. Strategies are plans or components of plans to achieve management of a resource, whereas conservation measures are specific restrictions to those plans in order to protect species from adverse impacts. Species-specific management strategies and actions are further described throughout this chapter. This table serves as a consolidated source of conservation measures for the NHNGTS.

Table 27: NHNGTS Conservation Measures

Species	Conservation Measures
Mammals (Bats)	Conduct over story tree removal **November 1st to March 30th** to avoid bat active season. Unless bats pose a safety or health threat to the occupants, bats shall only be excluded or removed from any structure **August 15th to May 15th**.
Birds	Conduct all vegetation management activities **August 1st to May 15th** to protect nesting birds, unless pre-management nesting survey is conducted. There may be one exempt time period where cutting is allowed. Please reference **Insect** conservation measures below.
Amphibians	Maintain 100' natural buffer around all wetlands. Maintain 15MPH speed limit along gravel roads. Maintain hydrology via beaver dam alterations. Conduct water level alterations in wetlands **May 15th to September 30th** to avoid mortality to hibernating amphibians.
Turtles and snakes	Limit speeds to under 15 MPH for all wheeled vehicles. Maintain 100' natural woodland buffer around all wetlands. Mowing of the outer 25 feet perimeter of fields (most utilized by turtles) will be completed **September 1st to April 15th** for the protection of reptiles. Maintain hydrology via beaver dam alterations. Conduct water level alterations in wetlands **May 15th to September 30th** to avoid mortality to hibernating reptiles. Disinfect any object including hands after handling snakes (In relation to the fungus Ophidiomyces ophiodiicola)

Insects (dragonflies and butterflies)	Maintain 15MPH speed limit along gravel roads. Conduct grassland mowing during vegetative dormancy when possible to protect pollinators. If completed during active season, avoid sensitive areas such as milkweed. Mowing of fields with milkweed may be conducted **June 20th to July 10th** for milkweed regeneration. Timeframe will be coordinated with NHFG. Maintain 100' natural woodland buffer around all wetlands for Odonata protection.
Small-whorled pogonia	Conduct forestry operations primarily during frozen conditions with snow cover to limit disturbance and compaction to the forest soils. Foot traffic only in habitat area.

The following sections further describe unique management for individual species or species groups.

7.4.1.1 Mammal Management at the NHNGTS

Based on multiple bat acoustic surveys, it has been determined that no federally listed bat species have been confirmed onsite. Multiple declining bat species have been documented at the site and include the big brown, silver-haired, red and hoary bats. Two state endangered bats, little brown (*M. lucifugus*) and tri-colored (*P. subflavus*), were also documented onsite. The number of calls for each state listed species is very low, likely a result of the statewide and expanding national decline of the species (S. Reynolds, 2019). Little brown bats typically use buildings for maternal and night roosting, while tri-colored bats only occasionally use human structures (NHFG, 2015). Management for bat populations onsite will be based on management strategies and conservation measures. Management of bat populations onsite will include the following:

- Fish and Game rule (Fis 1001.05, Bats in Structures) limit the removal and exclusion of bats from structures during certain times of the year to protect bats during the critical pupping season. Unless bats pose a safety or health threat to the occupants no bats shall be excluded or removed from any structure **May 15th to August 15th**.
- For all other activities, best management practices (BMP) provided by the USFWS are used (USFWS 2011).

- The NHARNG will also continue to conduct acoustic bat surveys onsite to maintain current information on bat species utilizing the site. Bat populations are typically surveyed every two years using the most current USFWS summer survey guidelines for the Indiana bat.
- Overstory tree removal will be conducted **July 31st to June 1st** for protection of maternal bats during pupping season, with the exception of hazard tree removal.

7.4.1.2 Bird Management at the NHNGTS

Management for rare, threatened and endangered bird species will consist of various management actions and conservation measures. Management for birds will include the following:

- Management actions and strategies listed in **Section 7.3.1 Flora and Fauna Management at the NHNGTS**.
- Management strategies and actions described within section **7.4.1 Rare, Threatened, and Endangered Species and Habitats Management at the NHNGTS.**
- Conduct all vegetation management activities **August 1st to May 15th** to protect nesting birds, unless pre-management nesting survey is conducted.
- Additional small management actions such as girdling pine trees along the edge of the wetland to improve wood duck habitat may be conducted as deemed necessary.
- Potential installation of species-specific bird boxes (kestrel, chimney swift, bluebird)

7.4.1.3 Amphibian and Reptile Management at the NHNGTS

General management actions and conservation measures are used to benefit both amphibians and reptiles at the NHNGTS. Management for amphibians and reptiles will include the following:

- Maintain 100’ natural buffer around all wetlands.
- Maintain 15MPH speed limit along gravel roads.
- Wetland protection, further described in **Section 7.5.1 Water Resource Protection at the NHNGTS** below.
- Management practices followed in section **7.4.1.6 Exemplary Natural Community Management at the NHNGTS.**

Essential to both amphibians and reptiles onsite is the existence of the central wetland. The water levels of the central wetland are partially regulated by multiple beaver impoundments onsite. To benefit amphibians, reptiles, and other species onsite such as fish and aquatic invertebrates and insects, water levels will be managed. Beaver impoundments may be altered or removed to maintain normal water flows onsite.

Coordination with NHFG will occur if water levels need to be changed at any point during the season. As a general timeline, hydrology will be altered only during the May 15th to October 1st timeframe to avoid harm to amphibians and reptiles.

- Maintain hydrology via beaver dam alterations. Conduct water level alterations (only if necessary and in coordination with NHFG) in wetlands **May 15th to October 1st** to avoid mortality to hibernating amphibians.

7.4.1.3.1 Amphibian Management at the NHNGTS

There are no rare, threatened or endangered amphibian species found at the NHNGTS. There are no amphibian-specific management strategies in place. Although there have been no species of interest documented onsite, any undocumented species of interest onsite will benefit from amphibian conservation measures.

- NHNGTS Conservation Measures in **Table 27** and in conservation measures and management actions in **Section 7.4.1.3.**

7.4.1.3.2 Turtle Management at the NHNGTS

As stated above in **Section 7.4.1.3,** there are several management actions and conservation measures in place that benefit rare turtles onsite. These primarily address common threats to herpetofauna in general, including vehicle collisions and wetland alteration. Specific management for turtles will also be based on awareness, knowledge of the species utilization of the site, and protection of critical habitat features (if identified) throughout the site. Management for turtles includes the following:

- NHNGTS Conservation Measures in **Table 27** and in conservation measures and management actions in **Section 7.4.1.3**.
- The NHARNG will provide awareness to both full time site staff as well as military units utilizing the site. The NHARNG will continue to develop awareness materials to be provided at the site, as well as annual training of Environmental Compliance Officers.
- Continued monitoring through PLS on an approximately 5 year occurrence will provide the NHARNG current information on the status of the species onsite. Both the wetlands and vernal pools will be surveyed throughout the active season. Monitoring will be completed using both baited hoop traps and visual surveys using both contracted and in-house staff. Surveys will also include identification of critical habitat features, such as nest and hibernacula sites.
    - During the 2021 field season, a new survey technique may be employed. The technique involves erecting drift fences in preferred habitat areas which funnel turtles towards a gap in the fencing. A motion activated trail camera will be placed strategically at the gap to document any species

moving through. The new survey technique is described in **Section 5.3.1.3 Amphibians and Reptiles at the NHNGTS**.

7.4.1.4 Insect Management at the NHNGTS

General management that benefit rare insects in general at the NHNGTS include both management actions and conservation measures. Notably, the grassland management strategy described in **Section 7.4.1** serves multiple purposes. One of the purposes of the cutting strategy is to benefit insect species, by keeping the grasslands in an early successional state supporting many pollinator plants and nectar sources. The management strategy is as follows:

- Management of grasslands will be through the use of mowing and prescribed fire on an approximately 3-4 year rotation to suppress the growth of woody vegetation (Oehler, Covell, Capel, & Long, 2006).

In addition to the cutting management strategy, a full list of Conservation Measures for insects are described in **Section 7.4.1.** Conservation measures that apply to all insects onsite are as follows:

- Maintain 15MPH speed limit along gravel roads.
- Conduct grassland mowing during vegetative dormancy when possible to protect pollinators. If completed during active season, avoid sensitive areas such as milkweed.

Other order-specific management and conservation measures for Odonata and Lepidoptera are included in the following sections.

7.4.1.4.1 Odonata Management at the NHNGTS

Management for the rare Odonata that occur onsite will be based upon habitat protection and vehicle collision avoidance. The most substantial breeding habitat onsite for the ebony and ringed boghaunters is the black gum - red maple basin swamp, as it has large areas of floating sphagnum moss. This exemplary natural community already receives protection due to its exemplary state status, and therefore will also provide protection for the larvae. Management for Odonata at the NHNGTS includes the following:

- NHNGTS Conservation Measures in **Table 27** and in conservation measures and management actions in **Section 7.4.1.4**.
- Management for the black gum swamp is further described in **Section 7.4.1.6 Exemplary Natural Community Management at the NHNGTS** will also manage/benefit rare Odonata onsite.
- Rare Odonata will also benefit from **Section 7.5.1 Water Resource Protection at the NHNGTS.**

These species are also especially vulnerable to vehicle strikes during the adult life stage as it feeds and mates in the surrounding landscape. Individuals historically have been seen flying and presumably landing along the gravel combat road, vulnerable to strikes. This is a main reason for the implementation of the speed limit in **Table 27** and **Section 7.4.1.4.**

Collection of more information regarding the rare Odonata onsite will help better inform management.

- Formal surveys will continue to be conducted on about 5 year intervals to maintain current information. Future surveys will focus on both the adult and larvae (including exuviae) to potentially confirm breeding onsite. This survey may be included within the general insect survey planned for every 5 years.

7.4.1.4.2 Lepidoptera Management at the NHNGTS

Management for the monarch at the NHNGTS is based on the grasslands management strategy listed in **Section 7.4.1**. Burning and cutting will promote milkweed growth within the grasslands, which is necessary for Monarch reproduction. However, to promote milkweed regeneration, mowing may occur midseason in coordination with NHFG.

- Management of grasslands listed in **Section 7.4.1 Rare, Threatened, and Endangered Species and Habitats Management at the NHNGTS** will benefit the monarch butterfly
- During the general time period of **June 20th – July 10th**, mowing may occur on a portion of the available milkweed stands, promoting plant regrowth for the last generation of monarchs.

The monarch will also benefit from Conservation measures focused on birds. Conservation measures listed in **Table 27** and **Section 7.4.1** effectively exclude management of grasslands during the active period of the butterfly onsite. The Conservation Measures are as follows:

- Conduct all vegetation management activities **August 1st to May 15th** to protect nesting birds, unless otherwise noted in this plan, or a pre-management nesting survey is conducted.
- If possible, mowing and prescribed fire activities will be planned for the dormant season when possible to limit impact to pollinators. If management activities do take place during the growing season, efforts will be made to limit impacts to monarch butterflies by not impacting milkweed populations onsite.

7.4.1.5 Fish Management at the NHNGTS

There are no rare, threatened or endangered fish known to occur at the NHNGTS. However, if there are undocumented species occurring onsite, conservations measures for water and amphibians and reptiles will properly protect and manage them.

- Follow protection measures for water in **Section 7.5.1**, and amphibians and reptiles in **Section 7.4.1.3**.

7.4.1.6 Exemplary Natural Community Management at the NHNGTS

The black gum - red maple basin swamp is a wetland community type and afforded protections that apply to all surface waters.

- **Section 7.5.1 Water Resource Protection at the NHNGTS** further describes Water Resource conservation measures that will benefit the black gum swamp.
- Given the exemplary status of this community onsite the NHARNG will continue to closely monitor this wetland for potential negative impacts from construction projects and training activities.

7.4.1.7 Rare Plant Management at the NHNGTS

Management for the small whorled pogonia will be based on management actions and conservation measures. The management strategy for the species will include the following:

- Maintain an partially open canopy within the forested area to provide additional sunlight to the forest floor
- Continue to coordinate with the USFWS and NHNHB to identify ways to protect and enhance habitat onsite
- Monitor invasive species to ensure no negative impacts to the habitat onsite
- Annually survey the habitat area and prior to any forestry activities to maintain current information on the species status onsite
- The Environmental office will be consulted prior to conducting activities, such as military training that have a potential for ground disturbance within the habitat area

Conservation measures for the species are detailed below. Small whorled pogonia conservation measures are also listed in **Table 27:**

- Conduct forestry operations in frozen conditions when possible to limit ground disturbance
- Activities in the habitat area will be restricted to foot traffic only, no ground disturbing activities

7.4.2 Rare, Threatened, and Endangered Species and Habitats Management at the ECTC

Management of the rare species onsite will be performed through a coordinated effort with DMAVS/NHARNG, NHNHB, NHFG and USFWS. Activities such as military training, construction and habitat management activities all can have both positive and negative impacts to threatened and endangered species. The management actions and conservation measures listed below will serve as guidelines to sustainably protect and promote all species (focus of rare species) onsite in concert with the military mission. The ultimate goal of this plan, as well as subsequent additions and revisions, is to ensure military mission capability while managing for sustainability of the ECTC's natural resources into the future. Management actions and strategies below will benefit rare natural resources onsite:

- Appropriate NEPA review, such as a Record of Environmental Consideration (REC), will be filled out prior to all training and habitat management activities not already covered in the 2009 RTI Environmental Assessment (NHARNG, July 2009), 2017 Readiness Center Environmental Assessment (NHARNG, 2017) or existing NEPA analysis. Training activities covered in the existing EA's are as follows: land navigation by foot, foot patrol and marching, movement to contact activities, ambushes, digging training positions, physical fitness training, tactical tasks and HIMARS crew drills (NHARNG, July 2009). No live fire, blanks pyrotechnics use or driver training will be conducted at the site (NHARNG, 2017). Through this evaluation, the NHARNG will consult with the appropriate agency if the activity is expected to have an adverse impact on state or federally listed species.
- DMAVS/NHARNG will provide awareness training on endangered species to all military units that utilize the site for field training activities. This training will identify species of concern, generalized locations and the protective measures that will be implemented onsite.
- DMAVS/NHARNG will provide additional awareness about sensitive resources found onsite through an information kiosk onsite. The kiosk will provide both military and recreational users awareness about rare species onsite. Awareness will include species identification, contact information for encounters/further information, areas of restricted activities and general species and habitat information for the ECTC.
- Maintenance and restoration of the PPSOW onsite both improves this rare natural community as well as improves habitat for the variety of species that depend on it. Space timing of restoration management events to prevent chronically stressing sensitive natural resources. Since the PPSOW habitat onsite has lacked adequate disturbance much of the management activities onsite are working to restore the habitat so that the community may again

support many of the rare species. These initial restoration activities require more intensive methods be used, in hopes that restoration will transition into less intensive maintenance of the habitat.

- **Appendix C** contains a Memorandum of Agreement (MOA) with the NHFG. This agreement provides a mechanism to allow NHFG to conduct restoration, population and habitat management activities on site which do not interfere with military use. Through this agreement, the NHARNG and NHFG can work cooperatively on scientific studies and management of species onsite.

Table 28 below summarizes conservation measures that guide habitat restoration activities such as brontosaurus/forestry, hand cutting and mowing as well as military use throughout the site. Conservation measures that directly relate to prescribed fire are found in **Chapter 2.8** of the IWFMP. Overall management for individual species is further described in the sections below. Conservation measures were developed using a variety of sources, including the Karner Blue Butterfly Recovery Plan (USFWS, September 2003) and WAP (NHFG, 2015).

Conservation measures differ from species-specific management strategies and actions. Strategies are plans or components of plans to achieve management of a resource, whereas conservation measures are specific restrictions to those plans or common actions in order to protect species from adverse impacts. Species-specific management strategies and actions are further described throughout this chapter.

Table 28: ECTC Conservation Measures

Species	Conservation Measures
Mammals (Bats)	Conduct overstory tree removal **November 1st – March 30th** to avoid bat active season. Unless bats pose a safety of health threat to the occupants, bats shall only be excluded or removed from any structure **August 15th to May 15th**.
Birds	Conduct all vegetation management activities **August 15th - May 15th** to protect nesting birds, unless pre-management nesting survey is conducted.
Amphibians	Maintain 100’ natural buffer around all wetlands. Maintain 15MPH speed limit along gravel roads. Maintain hydrology via beaver dam alterations. Conduct water level alterations in wetlands **May 15th to**

	September 30th to avoid mortality to hibernating amphibians.
Reptiles	Limit speeds to under 15 MPH for all wheeled vehicles. Maintain 100' natural woodland buffer around all wetlands. Mowing will be conducted **October 15th to April 15th** for the protection of reptiles. If mowing or prescribed fire occurs **April 15th to October 15th**, a pre-management survey will be conducted. Maintain hydrology via beaver dam alterations. Conduct water level alterations in wetlands **May 15th to October 1st** to avoid mortality to hibernating reptiles. Disinfect any object including hands after handling snakes (In relation to the fungus Ophidiomyces ophiodiicola)
Karner Blue butterfly, Frosted Elfin, and other assorted Lepidoptera	Mechanical habitat management: Mechanical cutting of shrubs/trees and mowing around lupine will be done **September 1st to April 15th** for protection of adult stage butterflies. Work done in frozen conditions when possible. Management activities (both prescribed fire and mechanical treatment) will impact no more than **1/3 of the primary habitat** (lupine area) and **1/3 of secondary habitat** onsite in a given year. Mower blade height is set 6-8" from ground. Hand management: Hand cutting of individual shrubs and brush can be done any time of year, but preferably during dormant season. Herbicide treatments:

	Application will be done outside the Karner flight period when possible and or effective. Treatment will be done with hand operated equipment by certified personnel in areas with lupine or milkweed. Application will not be done directly to lupine or other rare plants, and plants will be marked in the area of application to avoid direct application and trampling. <u>Signage:</u> Maintain fence and signage around lupine along ROW.

The following sections further describe unique management for individual species or species groups.

7.4.2.1 Mammal (Bat) Management at the ECTC

Based on acoustic surveys done at the site, presence of the northern long-eared bat cannot be ruled out at the ECTC. Many calls from each of the 3 sampling years were inconclusive, leading the NHARNG to assume presence of the species onsite. It is assumed that if the species is utilizing the site throughout the active season, although at very low density and in relatively localized areas. Management for bats will be based on conservation measures and management strategies. Management is as follows:

- Protection for the species from mechanical and prescribed fire activities can be found in **Table 28** above and **Table 5** within the IWFMP.
- The NHARNG will continue to conduct PLS through use of acoustic surveys to maintain a current list of species onsite.
- The NHARNG will continue to consult with the USFWS and/or NHFG, as appropriate, to address additional activities that have a potential to impact bats onsite.

Management for the NLEB is also intended to benefit other bat species as well, such as those that are state-protected.

7.4.2.2 Bird Management at the ECTC

Management for rare, threatened and endangered birds at the ECTC will be based on forest management, which primarily includes the DAOF and PPSOW forest onsite. Management of the DAOF will benefit forest-interior and forest-edge bird species, whereas management of PPSOW will benefit shrubland bird species. Development of a forest management plan for all forest types at the ECTC is included within **Section**

7.7.1. Development of the plan is based on multiple objectives, one of which being increased wildlife habitat value. Bird habitat will be enhanced by the implementation of the plan. Forest management is included within the two following sections:

- **Section 7.7.1 Forest Management at the NHNGTS and ECTC**
- **Section 7.4.2.6.1 Pitch Pine – Scrub Oak Woodland (PPSOW)**

Additionally, the continued periodic mechanical clearing of the ROW will benefit shrubland bird species by sustaining vigorous young shrub cover. ROW management is briefly covered within the following section:

- **Section 7.3.2 Flora and Fauna Management at the ECTC**

There also exists one conservation measure for birds in **Section 7.4.2,** and is also listed below. It will apply to the forest management plan as well.

- Conduct all vegetation management activities **August 15th - May 15th** to protect nesting birds, unless pre-management nesting survey is conducted.

7.4.2.3 Amphibian and Reptile Management at the ECTC

General conservation measures that benefit amphibians and reptiles in at the ECTC include the following:

- Maintain 100’ natural buffer around all wetlands.
- Maintain 15MPH speed limit along gravel/dirt roads.
- Maintain hydrology via beaver dam alterations. Conduct water level alterations in wetlands **May 15th to September 30th** to avoid mortality to hibernating amphibians.

Other class-specific management strategies and actions for amphibians and reptiles are as follows.

7.4.2.3.1 Snake Management at the ECTC

For management purposes, the DMAVS has collected four years of telemetry information on five individual eastern hognose snakes (*H. platirhinos*) on the ECTC. Due to the secretive nature of this species and an assumed low population size, understanding the habitat requirements to support this species is difficult. Information gathered from the NHARNG telemetry work, as well as on other populations within the state serve as guidance for management and protection of this species onsite. Management for snake species on site will include the following:

- Continue surveying for snakes. This will be done through annual use of cover boards and random habitat searches for rare species. New materials for cover boards may be utilized throughout the INRMP cycle to improve detection

probability for rare snakes. Board surveys and random habitat searches will be conducted a minimum of twice per month between the months of June and October.

  - Employ new survey technique utilizing camera traps and drift fencing may be employed during the 2020 or 2021 field season. The technique involves utilizing a strategically placed trail camera in relation to a small length of drift fencing.
  - Documentation of length, weight and location will be recorded for all state listed species encountered. Use of telemetry will be based on individual weight/condition, availability of equipment, funding and staff time. The NHARNG will seek an annual permit from the NHFG for these activities and provide a written report at the end of the year.
  - All smooth green snakes (*O. vernalis)* and black racers *(Coluber constrictor)* encountered onsite will be documented and reported through the online Reptile and Amphibian Reporting Program (RAARP): http://nhwildlifesightings.unh.edu/Default.aspx

- DMAVS/NHARNG will establish protection of critical habitat features (i.e. nest and hibernacula sites) identified on NHARNG property. Once identified, DMAVS/NHARNG will seek guidance from NHFG regarding the appropriate conservation measures for implementation. The NHARNG will monitor these identified sites for activity during critical times, such as entry/exit from hibernacula and egg emergence.
- With guidance and assistance from the NHFG, DMAVS/NHARNG may develop suitable nest sites and hibernacula for snakes and/or turtles within the unimproved land of the site. This will be accomplished through activities such as development and maintenance of sandy openings, protection of large downed trees that may serve as hibernacula sites, and possible construction of suitable hibernacula.

Protective measures identified in the DMAVS/NHARNG's IWFMP and Conservation measures differ from species-specific management strategies and actions. Strategies are plans or components of plans to achieve management of a resource, whereas conservation measures are specific restrictions to those plans or common actions in order to protect species from adverse impacts. Species-specific management strategies and actions are further described throughout this chapter.

Table 28 will be implemented to mitigate impacts to the species from prescribed fire.

- Protective measures will also be taken during intensive ground habitat management activities such as prescribed fire, mechanical vegetation treatment and firebreak construction. Protective measures will include surveys prior to

activities, protection of critical habitat components, limiting widespread ground intensive activities and providing awareness regarding species of concern to individuals conducting activities.

Pathogens and fungus are a serious emerging threat to reptiles in the region that seems to be increasingly associated with free ranging wildlife (Allender, 2018). Ophidiomycosis, also known as Snake Fungal Disease (SFD), is a newly emerging threat to snake health and population sustainability (Allender, 2019). SFD was first observed in New Hampshire at a location relatively close to the ECTC in 2006 (Cornell, 2019). The disease is caused by the fungus *Ophidiomyces ophiodiicola*, and results in crusted or ulcerated scales, nodules, most commonly affecting the face severely (Thompson N. E., 2018). Mortality from this disease is common, with certain studies estimating nearly 40% mortality (Cornell, 2019). As a result of a DoD Legacy grant, a Snake Fungal Disease (SFD) survey was conducted onsite during the 2018 season. Although the results indicated the disease was not common onsite, and represented 8% of the samples that were given. Data from the DoD-wide survey indicated that multiple species documented at the ECTC are potential receptors for the disease.

Management strategies for this disease are not well developed and are currently ineffective. Currently, the NHARNG's management strategy is to continue surveying for disease prevalence, and to reduce spread through pathogen vectors.

- Survey for SFD on a periodic basis as part of nation-wide DoD surveys in affiliation with the Wildlife Epidemiology Laboratory University of Illinois Urbana-Champaign.
- When appropriate, remove pathogen vectors in the environment such as snake cover boards in coordination with NHFG
    - Disinfect any object after handling snakes that may be contaminated with the fungus *Ophidiomyces ophiodiicola* (Allender, 2019)

7.4.2.3.2 Turtle Management at the ECTC

Management for the wood turtle onsite is based on conservation measures and awareness. Conservation measures will reduce or eliminate impacts to wood turtles from ongoing natural resource or military training activities. Awareness will further eliminate impacts to the wood turtle by educating soldiers and the public of the turtle and its vulnerabilities.

This species is most vulnerable to impacts during the times of the year when they utilize the surrounding uplands adjacent to the Soucook River to forage and nest, mainly **April 1st to October 31st**. Management for the wood turtle will include the following:

- Conservation measures contained within **Table 28**.

- All wood turtles (*G. insculpta*) encountered onsite will be documented and reported through the online Reptile and Amphibian Reporting Program (RAARP), http://nhwildlifesightings.unh.edu/, or directly with the NHFG
- The DMAVS/NHARNG will cooperate with NHFG for future species surveys and habitat management activities, including tracking individuals using telemetry. The DMAVS/NHARNG will support future conservation efforts for the species so long as activities don't conflict with current of future military activities on the site.
- The DMAVS/NHARNG will develop and distribute awareness material to military units that utilize the site. Information will include protection measures for rare species as well as general awareness on natural resource projects onsite.
- The NHARNG will coordinate with military units conducting field training exercises onsite to reduce adverse impacts to rare wildlife species occurring onsite.
- DMAVS/NHARNG will coordinate with Eversource (and Keyspan, if needed) regarding vegetation management along the powerline and gas line easement. Management will be restricted to late season in order to avoid impacts to rare wildlife utilizing the uplands along the easement. The DMAVS/NHARNG will also coordinate for other routine and planned maintenance activities to ensure protection of the species.

7.4.2.4 Insect (Lepidoptera) Management at the ECTC

Habitat management activities focus on improving primary and secondary habitat for the rare Lepidoptera documented onsite, including the Karner blue butterfly and frosted elfin. Currently the only primary habitat onsite, defined as areas within ten meters of wild lupine, is the small patch (0.4 acres) wholly within the powerline easement. This lupine patch will continue to be managed on an approximately 3 year rotation, consisting of hand-cutting shrubs to reduce competition for the lupine.

Secondary habitat, defined as areas containing important but not main food sources for KBB, consists of the remainder of the powerline easement as well the PPSOW management area (**Figure 31**). Vegetation management along the powerline is primarily conducted by easement holding utility companies conducting routine mechanical vegetation clearing. This currently occurs on an approximate 4 year rotation. Although conducted for utility maintenance purposes, this management concurrently promotes and benefits secondary habitat within the ROW. Periodic disturbance should suppress woody vegetation growth, create habitat openings, and promote nectar growth. The lupine patch is currently excluded from the periodic four-year clearing by the Utility Companies.

Restoration and management of the additional PPSOW (approx. 36 acres) should promote and benefit secondary habitat as well. Periodic disturbance from management should sustain habitat openings along with promoting nectar species.

Management of the ECTC for Lepidoptera will not only benefit the species utilizing the site, but also the regional population. Situated in close proximity to the Concord Pine Barrens complex, the ECTC may serve as a functional component of the Lepidoptera meta-population.

Management for Lepidoptera species within the Pitch pine - Scrub oak Community at the ECTC will include the following:

- Implementation of the NHARNG IWFMP. **Goals 3 and 4** specifically relate to the protection of rare species onsite, to include Lepidoptera and management of the fire dependent and adapted Pitch pine - Scrub oak woodland (PPSOW).
- Continue to conduct annual butterfly surveys along the powerline to assess the presence of rare species, mainly Karner blue butterfly (*L. melissa samuelis*) and frosted elfin (C*. irus)*. If results of a butterfly survey indicate the potential for reproduction (i.e. adults documented in close proximity to a wild lupine patch or feeding caterpillar); and if warranted, additional surveys will be conducted to verify reproduction. Survey routes may be modified as the habitat begins to increase with PPSOW management activities.
- DMAVS will conduct targeted moth surveys no less then every 10 years. These surveys will maintain a current species list and abundance as well as serve as an indicator of the success of the management techniques implemented within the Pitch pine – Scrub oak woodland.
- Implement protection of the existing wild lupine (*L. perennis*) population. The fence and signage as required by the 2009 RTI Environmental Assessment will be maintained and activities that could adversely impact the lupine population will be restricted as appropriate (NHARNG, July 2009). If additional lupine is identified onsite appropriate protections will also be implemented for both the lupine and potential rare butterflies.
- Monitoring of lupine and nectar species throughout the powerline and PPSOW to ensure distribution and abundance support rare Lepidoptera. Since lupine is the sole food source of Karner larvae, surveys will ensure that protection strategies utilized for lupine/obligate Lepidoptera during intense habitat management are effective.
- Coordinate with Eversource and/or Liberty Utilities (or current easement holder) for the utility ROW maintenance, to include discussion of the protected wild lupine (*L. perennis*) patch. The NHARNG will supplement mechanical treatment around and within the existing lupine patch at approximately 3 year intervals to

limit shading of the lupine by woody vegetation. Consistent with the conservation measures listed in **Table 28**, no more than 1/3 of the woody vegetation within the lupine patch will be cut in any given year. If necessary, the NHARNG will allow monitored, hand removal of non-desirable vegetation within the lupine patch by current easement holder. Vegetation removal may be required for ROW safety purposes. All work done in and around the lupine patch will be completed consistent with **Table 28**.

- Species that compete for KBB resources will be removed or managed in coordination with NHFG and USFWS. Groundhogs may be removed, to reduce competition/herbivory on nectar species. Other species competition for resources may be managed in a similar fashion.
- DMAVS/NHARNG will continue to consult with the USFWS and NHFG, as appropriate, if evidence of reproduction of rare butterfly species is found on the lupine.

7.4.2.5 Fish Management at the ECTC

Management for the American eel, bridle shiner and any other rare, threatened or endangered species of fish or mollusk that may be present at the ECTC will consist of conservation measures taken to protect water quality onsite.

- Water protections are listed in **Section 7.5.2 Water Resource Protection at the ECTC**.
- No known impediments to the Soucook River's flow will be constructed, and severe beaver impoundments will be removed if deemed necessary (In coordination with NHFG).
- No planning level surveys will be conducted per guidance of NHFG (Magee 2019)

7.4.2.6 Exemplary Natural Community Management at the ECTC

The only exemplary natural community at the ECTC is PPSOW. Management of PPSOW is discussed below in **Section 7.4.2.6.1**.

7.4.2.6.1 Pitch Pine – Scrub Oak Woodland (PPSOW)

Management

As a fire adapted community, PPSOW depends on periodic fires to maintain species composition and community structure. However, nearly all of the PPSOW at the ECTC has experienced lack of fire within the recent past. The 2011 NHNHB Floristic Inventory for the site stated that the lack of fire would ultimately lead to a shift in the community to a more fire intolerant species composition, similar to the adjacent Dry Appalachian Oak Forest (NHNHB, January 2012). To restore and maintain the PPSOW community at the ECTC, the primary mechanisms for management will be implementation of prescribed

fire and mechanical management. The prescribed fire and mechanical management regime are further described within **Section 3.1** of the IWFMP.

To restore and maintain PPSOW management units that have not been exposed to normal fire frequency, fire may not be an effective first management action. Mechanical management is a more effective preliminary management action for PPSOW units that are lacking fire disturbance. Mechanical management allows for the process to be expedited, by removing nearly all non-desirable species and preparing the PPSOW for fire. Prescribed burning may then follow to reduce slash, litter, and duff, along with eliminating young, recently sprouted non-desirable species. The introduction and planting of desirable species may follow mechanical management and fire, to supplant historical PPSO-native species.

- To restore and maintain the PPSOW community at the ECTC, the primary mechanisms for management will be implementation of prescribed fire and mechanical management. The prescribed fire and mechanical management regime are further described within the IWFMP, **Sections 3, 4 and Appendix D of the IWFMP.**
- Planting/transplanting of PPSO native/associated species will occur when appropriate

Vegetative Structure Goals

The following objectives will serve as the target vegetative structure for PPSOW at the ECTC:

Objective 1: Restore PPSOW woodland environment by setting the following vegetation structure goals:

- 30 – 60% canopy, 30 - 60% shrub, 20 – 40% heath and 10 - 20% herbaceous cover. The variability allows for a matrix of community composition to exist throughout the community.
- Maintain a minimum of 2 grass/heath openings between 0.5 and 1 acre within the PPSOW.

Objective 2: Maintain Pitch Pine in all vegetation strata throughout PPSOW. Pitch Pine is an essential component of the PPSOW and a multi-age stand of the species indicates a healthy and thriving ecosystem from mature trees to regeneration.

Objective 3: Have Scrub Oak be at least 50% of the overall shrub strata to provide available food for pine barrens Lepidoptera.

Objective 4: Limit establishment of non-desirable species in each strata to <20% cover. Species may include White pine, Aspen, Gray birch, Red Maple and Black cherry.

These objectives are long term overall goals that may take many years (even decades) to obtain. This community requires continued disturbance to maintain, even after the overall vegetation structure goals are achieved. Since this community has lacked management/disturbance for 30+ years, more intense and frequent treatments will likely be required during the initial years of restoration.

Monitoring

Monitoring vegetative response to management activities and other natural influences is important to ensure progress towards Objectives of PPSOW management. Monitoring allows tracking of community structure change over time and will inform decisions on future management.

The NHARNG conducts vegetation monitoring for the site, identifying current conditions information and progress toward meeting long term goals. In the summer of 2017 (updated 2020) the NHARNG developed a vegetation monitoring protocol, “NHARNG Vegetation Monitoring Handbook”, that allows for relatively quick and easy vegetation data collection. This protocol can be found in Appendix A. Data from this monitoring will help the NHARNG track both current conditions within the PPSOW as well as vegetative response to specific treatments and adaptive management.

Management for this community type will involve monitoring both the vegetation structure and the wildlife that depend on this community. Management techniques and objectives may be refined over time to ensure a healthy environment for the species that depend on this community. The following monitoring will be conducted to assess the continued management and restoration of the PPSOW community:

- Establish permanent photo plot in each of the burn units. Photos will be taken in each of the units prior to the start of management and 1-2 years following management. Each unit will be photographed no less than once every 5 years. This will generally be done in conjunction with vegetation monitoring.
- Conduct vegetation monitoring in accordance with protocol found in **Appendix A**. Monitoring within each management unit at established monitoring points will take place both the growing season prior to management and again within 2 years following treatment, and no less than every 5 years thereafter. From this survey method the following parameters can be measured:
    - *Duff/Litter depth*. Measuring the depth of the litter and duff will reflect the current state of the unit, along with the effectiveness of the treatment at reducing downed woody and leaf debris, and

exposing mineral soil. Exposure of mineral soil supports Pitch Pine regeneration.

- *Species Composition*. Counting all species at both <1m and >1m heights document the species occurring within the unit and their growth. From this measurement, percent cover for each species across the plot species can be calculated. This will assess the effectiveness of management techniques on desired and non-desirable species within each vegetation strata.
- *Canopy Cover*. Estimating percent canopy cover and species composition will ensure the canopy consists of desirable species and is of the appropriate density.

- Conduct tree coring of mature Pitch Pine trees. Tree cores will reconstruct the wildfire history of the site, benefiting the NHARNG's understanding of the site's forest history. A cross section will be taken from Pitch pine trees removed for other purposes including construction and hazard tree removal.

7.4.2.7 Rare Plants at the ECTC

A majority of the rare plant species identified on the ECTC exist along the mechanically cleared powerline easement. These species depend on the heavily disturbed and open environment that exists in this portion of the site. The following management techniques will be implemented to support the continued existence and potential expansion of these species:

- Continue coordination between NHARNG and Eversource on timing and treatment techniques utilized within the powerline easement. Efforts will be made to delay cutting until late season (mid-September – October) to allow for seed maturity and dispersal.
- The NHARNG will conduct rare plant surveys on an approximately 5 year rotation, or as needed. The surveys will focus on existing known plant populations as well as to identify new species/populations. GPS locations of individuals and estimate the number of stems will be collected. This information will be provided to the NHNHB for inclusion in their tracking database.
- Continued coordination between the military units and Environmental office to ensure activities don't impact rare plant species onsite.
- Conduct yearly, informal surveys to protect the lupine population from invasive species.
- During most years, one third (1/3) of the shrub/tree cover within the lupine patch will be hand cut. This will reduce competition, and ensure the lupine will not be shaded out.

7.4.3 Rare, Threatened, and Endangered Species and Habitats Management at the SMR

Management of the rare species onsite will be performed through a coordinated effort with DMAVS/NHARNG, NHNHB, NHFG and USFWS. Activities such as military training, construction and habitat management activities all can have both positive and negative impacts to threatened and endangered species known onsite. The management practices listed below will serve as guidelines to sustainably protect and manage all species (focus of rare species) in concert with the military mission. The ultimate goal of this plan, as well as subsequent additions and revisions, is to ensure military mission capability while managing for sustainability of the SMR's natural resources into the future. The conservation measures and management actions below will benefit rare natural resources onsite:

- Appropriate NEPA review, such as a Record of Environmental Consideration (REC), will be filled out prior to all training and habitat management activities not already covered in existing NEPA documents.
- DMAVS/NHARNG will provide awareness training on endangered species to all military units that utilize the site for field training activities. This training will identify species of concern, generalized locations and the protective measures that will be implemented onsite.
- Restoration of the PPSOW onsite both improves this rare natural community as well as improves habitat for the variety of species that depend on it. Management onsite is transitioning between intense restoration and a sustainment phase.

Table 29 below summarizes conservation measures that guide habitat restoration activities such as brontosaurus/forestry, hand cutting and mowing as well as military use throughout the site. Conservation measures that directly relate to prescribed fire are found in **Chapter 2.8** of the IWFMP. Conservation measures were developed using a variety of sources, including the Karner Blue Butterfly Recovery Plan (USFWS, September 2003) and WAP (NHFG, 2015).

Conservation measures differ from species specific management strategies and actions. Strategies are plans or components of plans to achieve management of a resource, whereas conservation measures are specific restrictions to those plans in order to protect species from adverse impacts. Species specific management strategies are further described throughout this chapter.

Table 29: SMR Conservation Measures

Species	Conservation Measures
Mammals (Bats)	Conduct overstory tree removal **November 1st – March 30th** to avoid bat active season. Unless bats pose a safety of health threat to the occupants, bats shall only be excluded or removed from any structure **August 15th to May 15th**.
Nesting birds	Conduct all vegetation management activities **August 15th to May 15th** to protect nesting birds, unless pre-management nesting survey is conducted.
Karner Blue butterfly, Frosted Elfin, and other assorted Lepidoptera	Routine fenceline, structure and roadway mowing: Mowing and tree removal will be done as needed to maintain current force protection setbacks, generally once per month during the growing season. When possible work will be conducted **September 1st to April 15th**, preferably after first hard frost. Mechanical habitat management: Mechanical cutting of shrubs/trees and mowing around lupine will be conducted **September 1st to April 15th** to avoid adult butterfly flight time. Management activities (both prescribed fire and mechanical treatment) will impact no more than 1/3 of the lupine area (primary habitat) and 1/3 of secondary habitat onsite in a given year. Mower blade height set 6-8” from ground and in frozen conditions when possible. Hand management: Hand cutting of individual shrubs and brush can be done any time of year, preferably during dormant season. Herbicide treatments (fenceline and habitat):

	Application will be done outside the Karner flight period when effective. Treatment will be done with hand operated equipment by certified personnel in areas with lupine or milkweed. Application will not be done directly to lupine or other rare plants, and plants will be marked in the area of application to avoid direct application and trampling. <u>Management Frequency:</u> Space timing of management events to prevent chronically stressing population.

* More detailed conservation measures that relate directly to prescribed fire activities can be found in **Section 2.8** of the IWFMP.

The following sections further describe unique management for individual species or species groups.

7.4.3.1 Mammal (Bat) Management at the SMR

Management for rare mammals at the SMR will be solely based on bats. Due to the relative absence of evidence for the NLEB, management will be conducted to benefit state listed species. Species identified as SGCN (NHFG, 2015) and Species of Special Concern (NHFG, 2017) include big brown (*E. fuscus*), silver-haired (*L. noctivagans*), eastern red (*L. borealis*) and Hoary (*L. cinereus*) have been documented onsite. Management for bats onsite is as follows:

- Protection for bats from mechanical and prescribed fire activities can be found in **Table 29: SMR Conservation Measures** above and **Table 6 within the IWFMP**.
- The NHARNG will also continue to conduct acoustic bat surveys to maintain current information on bat species utilizing the site.

7.4.3.2 Bird Management at the SMR

Management for rare, threatened and endangered bird species will primarily consist of the PPSOW habitat management onsite, along with conservation measures taken to avoid adverse impacts to birds while conducting management or other routine actions. Management of the PPSOW habitat onsite will sustain habitat for both grass and shrubland birds. Management techniques include the following:

- Conservation measures are listed in **Section 7.4.3 Rare, Threatened, and Endangered Species and Habitats Management at the SMR.**

- Birds will also be benefitted by management of the pitch pine - scrub oak woodland onsite, discussed in **Section 7.4.3.6.**

7.4.3.3 Amphibian and Reptile Management at the SMR

Due to the relative absence of herpetofauna at the SMR, management is based on general wildlife management strategies and conservation measures.

- Management for amphibian and reptiles found at the SMR will be based on the management strategies and conservation measures found within **Sections 7.3.3 and 7.4.3.**

7.4.3.4 Insect (Lepidoptera) Management at the SMR

Management for Lepidoptera species at the SMR will be based on conservation measures and management actions. Management is as follows:

- Prescribed fire will be conducted throughout the habitat on the site through implementation of the IWFMP. When prescribed fire cannot be implemented mechanical treatment, both hand and machine, will be used. Conservation measures outlined in above and in the IWFMP will be implemented to reduce impact to rare species, including the Karner blue butterfly.
- Continue to conduct annual butterfly surveys throughout the habitat area to assess the presence of rare species, mainly Karner blue butterfly (*L. melissa samuelis*) and frosted elfin (C*. irus)*. Surveys will document reproduction onsite to ensure management is effective and allow for protections during intense habitat management activities. Mark-recapture as well as transect survey methods will be used.
- To ensure adequate food source for the rare Lepidoptera, both lupine and nectar plants will be planted throughout the habitat area. Plants, including seed, will be from local source, collected both onsite and from the surrounding CMA area. Lupine seed collection would be performed just prior to seed pod maturity and only 20-25% of seed in a location would be collected.
- Monitoring of lupine and nectar species throughout the habitat area to ensure distribution and abundance support the Karner and other rare Lepidoptera. Since Lupine is the sole food source of Karner larvae, surveys will ensure intense habitat management activities minimize impacts to a large proportion of the Lupine and obligate Lepidoptera species during intense habitat management activities, such as prescribed fire.
- NHARNG/DMAVS will conduct moth surveys no less then every 10 years. These surveys will identify current species and abundance and serve as an indicator of the success of the management techniques implemented within the pine barrens habitat area.

- Removal of species that compete for KBB resources will be removed or managed in coordination with NHFG and USFWS. Groundhogs may be removed, to reduce competition/herbivory on nectar species. Other species competition for resources may be managed in a similar fashion.

7.4.3.5 Fish Management at the SMR

There are no rare, threatened or endangered fish species at the SMR. Therefore, no management is necessary.

7.4.3.6 Exemplary Natural Community Management at the SMR

The entirety of the habitat area at the SMR is considered PPSOW. Management of the community is discussed below in **Section 7.4.3.6.1**.

7.4.3.6.1 Pitch Pine – Scrub Oak Woodland (PPSOW)

Management

The PPSOW community that exists at the SMR is unique from other PPSOW communities in the Concord Pine Barrens complex. Since its inception as a mitigation requirement contained within the 2000 B.O. for AASF construction and use, the PPSOW has been constructed, actively managed and sustained by NHARNG staff. This intimate management has produced a functional PPSOW community that needs less intensive management than do the other local PPSOW communities (including the ECTC). Regardless, as a fire adapted community PPSOW still depends on periodic fires to maintain species composition and community structure. Without fire the community will revert to a later successional stage such as Dry Appalachian Oak.

The sequence of management actions depends on the state of the unit planned to be managed. Mechanical management is a more effective preliminary management action for SMR PPSOW units that contain extensive, large, established non-desirable species, or where reduction of fuels is necessary. Whereas prescribed burning is used to reduce slash, litter, and duff, along with eliminating somewhat young, recently sprouted non-desirable species. Prescribed often follows mechanical management, but not always. The introduction and planting of desirable species may follow mechanical management and fire, to supplant historical PPSO-native species.

The intent of the 15.2 acres of restoration area on the SMR is “contribute to the KBB recovery in the foreseeable future” (FAA, 8/18/2000). Pine barrens naturally exhibit a mosaic of vegetation structure, ranging from large grassland/heath, open canopy shrublands and dense canopy woodlands. Habitat management activities will allow development of a heterogenic habitat structure in support of Karner blue butterfly recovery. Among the species that naturally occur within a PPSOW community is wild

lupine. The presence of wild lupine onsite is a critical habitat component as both the federally endangered Karner blue butterfly and state endangered frosted elfin butterflies depend on this plant.

The Karner blue butterfly also relies on nectar throughout its life cycle; nectar being wild lupine in larval stage and common wildflowers during adult stage. Management within the habitat area will support development of these plant species, which will in turn support the rare Lepidoptera. The following management will be conducted to support PPSOW and KBB:

- To restore and maintain the PPSOW community at the SMR, the primary mechanisms for management will be implementation of prescribed fire and mechanical management. The prescribed fire and mechanical management regime are further described within the IWFMP, **Sections 3 & 4, and Appendix D**. Protection strategies identified in both the INRMP and the IWFMP will ensure management is done in such a way to minimize impact to rare species while supporting long term management of the community.
- Native pine barrens vegetation will be planted throughout the habitat area. Plants will either be locally collected seed will be collected and propagated from both the SMR and surrounding Concord Pine Barrens. Seeds will either be directly sown into the soil or propagated and mature plants planted, including lupine.

Vegetative Structure Goals

Below in and depicted in **Figure 22** are the three general habitat classifications that will be the vegetative structure target range for the PPSOW at the SMR. These classifications closely follow those developed by NHFG (NHFG, February 2016) for pine barrens being managed on the adjacent CMA.

Table 30: Habitat Classification Goals at the SMR

Habitat Classification	Vegetation Structure	Ecology	Management
Grassland/ Heathland	10-20% mineral soil, 30-60% herbaceous and heath strata, <10% shrub strata, <10% canopy	High level of disturbance, drought adapted, low vegetation with sandy openings. High herb density and openings	Frequent fire and/or mowing to reduce woody encroachment to encourage early colonizers and diverse herbs

		support rare butterflies	
Open Canopy Shrubland	5-10% mineral soil, 10-20% herbaceous, 30-80% shrub stratum and 10-20% canopy	Thicket of shrub, mainly scrub oak, interspersed with herb and heath openings allow for diversity of birds and Lepidoptera	Mechanical treatment followed by prescribed fire to reduce shrub while maintaining heath and herb strata.
Woodland	<10% mineral soil, 20-60% herbaceous stratum, 30- 60% shrub, 30- 60% canopy	Open canopy dominated by Pitch Pine with matrix of herb/shrub in understory provide for diversity of woodland species and provide protection	Mechanical treatment followed by prescribed fire to reduce fire intolerant species and maintain open canopy and understory.

These objectives are long term overall goals that may take many years (even decades) to obtain. This community requires continued disturbance to maintain, even after the overall vegetation structure goals are achieved.

Monitoring

Monitoring vegetative response to management activities and other natural influences is important to ensure progress towards the Vegetative Structure Goals. Monitoring allows tracking of community structure change over time and will inform decisions on future management. This information will allow the Conservation Specialist and Fire Program Manager develop an adaptable treatment rotation which best supports the habitat and rare species.

- Monitoring of habitat area to ensure a mosaic of habitat types exist throughout, meeting vegetation structure in above. This will be done via the habitat monitoring protocol in Appendix A. Monitoring will be done the year prior to management and the two growing seasons following management, and no less than every 5 years thereafter. Monitoring is further described in **Section 7.4.2.6.1.**

7.4.3.7 Rare Plants at the SMR

All of the rare plant species identified on the SMR exist within the managed 15.2 acre habitat area. These species depend on an early successional natural community, maintained with the periodic disturbance. The following conservation measures and management actions will be implemented to support the continued existence and potential expansion of these species:

- Management activities (both prescribed fire and mechanical treatment) will impact no more than 1/3 of the lupine area (primary habitat) and 1/3 of secondary habitat onsite in a given year. Hand cutting of individual shrubs and brush can be done any time of year, preferably during dormant season.
- Lupine seed will be collected and manually dispersed each year to increase lupine population as needed.
- The NHARNG will conduct rare plant surveys on a ~ 5-10 year rotation, or as needed. The surveys will focus on existing known plant populations as well as to identify new species/populations. GPS locations of individuals and estimate the number of stems will be collected. This information will be provided to the NHNHB for inclusion in their tracking database.
- Continued coordination between the military units and Environmental office to ensure activities don't impact rare plant species onsite.
- The lupine population that occurs onsite will be informally surveyed each year to inform management decisions.
- Conduct management (minimize) on groundhog population to reduce herbivory on lupine.
- Additionally, rare plant management at the SMR will consist of Conservation measures listed in **Section 7.4.3**.

7.5 Water Resource and Wetland Protection

Surface and groundwater resources are directly related to the land management practices throughout the site. Activities that take place in the adjacent uplands can directly impact surface waters through runoff. Groundwater can be impacted by both activities both onsite and adjacent land use. Water resources are afforded many protections through federal, state and local laws, both directly and indirectly through land use restrictions. The DMAVS/NHARNG not only adhere to legal requirements for the resources at these sites, but also take additional measures to ensure the health of the now and into the future.

7.5.1 Water Resource Protection at the NHNGTS

Management of the water resources onsite, both surface and drinking waters, will focus on limiting activities which have a potential to negatively impact the resource.

- Maintain a 100-foot natural woodland buffer around wetlands, vernal pools and streams. Limit construction/development activities within the buffered area.
- Avoid construction activities within 100' of vernal pools during spring migration (generally late March through April).
- Avoid the use of herbicides and pesticides within 100' of wetlands, streams and vernal pools onsite.
- Allow vehicles to cross only at established crossings. No vehicles are allowed in any wetlands or stream crossings.
- When designing new or upgrades to existing water crossings onsite consider wildlife friendly designs. These allow for safe passage of species as they move throughout the site.
- Maintain natural beaver flowage to maintain hydrology onsite. Conduct routine maintenance of culverts to ensure proper flowage of water.

7.5.2 Water Resource Protection at the ECTC

The ECTC has a variety of water resources onsite as mentioned in **Section 5.5.2 Water Resources at the ECTC**. The following management activities will take place onsite to ensure protection.

- Coordinate with utility easement holders, currently Eversource and Liberty Utility, for routine vegetation maintenance along the powerline ROW. No herbicides will be used for vegetation control along this ROW without written DMAVS/NHARNG written approval for protection of both water resources as well as rare flora and fauna known to exist in this area. State and/or federal permits may also be required for herbicide applications within this area.
- Conservation measures during prescribed fire operations to avoid potential contamination to ground and surface waters will be employed. See **Section 2.8 Natural and Cultural Resource Considerations** of the IWFMP for conservation measures that will be taken.
- Any natural resource management activities will follow the requirements of NH Env-Wq 401, Best Management Practices for Groundwater Protection.
- The NH Comprehensive Shoreland Water Quality Protection Act limits activities within 250 feet from the Soucook River. If necessary, permits will be obtained from NHDES. The DMAVS/NHARNG will allow the Soucook River's natural flow to continue.
- The DMAVS/NHARNG will maintain a 100' natural vegetated buffer around all wetlands, vernal pools and Soucook River.
- Impacts to wetlands may require a wetlands permit from the NHDES under RSA 482-A: Fill and Dredge in Wetlands. If activities and/or projects require a wetlands permit the DMAVS/NHARNG will seek a permit for such activities.

- Discuss existing and potential future concerns for activities that may have an impact on water resources at annual meeting with Site Commander.
- Monitor site annually for potential erosion issues onsite. Discuss and address resolution with Site Commander.

7.5.3 Water Resource Protection at the SMR

No surface waters or wells exist on the SMR. All activities will follow the requirements of NH Env-Wq 401, Best Management Practices for Groundwater Protection.

7.6 Grounds Maintenance

Grounds maintenance at all sites primarily is done by State Maintenance personnel who are responsible for both the buildings and the surrounding grounds. They generally do not routinely maintain the unimproved and semi-improved portions of the grounds with the exception of security fence lines, occasional mowing and hazard tree removal. Below are grounds maintenance management techniques that apply to all facilities, while site specific management is further described in the sections below.

- Encourage the use of local, native genotypes during restoration and landscaping projects. A list of native species can be found at https://extension.unh.edu/Gardening-Resources or http://www.plantnative.org/
- Use of natural fiber erosion control netting to limit wildlife entrapment.
- Meet annually, or as needed with the BOS/site commander to address and maintenance issues that may impact natural resources.

Pest management activities are further described in **Section 7.10 Integrated Pest Management Program**.

7.6.1 Grounds Maintenance at the NHNGTS

Grounds maintenance at the NHNGTS in the semi-improved and unimproved portions of the site primarily include annual mowing the grasslands, routine road maintenance of gravel roads (including culverts) and occasional tree pruning and/or removal along the roads address safety issues. Other maintenance activities may be covered in additional portions of this plan, such as **Section 7.5.1 Water Resource Protection at the NHNGTS** and **Section 7.10.1 Pest Management at the NHNGTS**.

- BOS will coordinate with NHARNG Environmental Office prior to any tree removal that is not a threat to safety. The NHARNG will review current natural resource information and coordinate as need to ensure activities do not negatively impact species, such as bats or small-whorled pogonia.
- The Environmental Office will coordinate with the BOS during planning and implementation of habitat management activities onsite to ensure no negative impact to training lands and use.

- The BOS will ensure gravel roads and culverts throughout the semi-improved and unimproved portions of the property are maintained in proper condition as to not impact surface waters. NHDES has developed *Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire* (NHDOT, 2018) which can provide guidance. The BOS will coordinate with the NHARNG Environmental Office to ensure proper permits are obtained, if required, for culvert and road repair and maintenance. Administrative rule Env-Wt 300 defines the need for a wetland permit for such activities.
- All activities conducted in the wellhead area will be performed in accordance with provisions of the NH Department of Environmental Services *Best Management Practices for Groundwater Protection* (Env-Wq 401). This includes storage of potentially hazardous materials, salt storage and vehicle maintenance.
- Management of the grasslands onsite is discussed in **Section 7.3.1 Flora and Fauna Management at the NHNGTS**.

7.6.2 Grounds Maintenance at the ECTC

Grounds maintenance at the ECTC is primarily conducted in the improved portion of the site. Maintenance in the semi-improved and unimproved portions of the site is primarily conducted the Environmental Office in support of habitat restoration activities.

- ECTC commander will coordinate with NHARNG Environmental Office prior to any tree removal that is not a threat to safety. The NHARNG will review current natural resource information and coordinate as need to ensure activities do not negatively impact species, such as bats or PPSOW management.
- The Environmental Office will coordinate with the BOS during planning and implementation of habitat management activities onsite to ensure no negative impact to training lands and use.
- Existing trails and firebreaks will also be conducted in accordance with the *Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire* (NHDOT, 2018).
- The existing ROW is currently maintained by Eversource and Liberty Utilities. The NHARNG will work cooperatively to ensure maintenance activities limit negative impacts to rare species known to utilize this area. Conservation measures such as vegetation cutting during late fall and winter months will be implemented when possible.
- All activities conducted in the wellhead area will be performed in accordance with provisions of the Town of Pembroke's Aquifer Conservation District Zoning Ordinance and the NH Department of Environmental Services *Best Management Practices for Groundwater Protection* (Env-Wq 401) . Storage of hazardous materials will be limited to household quantities for items such as the following: building cleaning supplies, petroleum, oils and lubricants for operation of motor

vehicles and equipment and building maintenance supplies such as paints and adhesives (NHARNG, July 2009).

7.6.3 Grounds Maintenance at the SMR

Grounds maintenance within the habitat area primarily consists of plowing of the road leading to the captive rearing facility, maintenance of the captive rearing facility (primarily NHFG responsible), routine mowing of overhead communication line and around captive rearing facility, and mowing of fence line as required for security. Since this rare community and species are immediately adjacent to the existing active base, communication between site maintenance personnel and NHARNG Environmental Office is essential. The following conservation measures will be implemented to ensure protection of natural resources while meeting the needs and requirements of the surrounding active military base are met.

- Routine road and fenceline mowing and tree removal will be done as required by current force protection requirements. Generally, a 10’ mow line will be maintained once per month during the growing season. When possible work will be done after September 1st, preferably after first hard frost.
- Spraying of herbicides in areas with lupine during the Karner flight period, or areas of milkweed respectively, will be done with hand operated equipment by certified applicators. Application will not be done directly to lupine of milkweed plants, and plants will be marked in the area of application to avoid direct application and trampling.
- Annual coordination with maintenance staff for plowing and mowing along the perimeter of the habitat area. Ensure activities limit impact within habitat area.

7.7 Forest Management

The NHARNG does not have a formal forest management program at any installation nor are lands are actively managed for timber production. This is primarily due to the small acreage of forest at the installations, which limits the ability for a profit-driven forest management program onsite. Forest management activities onsite primarily relate to the natural resource and habitat improvement objectives of the INRMP.

7.7.1 Forest Management at the NHNGTS and ECTC

The NHNGTS has approximately 45 acres of forested lands onsite which is classified as a Hemlock – beech – oak – pine forest. Any tree cutting that has taken place has either been in support of habitat management for the small-whorled pogonia or hazard tree removal in support of military training activities. Given the small size of the forest no whole scale forest management is planned for the site and current management will likely continue.

The ECTC has approximately 157 acres of forested land which is broken into four major forest community types: Dry Appalachian Oak, Pitch Pine – scrub oak woodland, Temperate minor river floodplain system, and a small area of Hemlock – white pine forest. Prior to the purchase of the land by the DMAVS in 2009 the parcel was selectively harvested for timber by the previous landowner. Since that time, forest succession has taken place without human intervention (without consideration of PPSOW management by the DMAVS). Due to the moderate forest size, diverse composition, and value to wildlife, development of a forest management plan is necessary.

- The development of a forest management plan for all forest types at the ECTC is planned to be completed by the end of 2021.

Objectives for the forest management plan will include increased forest integrity, health, and wildlife habitat value, increased resiliency to changing climate, ensure implementation of goals and objectives of NHARNG Integrated Natural Resource Management Plan (INRMP) and Integrated Wildland Fire Management Plan (IWFMP), and support of the military mission.

The following management guidelines will be implemented when forest management activities do take place at either site:

- Coordination with the Environmental Office prior to any tree cutting in forested portions of site. Coordination with the USFWS will also take place to ensure protection of the small-whorled pogonia at the NHNGTS and bats at the ECTC. Follow conservation measures outlined in **Section 2.8** of the IWFMP.
- Maintain a 100-foot natural woodland buffer around all wetlands, streams and vernal pools. Implement water resource conservation measures outlined in **Section 5.5 Water Resources**.
- Restrict vehicles to designated gravel roads and trails.
- Manage invasive species and forest pests to maintain a healthy forest ecosystem. Conduct routine surveys to ensure early detection and necessary control.

7.7.2 Forest Management at the SMR

Forest management at the SMR is entirely in support of PPSOW habitat restoration activities onsite. Trees may need to be removed if their height infringes upon flightpaths to the Concord Municipal Airport. Forestry operations are generally conducted to create or maintain firebreaks and reduce canopy cover to safely execute a burn. Protection strategies during forestry operations will be in accordance with **Section 7.4.3 Rare, Threatened, and Endangered Species and Habitats Management at the SMR** above.

7.8 Fire Management

Fire management activities will be conducted all three facilities for management of natural resources. Fire management at the ECTC and SMR are for maintenance of the PPSOW and Dry Appalachian Oak natural communities, while at the NHNGTS it is for maintenance of grasslands and shrublands. Fire management activities are covered in the Integrated Wildland Fire Management Plan in **Appendix F** of this document.

7.9 Agricultural Outleasing

The NHARNG does not currently have, or plan to have, any agricultural outleasing on any of its properties.

7.10 Integrated Pest Management Program

All pest management activities will be conducted in accordance with the NHARNG Integrated Pest Management Plan (IPMP) (NHARNG, 2011). The IPMP is being updated, expected to be implemented during 2022-2023. An integrated approach will be used via a combined effort through the use of cultural, biological, mechanical and chemical controls. Maintenance staff are primarily responsible for both indoor and outdoor control in coordination with the Pest Manager. Pests, such as forest pest and invasive species, which have the potential to negatively impact the natural communities' onsite are managed by the NHARNG Environmental Office.

The following management activities will address pests' at all 3 properties covered in this plan:

- Conduct surveys for forest pest's onsite. Focus will be on those that have a potential to be onsite and have a negative impact on the rare natural communities. Information from the NH Bugs website (https://nhbugs.org/) will be used to determine current species range and status in the state.
- The NHARNG will work with the State of NH Department of Agriculture and other state agencies to address control of an invasive insect pest, if found onsite. The US Department of Agriculture is a good resource for control methods for common invasive species found in NH (https://www.invasivespeciesinfo.gov/unitedstates/nh.shtml).
- The NHARNG will maintain a current list and location information for all known invasive plant species onsite. This will be done through surveys and maintenance of GIS data. Focus will be given to invasive species which have a potential to negatively impact rare species/natural communities and military training activities onsite.
- Integrated pest management techniques will be used to control all pests, and chemical control will only be used when other control methods are not effective. All chemical control methods will be in compliance with the NHARNG IPMP (NHARNG, 2011) as well as federal, state and local laws.

- The NHARNG will discuss pest issues with the BOS/site commander in the annual meeting, or as needed. Any control methods will ensure protection of both natural resources and human health.
- Avoid the use of herbicides and pesticides within 100’ of wetlands, streams and vernal pools onsite. Regulations limit application of pesticides applications include Pes-1001 (25’ from non-public waters), NH Shoreland Water Quality Protection Act RSA 483-B (50’ from protected waterbodies), Pes-502 (250’ from public water supplies.
- Facilities staff will use only general use pesticides on property immediately adjacent to the buildings in accordance with Pes-303.The NHARNG has no NH certified pesticide applicators.
- Additional conservation measures that relate to pest management are discussed throughout this document, such as **Section 7.4 Management of Rare, Threatened, and Endangered Species and Habitats**, **Section 7.5.1 Water Resource Protection at the NHNGTS** and **Section 7.6 Grounds Maintenance**.

7.10.1 Pest Management at the NHNGTS

The NHNGTS has two water wells onsite which provide all the potable and non-potable water to the site. The site also falls within the wellhead protection area for the Strafford school. Because these wells provide drinking water to site users they are registered with the NHDES, pest management application and storage activities are regulated in these areas. Any pesticide applications within either the wellhead or sanitary protection radius for the wells need a Special Permit from the NHDES Pes- 502. **Figure 16** depicts the wellhead protection area for the Strafford school.

No waterbodies covered under the NH Shoreland Water Quality Protection Act exists onsite. Pesticides applied within 25’ of surface waters onsite will also require a Special Permit (Pes-502).

All pesticide applications not covered under the janitorial exemption of the state pesticide application rules (Pes-303) will require a certified pesticide applicator. At this time there are no certified applicators onsite. **Table 31: Invasive Species at the NHNGTS** below lists the invasive plant species known to occur onsite. To date all invasive plant species are controlled using mechanical treatment by hand pulling and/or digging.

Table 31: Invasive Species at the NHNGTS

Common Name	Scientific Name	Distribution	Recommended Control Method
Autumn Olive	*Elaeagnus umbellata*	Hedgerow and semi-improved	Mechanical, cutting and hand pulling
Bull thistle	*Cirsium vulgare*	Semi-improved	Mechanical, hand pulling
Burning Bush	*Euonymus alatus*	Semi-improved and forest	Mechanical, cutting and hand pulling
Canada thistle	*Cirsium arvense*	Semi-improved	Mechanical, hand pulling
Japanese barberry	*Berberis thunbergii*	Forest	Mechanical, cutting and hand pulling
Morrow's honeysuckle	*Lonicera morrowii*	Hedgerow and semi-improved	Mechanical, cutting and hand pulling
Multiflora rose	*Rosa multiflora*	Hedgerow and semi-improved	Mechanical, cutting and hand pulling
Oriental Bittersweet	*Celastrus orbiculatus*	Hedgerow	Mechanical, cutting and hand pulling

In addition to the plant species listed above Poison Ivy (*Toxicodendron radicans*) can be found throughout the site, but most abundant in the semi-improved fields and hedgerows. This species negatively impacts both military training activities as well as natural resource considerations through its skin irritation and climbing growth form. Impacts to training occur by restricting training activities in areas with high density of the plant due to human reaction from contact with the plant (rash). The plant forms thick mats throughout the fields making it difficult to pass through. Management of this species through mechanical or prescribed burning control methods can be difficult due to irritating oils the plant produces. Chemical control will be considered to help reduce its abundance in areas where military training and natural resource management occur. Control may also be needed prior to prescribed fire activities to ensure safety of fire personnel.

7.10.2 Pest Management at the ECTC

Surface waters at the ECTC contain both wetlands and the Soucook River. If pesticides are to be applied adjacent to these areas a special permit will need to be issued from the NHDES and NH Department of Agriculture.

In accordance with the janitorial exemption of the NH pesticide rules (Pes 303) pesticide applications not immediately adjacent to buildings will require a certified applicator. This includes pesticide applications for such things as forest pests, invasive species and noxious weeds found onsite. **Table 32: Invasive Species at the ECTC** below list invasive plants known to exist onsite.

Table 32: Invasive Species at the ECTC

Common Name	Scientific Name	Distribution	NHB recommended control
Autumn olive	*Elaeagnus umbellata*	3 occurrences, powerline and near river	Mechanical, pulling
Black locust	*Robinia pseudoacacia L.*	Forest edge of Improved areas	Pulling
Black swallow-wort	*Cynanchum nigrum*	Along forested trail within pine barrens	Mechanical, pulling
Chinese silvergrass	*Miscanthus sinensis*	Single clump along powerline	Mechanical, pulling
Common reed	*Phragmites australis ssp. australis*	Small clump along powerline	Mechanical, pulling
Japanese barberry	*Berberis thunbergii*	Several locations along floodplain	Mechanical, pulling
Japanese knotweed	*Fallopia japonica*	Adjacent to property along river, retention basin	Mechanical, pulling. Possible herbicide.

Common Name	Scientific Name	Distribution	NHB recommended control
Morrow's honeysuckle	*Lonicera morrowii*	Single location along river	Mechanical control (may be difficult due to location)
Oriental bittersweet	Celastrus orbiculatus	Single location along river	Mechanical, pulling
Purple loosestrife	*Lythrum salicaria*	Along floodplain and powerline	Control impractical and unnecessary
Reed canary grass	*Phalaris arundinacea*	Along floodplain and powerline	Control impractical and unnecessary

If pesticide/herbicide application is required within the undeveloped portion of the site protection measures for rare plants and/or animals will be followed, as described in **Section 7.3.2** above.

7.10.3 Pest Management at the SMR

No surface waters exist on the SMR, nor do any drinking water well exist on or immediately adjacent to the site. Pest management activities outside the habitat restoration area are conducted by state maintenance staff or contracted certified pesticide applicators. The use of herbicides has historically been used to treat and inhibit growth of vegetation along the perimeter fence line to maintain security requirements. Herbicide treatments are conducted by NH certified pesticide applicators, as the NHARNG does not have certified pesticide applicators on staff.

Control of invasive and non-desirable plant species within the habitat area is primarily done by mechanical means, such as hand pulling or digging, when effective. Occasionally some aggressive species require the use of herbicides to effectively control. To date one plant species, switchgrass (*Panicum virgatum*), has begun to invade the habitat area and required the use of herbicide application to control. Given the highly disturbed habitat it is likely that additional species will invade and require herbicide application. Since these species being controlled are in close proximity to both rare plant and animal species, precautions will be taken to ensure protection of these species is maintained when herbicide application is considered required for habitat management. **Table 29** in **Section 7.4.3** above outlines conservation measures that will

be taken during herbicide applications to ensure protection of all rare species known to exist onsite.

Table 33: Invasive Species at the SMR

Common Name	Scientific Name	Distribution	Control Method
Autumn olive	*Elaeagnus umbellata*	Scattered throughout habitat area	Mechanical, cutting/digging
Black swallow-wort	*Cynanchum louisea/Cynanchum rosicum*	Isolated near captive rearing facility and JFHQ	Mechanical, hand pulling
Black locust	*Robinia pseudoacacia*	Scattered throughout habitat area	Mechanical, hand pulling
Bull thistle	*Cirsium vulgare*	Scattered throughout habitat area	Mechanical, hand pulling
Glossy buckthorn	*Rhamnus frangula/Frangula alnus*	Scattered throughout habitat area	Mechanical, cutting
Japanese honeysuckle	*Lonicera japonica*	Pockets throughout	Mechanical, cutting/digging
Oriental bittersweet	*Celastrus orbiculatus*	Pockets throughout	Mechanical, Pulling
Siberian elm	*Ulmus pumila*	Pockets throughout	Mechanical, cutting/digging

Vertebrate species, such as voles (*Microtus spp*.), skunk (*Mephitis mephitis*) and woodchuck (*Marmota monax*), have also historically caused damage to the habitat area on the SMR. Voles have girdled pitch pines in winter, while woodchucks and skunks significantly feed on lupine and newly planted nectar species. Control of these mammals has been with the use of mechanical means through use of trapping. This

method has been marginally successful and labor intensive. Killing traps for groundhogs will be used beginning in 2021-2022, due to the relative ineffectiveness of live trapping.

7.11 Outdoor Recreation

The NHARNG is a trustee of public land and has a responsibility to protect and enhance environmental quality, conserve natural resources, and provide opportunities for outdoor recreation. The NHARNG encourages low-impact public use of lands, when it does not interfere with the military mission. Low-impact recreational activities include hiking, fishing, hunting, nature observation. No OHRV use is allowed on NHARNG land (per RSA 215-A:29, XI), along with camping, target practice or other impactful activities.

7.11.1 Outdoor Recreation at the NHNGTS

Currently, local residents use the site for recreational activities such as hiking and hunting. Historically public use has been limited and has not interfered with military training activities. Although the public actively utilizes the site, there are no formalized outdoor recreation activities or programs at the NHNGTS. No special hunting or fishing laws apply at the NHNGTS. Anyone utilizing any sites for recreational hunting or fishing must hold a valid state issued permit.

Currently, recreational activities may be temporarily restricted when they conflict with military operations at the NHNGTS. Road gates are typically locked to restrict access by cars and OHRV, therefore access is by foot traffic only and would occur during non-training periods. Other than for training activities, there is no plan or reason to restrict public access to the site.

7.11.2 Outdoor Recreation at the ECTC

The ECTC is used on occasion by local citizens for recreational activities such as hiking, fishing and hunting. During the summer months, kayaking and swimming in the Soucook River along with occasional forays onto NHARNG land seem common. Although the public actively utilizes the site, there are no formalized outdoor recreation activities or programs at the ECTC. No special hunting or fishing laws apply at the ECTC. Anyone utilizing any sites for recreational hunting or fishing must hold a valid state issued permit.

Currently, recreational activities may be temporarily restricted when they conflict with military operations. The NHARNG does not intend to further restrict future activities unless they conflict with the military use of the site.

During development and consultation with the USFWS for the RTI Environmental Assessment (EA) prepared in 2009 (NHARNG, July 2009), a fence and signage was required around the lupine population along the power line easement. Once installed, this fence and signage will continue to be maintained by the NHARNG. These

measures will provide both protection of the lupine and awareness to those utilizing the site.

Various portions of the ECTC historically and presently are used for unsanctioned, informal target practice by members of the public, especially along the powerline easement. These activities conflict with the military use of the site, as well as pose a risk to the drinking water and safety of individuals. The NHARNG discourages/prohibits target practice due to the potential for groundwater contamination and safety issues. If illegal activities are encountered, the local authorities will be notified.

7.11.3 Outdoor Recreation at the SMR

Although the grounds and land were formerly open to the public, it is currently completely fenced and gated. Therefore there is no public access to the land, and use is limited to some recreational walks by staff and contractors of the NHNG.

7.12 Cultural Resources Protection

Cultural resources at all NHARNG sites are managed under the NHARNG's ICRMP (NHARNG, 2008), as amended. The ICRMP serves as the NHARNG's comprehensive plan for managing cultural resources installation-wide, in concert with the military mission. Implementation of the natural resource management activities referenced and described in this INRMP must be performed in accordance with the standard operating procedures referenced in the ICRMP in order to avoid and/or minimize any adverse effects to cultural resources.

Cultural resources under the stewardship of the NHARNG can consist of archaeological sites, cultural landscapes, documents, historic buildings, and structures; Native American sacred sites and properties of traditional, religious, and cultural significance; and artifacts contained in the NHARNG's archaeological collection which is curated and stored at the NH Division of Historical Resources (NH DHR) lab in Concord. A cultural resources inventory has been compiled based on the results of archaeological surveys, historic building surveys, and archival and site record searches that have been completed to date, and is included in the ICRMP. The current state-wide inventory includes 21 historic buildings and structures that are eligible for listing on the National Register of Historic Places (NRHP), 8 archaeological sites (including 2 that are NRHP-eligible). Although one recorded NHARNG archaeological site is a late Paleo-Indian site, no traditional cultural places (TCPs), or Native American sacred sites, have been recorded on NHARNG sites and training installations.

The NHARNG is in the process of completing an update of the *Integrated Cultural Resources Management Plan (ICRMP) 2008-2012*, which is an internal compliance and management tool that integrates the cultural resources program with ongoing mission activities. The *Draft Integrated Cultural Resources Management Plan Revision for Sites*

and Training Installations of the New Hampshire Army National Guard, Fiscal Years 2019-2023, dated March, 2020 describes the NHARNG's cultural resources, including those present at the NHNGTS, the ECTC and the SMR, and establishes priorities for cultural resources management within the NHARNG. The updated ICRMP will serve as the NHARNG's comprehensive plan for managing cultural resources. It includes detailed information regarding applicable cultural resources management laws, regulations, and standard operating procedures, as well as descriptions of known and potential cultural resources present on NHARNG's installations and outlines appropriate compliance and management activities for the next 5 years. It also readily identifies potential conflicts between the NHARNG's military mission and cultural resources, and the compliance actions necessary to maintain the availability of mission-essential properties and acreage, while protecting known cultural resources. The 2020 ICRMP Revision is being prepared in consultation with the New Hampshire Division of Historic Resources (NH DHR), and federally-recognized Native American tribes.

Federal law requires military installations to consult with all federally-recognized tribes who have an interest in New Hampshire.. The NHARNG has considered, and is committed to complying with all applicable Federal laws regarding consultation with tribal governments, including the *Annotated DoD Policy on American Indians and Alaska Natives* (August 17, 2004), *Department of Defense Instruction (DODI) 4710.2* (September 14, 2006); E.O. 13175, *Consultation and Coordination with Indian Tribal Governments* (January 5, 2001), *Army Policy Guidance for Implementing American Indian and Alaska Native Policy* (July 10, 2014), the Native American Graves Protection and Repatriation Act (NAGPRA), and the National Historic Preservation Act (NHPA).

No federally-recognized tribes exist in New Hampshire at the present time. In accordance with the above-referenced policies and guidance, the NHARNG has been conducting Government to Government consultation with two federally-recognized tribes, the Penobscot Nation of Indian Island, Maine, since 2010, and the Aroostook Band of Micmacs of Presque Isle, Maine since 2013.

Cultural resources could present constraints to various natural resources management activities proposed in this INRMP. Proposed ground disturbing activities associated with the INRMP could require NHPA Section 106 consultation with NH DHR and the above-referenced tribes. When necessary, the NHARNG's Cultural Resources Manager (CRM) would initiate the Section 106 review process with the State Historic Preservation Officer (SHPO) at the NH DHR, and consult with the respective Tribal Historic Preservation Officer (THPO) representing each of the above-referenced tribes, to avoid and/or minimize impacts to cultural resources.

The NHARNG CRM would submit the Draft INRMP and the accompanying Draft INRMP EA to the SHPO for review. Specific procedures for Section 106 consultation and

procedures for inadvertent discovery are specified in the ICRMP. The NHARNG CRM would also consult with the two above-referenced tribes, as appropriate, for any proposed INRMP activities that may have a potential to significantly affect protected tribal resources, or tribal rights. The ICRMP Revision includes contact information for the THPOs of the two tribes, and consultation procedures.

Management actions proposed by the NHARNG to avoid or minimize impacts to cultural resources are included in the original ICRMP (2008-2012) and the Draft ICRMP Revision (FY 2015-2019). The majority of these management actions have been completed to date, but the remaining portion are proposed to be completed over the next 5 years to allow the NHARNG to efficiently achieve compliance with cultural resources regulations, while supporting the vital military mission at each of its installations and training sites into the future.

NH Revised Statutes Annotated (RSA) Chapter 117-C:11, Confidentiality of Archaeological Site Location Information requires that “information which may identify the location of any archaeological site on state land, or under state waters, shall be treated with confidentiality so as to protect the resource from unauthorized field investigations and vandalism”. Further this law provides that “such information is exempt from all laws providing rights to public access.” Accordingly, in compliance with this law, no specific description of the location of any archaeological resources or maps of the locations of any recorded archeological sites is being provided in this INRMP, and the survey reports are not included as an appendix to this document.

7.12.1 Cultural Resource Protection at the NHNGTS

Table 34: Archaeological Surveys Conducted at the NHNGTS

Survey Year	Type	Prepared by	# Acres	# of STPs	# Artifacts	Recorded Sites
1999	Phase 1A PLS	Sargent Museum		51	98	0
2001	Phase 1B	Howe (VBI)	12	8	2	0
2002	Phase 1B	Wheeler (IAC)	60	96	23	2 Pre-Contact
2012	Phase 1B	Wheeler (IAC)	104	83	95	0
2013	Phase 1B and Partial Phase II Determination of Eligibility (DOE)	Wheeler (IAC)	4.1	33	0	0
2014	Phase II DOE	NE ARC	0.5	77	56	1 (Combined the 2002 Pre-Contact sites)

2015	Phase 1B and Phase II DOE	NE ARC	0.6	18	0	0
2016	Phase 1B	NE ARC	6.2	113	0	0

7.12.2 Cultural Resource Protection at the ECTC

Table 35: Archaeological Surveys Conducted at the ECTC

Survey Year	Type	Prepared by	# Acres	# of STPs	# Artifacts
2007	1A/1B	AMEC/ IAC	189	105	None; 1 Euro-American site recorded
2011 & 2012	1B	IAC	46.53	220	2 Euro-American/ No pre-Contact
2012	1B	IAC	26.32	119	None
2013	1B	IAC	43.5	100	None
2014	1B/II DOE	NE ARC	0.3	30 and 2 test units	774 Euro-American
2014	1B	NE ARC	18	195	None
2014	1B	NE ARC	5.88	78	None

As referenced in **Section 6.4 Natural Resources Constraints to Missions and Mission Planning,** the ECTC has three recorded archaeological sites. Any proposed prescribed fire or any ground disturbance activities in or within 25 feet around these three archaeological sites must be cleared with the DMAVS Cultural Resources Manager prior to proceeding with those activities. All management for the INRMP and the IWFMP that would involve ground disturbance will be coordinated through DMAVS Cultural Resources Manager. The NHDHR has concurred with the findings of one Phase 1B study that “there are no known properties of archaeological significance within test areas 2, 3, 4, 5 and 6 with the undertaking’s potential impact” (NHDHR, May 15, 2014). Test Areas 7 and 8 have also been cleared of any archaeological sensitivity. As of 2018, all prescribed fire units have been cleared for wildfire activities. Since these areas have been cleared for archaeological sensitivity, all planned activities proposed in the INRMP and the IWFMP may proceed without further consultation in these areas. Coordination with the NHARNG Cultural Resources Manager is required prior to conducting any ground-disturbing activities proposed in the INRMP and the IWFMP within these specific test areas. Map 10 within the IWFMP depicts the burn units identified in the IWFMP.

7.12.3 Cultural Resource Protection at the SMR

No archaeological surveys have been conducted at the SMR to date. The NH DHR noted in a letter dated March 18, 1999 that there are “No Resources Present” on the SMR, due to previous disturbance throughout the property. No future archaeological surveys of the property are required.

However, 2 buildings on the SMR (Building B and Building M) have been determined to be ”Eligible” for listing on the National Register of Historic Places.

7.14 Enforcement

In nearly all circumstances, law enforcement is called to handle illegal activity. In response to illegal activity related to the natural resources onsite, specifically hunting and fishing violations or issues, NHFG is called. The NHARNG would report any suspected criminal activity to local law enforcement. No regular enforcement or patrolling is conducted, leaving NHARNG responsible to notify NHFG/law enforcement if necessary.

7.15 Public Outreach

DMAVS/NHARNG does not conduct formal public outreach at any facilities beyond prescribed fire notifications and those required by law, such as NEPA and natural resource management planning documents. The public does utilize our sites for occasional recreational activities and awareness of natural resource protection should be communicated. At the ECTC an informational kiosk is installed which describes natural and cultural resource management activities onsite. The SMR is restricted access and therefore the public do not utilize the site. The NHNGTS has no formal communication method other than those listed above.

Chapter 8 - Management Goals and Objectives

This list serves as the format for achieving the goals of the INRMP. The timeline for the objectives and projects, along with updates may be found in the Work Plan, Appendix G. All major management proposals listed in multiple sections throughout this plan are included within this section. However, not all management activities appear within the goals and objectives listed below. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project. Conservation measures are also not considered management goals, objectives, or projects, but give guidance to when or how goals, objectives, or projects can be completed at lower risk to natural resources. This chapter in addition to the content within previous sections should form a holistic list of management items for each natural resource.

8.1 Goals and Objectives for the NHNGTS

The small-whorled pogonia generally inhabits mid-successional mixed-deciduous or mixed-deciduous/coniferous forests. Their habitat typically includes sparse to moderate ground cover, sunlight gaps, and long-persisting breaks in the forest canopy (USFWS 1992; Mehrhoff 1989a). To maintain the population found onsite, management of the forest is necessary. All major management proposals listed in **Section 7.4.1.7 Rare Plant Management at the NHNGTS** are listed below are objectives or projects. Those management activities not listed may be considered elsewhere in this section and or plan, or are different enough in scope or size that they cannot be considered a goal, objective, or project.

GOAL 1: Improve habitat for the federally threatened small-whorled pogonia within the potential habitat area.

- **Objective 1.1**: Reduce canopy cover by 50% in 50-75% of the small-whorled pogonia area by 2023
    - **Project 1.1.1:** Plan and execute selective forestry management annually to reduce canopy cover throughout the lifespan of this plan or until canopy reduction goal is complete (project executed FY20)
    - **Project 1.1.2:** Annually survey the potential habitat area for additional individuals
    - **Project 1.1.3:** Assess results of **Project 1.1.1** and execute additional habitat management for small whorled pogonia management if necessary

To benefit and improve habitat for regionally rare grassland birds, maintenance of grasslands existing onsite is necessary. Frequent treatments are necessary to promote early successional native grasses, and to suppress woody growth. All major management proposals listed in **Section 7.3.1 Flora and Fauna Management at the NHNGTS** are listed below as objectives or projects, and often in greater detail than it was listed before. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 2: Manage 50% of the semi-improved portion of the site to provide habitat to support a diverse grassland and early successional bird population

- **Objective 2.1:** Maintain a minimum of one 4 acre unfragmented block to support grassland bird species
    - **Project 2.1.1:** Conduct bird (avian) planning level survey in 2024
    - **Project 2.1.2:** Conduct grassland management activities (mowing or prescribed fire) on a 3-4 year rotation in grassland units outside primary bird nesting season (15 April through 15 August)
- **Objective 2.2**: Maintain minimum of an additional 5 ½ acres of the semi-improved land to support both grassland and early successional bird species and military training needs
    - **Project 2.2.1**: Meet with the Base Operations Supervisor annually to discuss mowing needs to support upcoming military training needs
    - **Project 2.2.2:** In consultation with the BOS and Training staff, develop a mowing and/or prescribed fire map to depict grassland management areas by 2021
    - **Project 2.2.3**: Mow or conduct prescribed fire activities on a 3-4 year rotation to discourage woody vegetation establishment outside primary nesting season
- **Objective 2.3:** Maintain <30% native woody vegetation throughout semi-improved area
    - **Project 2.3.1**: Survey semi-improved area for woody native and non-native plants by 2021. Develop a GIS map depicting general woody vegetation distribution, density and species list to identify native and non-native species distribution
    - **Project 2.3.2**: Develop a plan for non-native and invasive species removal with target areas of control by 2022
    - **Project 2.3.3**: Conduct non-native woody vegetation removal in a minimum of one target area in 2022
    - **Project 2.3.4**: Conduct non-native and invasive species removal in a second target area in 2024

Invasive species are non-native organisms that establish populations in a natural community. In many cases, the natural community in which an invasive species has colonized has not evolved to the species' presence. Due to the lack of an evolutionary check, invasive species typically have no predators or control mechanisms in the community in which it is newly established. With no growth or reproductive suppression, invasive species tend to breed and spread quickly. This leads to the invasive species out-competing native species for resources. A recent report states that nearly 42 percent of threatened or endangered species are at risk due to invasive species (National Wildlife Federation, 2019). All major management proposals listed in **Sections 7.4.1.7 Rare Plant Management at the NHNGTS**, **7.7.1 Forest Management at the NHNGTS and ECTC**, and **7.10.1 Pest Management at the NHNGTS** are listed below as objectives or projects, and often in greater detail than it was described before. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 3: Monitor and control invasive species that are potential harmful to natural communities and/or military training on the site.

- **Objective 3.1:** Monitor invasive plant species populations annually to maintain current invasive species list and distribution
    - **Project 3.1.1:** Annually conduct field survey for invasive species onsite. All invasive species location information will be maintained in the GIS database to reflect current conditions onsite
    - **Project 3.1.2**: Annually discuss with BOS plant species that have a negative impact on military activities onsite
- **Objective 3.2:** Manage invasive species onsite that have a potential to negatively impact natural resources or military training activities
    - **Project 3.2.1:** Annually prioritize target species for control. Develop a work plan and/or contracting necessary to target species
    - **Project 3.2.2**: Conduct a minimum of 1 invasive control project every 2 years. Control can be either mechanical or chemical and can be combined with Projects within Goal 2 above
- **Objective 3.3:** Maintain current information on invasive insect and fungal pests that are potentially harmful to natural communities on the site
    - **Project 3.3.1:** Conduct annual field surveys for non-native insect and fungal pests that have potential to inhabit the native communities' onsite
    - **Project 3.3.2:** If needed, coordinate with state officials to develop a control strategy to address the issue

Planning level surveys are necessary to determine the flora or fauna species that utilize each installation. Certain species groups such as birds, insects or bats tend to be secretive, rare, or difficult in nature to detect. Contracting field experts to conduct planning level surveys will serve as an accurate, effective way to keep updated species lists for each installation. All major planning level surveys are listed in multiple sections throughout this plan are listed below as objectives or projects, and often in greater detail than it was described before. Those surveys not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 4: Conduct planning level surveys as needed to maintain a foundation for effective planning and decision making

- **Objective 4.1:** Conduct a minimum of one fauna planning level survey annually, or as needed
    - **Project 4.1.1:** Conduct bird (avian) planning level survey in 2024
    - **Project 4.1.2:** Conduct an acoustic bat survey in 2021, 2023, and 2025.
    - **Project 4.1.3:** Conduct insect, including dragonflies, butterflies and bumblebees survey in 2021
    - **Project 4.1.4:** Conduct amphibian survey, to include locations of vernal pools habitat, in 2022
    - **Project 4.1.5:** Conduct PLS for turtles in 2023
    - **Project 4.1.6**: Annually conduct snake survey via cover boards
    - **Project 4.1.7**: Conduct vernal pool surveys in 2020, 2022, 2024

The quality of ground and surface waters affect the health of the human and the environment. To avoid costly remediation of waters onsite, prevention and protection of waters serve to save time, effort, and the health of natural resources onsite. All major management proposals listed in **Sections 4.5.1 Hydrology of the NHNGTS**, **5.5.1 Water Resources at the NHNGTS**, **7.4.1.3 Amphibian and Reptile Management at the NHNGTS**, **7.5.1 Water Resource Protection at the NHNGTS**, **7.6.1 Grounds Maintenance at the NHNGTS** are listed below as objectives or projects, and often in greater detail than it was described before. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 5: Protect ground and surface waters onsite

- **Objective 5.1:** Identify and repair any areas of potential erosion concern as a result of construction of training activities in the semi-improved and unimproved areas

    - **Project 5.1.1:** Conduct a site visit and identify any current or potential future erosion control concerns and establish corrective actions at a minimum, annually
    - **Project 5.1.2:** Meet annually with the BOS to identify any erosion concerns onsite and develop a plan to address those issues
- **Objective 5.2:** Maintain current information on activities in and around water resources onsite that have a potential negative impact on water resources
    - **Project 5.2.1:** Annually conduct site survey to identify potential concerns (hazardous material storage, fueling near drinking water wells, pesticide usage, etc). This should be conducted with the Water Resource Manager
    - **Project 5.2.2:** Meet annually with the BOS to discuss existing concerns identified, potential future concerns and means to address problems identified

In addition to the intrinsic value of conserving a NH Exemplary Natural Community, the black gum - red maple swamp provides critical habitat for insects, amphibians, birds and countless other natural resources onsite. Exemplary communities also provide heterogeneity across the landscape, increasing the site's resiliency. Protecting this community also relates to the Goal 5, protecting ground and surface waters onsite. There are no major management proposals listed for this exemplary natural community. However, water protection onsite will serve to manage and sustain this natural community. Those water protection strategies are considered in **Section 7.5.1 Water Resource Protection at the NHNGTS**, and are slightly altered to describe protections to the exemplary natural community onsite.

GOAL 6: Protect black gum swamp exemplary natural community from upland activities that could potentially have a negative impact on the community and the species dependent on the swamp

- **Objective 6.1:** Maintain 100' natural woodland protective buffer around black gum swamp
    - **Project 6.1.1:** Conduct annual onsite monitoring to ensure protection of the community from nearby construction and/or training activities

GOAL 7: Ensure protection of natural and cultural resources of value through implementation of this plan in support of military mission requirements

- **Objective 7.1:** Provide awareness targeted at units utilizing the site to provide awareness of critical natural resources onsite as well as conservation measures in place
    - **Project 7.1.1:** Generate and distribute a minimum of 1 awareness material in 2022

- **Project 7.1.2:** Annually provide natural resource training at unit Environmental Compliance Officer training event(s)
- **Project 7.1.3**: Generate and distribute a minimum of one additional awareness material by 2023
- **Project 7.1.4**: Work with BOS to develop a permanent location where current environmental information can be displayed to site users, such as a kiosk. Have permanent display installed by 2024

8.2 Goals and Objectives for the ECTC

In addition to the intrinsic value of conserving a NH Exemplary Natural Community, pitch pine scrub oak woodland provides critical habitat for insects, amphibians, birds and countless other natural resources onsite. Exemplary communities also provide heterogeneity across the landscape, increasing the site's overall habitat value. All major management proposals present in **Section 7.4.2.6 Exemplary Natural Community Management at the ECTC** are listed below as objectives or projects, and often in greater detail than it was described before.

GOAL 1: Restore and maintain the Pitch Pine scrub – oak woodland (PPSO) exemplary natural community onsite in support of rare flora and fauna. Goals will work toward the vegetation structure identified in **Section 7.4.2.6.1 Pitch Pine-Scrub Oak Woodland (PPSOW)**

- **OBJECTIVE 1.1:** A multi-age stand of Pitch Pine (seedlings, saplings to mature canopy trees) is important for long term health of this disturbance adapted community. Demonstrate Pitch Pine regeneration in 50% of managed PPSOW within two growing season following a treatment by 2025.
  - **Project 1.1.1**: Conduct vegetation monitoring in each PPSOW units in growing season following treatment for evidence of Pitch Pine regeneration. Continue to monitor as needed thereafter to assess survivorship
  - **Project 1.1.2**: Transplant seedlings from onsite or local area in units where recruitment is not naturally occurring. These are area where mineral soil was not exposed, density of mature seed producing trees is low or natural recruitment is not occurring based on vegetation surveys.
- **OBJECTIVE 1.2**: A variety of rare Lepidoptera feed on the young leaves and detritus of Scrub Oak. Ensure at least 50% of the shrub strata within the PPSOW is composed of Scrub Oak by 2024.
  - **Project 1.2.1:** Implement disturbance, mechanical or prescribed fire, regime outlined in **Section 3.1** of the IWFMP. This ensures new plant

growth suitable for feeding as well as reduction in non-desirable species which may begin to get established (such as Red Maple).
    - **Project 1.2.2:** Conduct vegetation monitoring in each PPSOW units starting the growing season following treatment to determine Scrub Oak density, and as needed thereafter
    - **Project 1.2.3:** Collect acorns for planting, or transplant seedlings from onsite or local area in units where recruitment is not naturally occurring

- **OBJECTIVE 1.3**: Small grassy openings naturally occur within the PPSOW community and provide habitat for a variety of plants and wildlife. Maintain a minimum of 2 grassy openings (less than 30% shrub and canopy cover) in the PPSOW that are between .5 and 1 acre in size.
    - **Project 1.3.1**: Identify 2 areas within the PPSOW to be maintained as grassy openings in 2021
    - **Project 1.3.2:** Conduct vegetation monitoring in areas to determine tree and shrub cover by 2022. Once baseline is established continue to conduct monitoring as needed no less than every 5 years thereafter
    - **Project 1.3.3:** Meet annually with the Wildland Fire Program Manager to discuss the coming year's treatment plan to ensure openings are maintained. Conduct mechanical and/or prescribed fire activities as needed to maintain openings
    - **Project 1.3.4**: Collect acorns for planting, or transplant seedlings from onsite or local area in units where recruitment is not naturally occurring
- **OBJECTIVE 1.4**: Maintain less than 30% cover of non-desirable species throughout the PPSOW
    - **Project 1.4.1:** Conduct vegetation survey within each PPSOW unit by Fall 2022
    - **Project 1.4.2:** Develop a list of non-desirable tree species by Fall 2022
    - **Project 1.4.3:** Establish priority control management units/areas by Fall 2022
    - **Project 1.4.4:** Conduct management (prescribed fire, mechanical and/or herbicide treatment) in a minimum of 2 control areas by 2025
- **OBJECTIVE 1.5:** Overall vegetation structure goals can take years, even decades to achieve and is constantly changing. By 2024 have a minimum of 12 acres of PPSOW (approx. 4 management units) meet a majority of the objectives listed above
    - **Project 1.5.1:** Conduct vegetation monitoring on all PPSOW units by Fall 2022

    - **Project 1.5.2:** Conduct vegetation monitoring growing season following management and no less than every 5 years thereafter to maintain current vegetation structure information
    - **Project 1.5.3:** Annually develop/update map showing status of vegetation toward meeting goals. This will be used to discuss future management needs with the WFPM for short and long term planning
    - **Project 1.5.4:** Conduct a minimum of one annual meeting between the Conservation Specialist and WFPM to discuss vegetation response to treatment, current status toward vegetation goals and future planning
- **OBJECTIVE 1.6:** Implement the Goals and Objectives (**Section 3.1** of IWFMP) for prescribed fire and/or mechanical treatment in support of pine barrens restoration
    - **Project 1.6.1:** Meet annually with the IWFPM to discuss plans for the upcoming years prescribed fire activities
    - **Project 1.6.2:** Purchase and annually maintain equipment to support prescribed fire activities

Planning level surveys are necessary to determine the flora or fauna species that utilize each installation. Certain species groups such as birds, insects or bats tend to be secretive, rare, or difficult in nature to detect. Contracting field experts to conduct planning level surveys will serve as an accurate, effective way to keep updated species lists for each installation. All major planning level surveys are listed in multiple sections throughout this plan are listed below as objectives or projects, and often in greater detail than it was described before. Those surveys not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 2: A variety of rare and declining fauna and flora species depend on PPSOW and the surrounding landscape throughout the site. Habitat management in the unimproved portion of the site aims to improve conditions for these species while integrating military training needs. Conduct PLS to maintain a foundation for effective planning and decision making.

- **OBJECTIVE 2.1:** Conduct a minimum of 1 PLS annually, or as needed
    - **Project 2.1.1:** Conduct a brook floater survey by 2019
        - (*Relict Project carried over from Pembroke Conservation Plan. Drafted into INRMP but completed before final revisions. Completed 2018*)
    - **Project 2.1.2:** Conduct a breeding bird survey, including nightjars, in 2024
    - **Project 2.1.3:** Conduct a bat survey in 2021, 2023, and 2025

    - **Project 2.1.4:** Conduct an amphibian survey in 2020, 2025
    - **Project 2.1.5:** Conduct a wood turtle survey in 2021 in coordination with NHFG. Monitor individuals annually using telemetry
    - **Project 2.1.6:** Conduct rare plant survey in 2021
    - **Project 2.1.7:** Conduct a moth survey in 2023
    - **Project 2.1.8:** Conduct vernal pool surveys 2020, 2022, 2024
    - **Project 2.1.9:** Conduct annual butterfly survey with focus on federally and state listed species flight times
    - **Project 2.1.10:** Annually conduct snake survey a minimum of twice per month between May and September. Monitor rare species using telemetry
- **OBJECTIVE 2.2:** Photo monitoring can be an effective way to assess habitat condition and changes over time. Establish permanent photo monitoring points and maintain current baseline photos throughout PPSOW throughout the life of the plan
    - **Project 2.2.1:** Establish and conduct photo monitoring points throughout the PPSOW by Fall 2021 to ensure baseline data. Use general guideline of 1 photo per acre
    - **Project 2.2.2:** Conduct photo monitoring a minimum of growing season prior to management and within 2 years following management to track changes. All other units no less than every 5 years
- **OBJECTIVE 2.3:** Establish permanent photo monitoring points throughout the Appalachian Oak forest and take baseline photos by 2024
    - **Project 2.3.1**: Establish and conduct photo monitoring points throughout DAOF (at rate of 5 DAOF units per year). Since this natural community requires less frequent disturbance and is relatively homogenous throughout, a general guideline <u>of 1-2 photo points per management unit.</u>
    - **Project 2.3.2:** Establish guidelines for conducting photo monitoring plots by 2022

Forests at the ECTC consist primarily of Dry Appalachian oak forest (DAOF), representing approximately 72% of forest onsite. Due to its large presence at the ECTC, support and management of this natural community trickles down to all species that use it as habitat. **Sections 7.7.1 and 7.8** contain management activities for DAOF, but are listed below in better detail. In addition, please reference the integrated wildland fire management plan (IWFMP) in **Appendix F** of this document.

<u>GOAL 3</u>: Manage Appalachian Oak forest onsite both in support of the habitat and military training needs

- **OBJECTIVE 3.1**: Implement Goals and Objectives outlined in IWFMP (**Section 3.1**) in support of Appalachian Oak management

    - **Project 3.1.1:** Implement a prescribed fire in a minimum of three Appalachian Oak management unit by 2025
    - **Project 3.1.2:** Have a forest management plan written for the Appalachian Oak forest by 2023
- **OBJECTIVE 3.2:** Ensure current information on land needs so management can support the military mission while maintaining the integrity of the habitat
    - **Project 3.2.1:** Conduct annual meeting between the Site commander, Conservation Specialist and WFPM to discuss current and planned training needs of the site and habitat management activities

Management and protection of rare flora and fauna depend on human awareness. In order to reduce inadvertent or accidental adverse impacts to rare natural resources, awareness training and materials must be developed. Management activities are listed within multiple sections of this plan, primarily **Section 7.4 Management of Rare, Threatened, and Endangered Species and Habitats**, and **7.11 Outdoor Recreation**, **7.15 Public Outreach.** The management activities are described here in more detail.

GOAL 4: Improve awareness to reduce risk to natural resources from training and public use of the site

- **OBJECTIVE 4.1:** Establish protection around critical habitat features onsite within 2 years of identification (allow time for funding request if needed)
    - **Project 4.1.1:** Annually survey fence around lupine in ROW to ensure it provides effective protection to lupine
    - **Project 4.1.2:** If needed, develop a work plan to repair any deficiencies in the fence which fail to adequately protect the lupine from onsite use
    - **Project 4.1.3:** Seek funding as needed to repair and/or maintain fence around lupine
    - **Project 4.1.4:** Maintain critical habitat features identified onsite in GIS. Annually (minimum) discuss these features and potential impacts with both the Site commander, WFPM and wildlife agencies during annual meetings

- **OBJECTIVE 4.2:** Develop a Standard Operating Procedure (or equivalent) to address potential environmental impacts as a result of military training activities by 2024
    - **Project 4.2.1:** Hold a meeting with the Site commander, Operations and Training, Conservation Specialist and WFPM to discuss development of the procedure and identify “due outs” by 2022
    - **Project 4.2.2:** Develop a draft procedure and distribute for internal comments by 2023

    - **Project 4.2.3:** Complete and implement a final procedure by 2024

- **OBJECTIVE 4.3:** Develop and distribute at least 3 awareness materials for rare species protection by 2023
    - **Project 4.3.1:** Develop and present annual training to all military units during regular annual Environmental training
    - **Project 4.3.2:** Develop a minimum of one new awareness material in informational kiosk (existing) to communicate rare species protection in 2021
    - **Project 4.3.3:** Develop one new awareness material focused on protection of species from military training activities onsite by 2021
    - **Project 4.3.4:** Develop one new awareness material focused on species protection from public use/recreation of the site by 2022

The quality of ground and surface waters affect the health of the human and the environment. To avoid costly remediation of waters onsite, prevention and protection of waters serve to save time, effort, and the health of natural resources onsite. All major management proposals listed in **Sections 4.5.2 Hydrology of the ECTC**, **5.5.2 Water Resources at the ECTC**, **7.5.2 Water Resource Protection at the ECTC**, **7.6.2 Grounds Maintenance at the ECTC** are listed below as objectives or projects, and often in greater detail than it was described before. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 5: Protection of both ground and surface waters onsite

- **OBJECTIVE 5.1:** Establish upland protective buffer of 100’ around all surface waters to include wetlands, vernal pools and rivers through implementation of this plan
    - **Project 5.1.1:** Conduct annual onsite monitoring to ensure activities within established buffers are not having an adverse impact on resources (i.e. erosion, dumping, and spills)
    - **Project 5.1.2:** Meet with ECTC Manager annually, or as needed, to discuss any issues and upcoming activities that currently or potentially pose a risk to surface waters. Develop a work plan to address issues that arise
- **OBJECTIVE 5.2:** Develop onsite local management guidelines and NHARNG activity restrictions within the ECTC wellhead protection area by 2023
    - **Project 5.2.1:** Meet with state and local water officials, as needed, to review activities and appropriate conservation measures by 2022

    - **Project 5.2.2:** Incorporate water resource conservation measures into the SOP as developed in Objective 4.2 above
    - **Project 5.2.3:** Develop an environmentally friendly drip torch fuel by 2025 that minimizes pollutant products, and is biodegradable by soil microbes
- **OBJECTIVE 5.3:** Maintain current information on activities in and around water resources onsite that have a potential negative impact
    - **Project 5.3.1:** Annually conduct site survey to identify potential concerns (hazardous material storage, fueling in wellhead protection area, pesticide usage, etc). This should be conducted with the Water Resource Manager
    - **Project 5.3.2:** Meet annually with the ECTC Manager to discuss existing concerns identified, potential future concerns and means to address problems identified

Invasive species are non-native organisms that establish populations in a natural community. In many cases, the natural community in which an invasive species has colonized has not evolved to the species' presence. Due to the lack of an evolutionary check, invasive species typically have no predators or control mechanisms in the community in which it is newly established. With no growth or reproductive suppression, invasive species tend to breed and spread quickly. This leads to the invasive species out-competing native species for resources. A recent report states that nearly 42 percent of threatened or endangered species are at risk due to invasive species (National Wildlife Federation, 2019). All major management proposals listed in **Sections 7.4.2.7 Rare Plants at the ECTC**, **7.7.1 Forest Management at the NHNGTS and ECTC**, and **7.10.2 Pest Management at the ECTC** are listed below as objectives or projects, and often in greater detail than it was described before. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 6: Monitor and control invasive species that are potential harmful to natural communities and/or military training on the site

- **Objective 6.1:** Monitor invasive plant species populations annually to maintain current invasive species list and distribution
    - **Project 6.1.1:** Annually conduct field survey for invasive species onsite. All invasive species location information will be maintained in the GIS database to reflect current conditions onsite
    - **Project 6.1.2:** Annually discuss with Site manager on plant species that have a negative impact on military activities onsite
- **Objective 6.2:** Manage invasive species onsite that have a potential to negatively impact natural resources or military training activities

    - **Project 6.2.1:** Annually prioritize target species for control. Develop a work plan and/or contracting necessary to target species
    - **Project 6.2.2**: Conduct a minimum of 1 invasive control project every 2 years. Control can be either mechanical or chemical and can be combined with Projects within Goal 1 above
- **Objective 6.3:** Maintain current information on invasive insect and fungal pests that are potentially harmful to natural communities on the site
    - **Project 6.3.1:** Conduct annual field surveys for non-native insect and fungal pests that have potential to inhabit the native communities' onsite
    - **Project 6.3.2:** If needed, coordinate with state officials to develop a control strategy to address the issue

8.3 Goals and Objectives for the SMR

The restoration and maintenance of the pitch pine – scrub oak community at the SMR will have multiple benefits. In general, restoration of a globally rare community type (PPSOW) is valuable intrinsically. Secondly, maintenance of PPSOW will attract and support other rare associated species. Objectives and projects for achieving **Goal 1** are listed below, including vegetative structure targets, surveys, mechanical management, and prescribed fire. Those management activities not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 1: Restore and maintain the pine barrens habitat in support of Karner blue butterfly recovery efforts. Implementation of this Goal will be in support of the USFWS Biological Opinion (Issued August 18, 2000), associated EA as well as vegetation structure identified in **Section 7.4.3.6.**

- **OBJECTIVE 1.1:** Have a majority of the habitat management units meeting the vegetation target structure (**Figure 22, Section 7.4.3**) by 2024
    - **Project 1.1.1:** Identify and conduct vegetation monitoring plots throughout the habitat area by Fall 2022. Monitoring should be done growing season following treatment and no less than every 5 years thereafter
    - **Project 1.1.2:** Generate a map depicting current status toward meeting goals by Spring 2023
    - **Project 1.1.3:** Conduct management (mechanical or prescribed fire) in a minimum of 10 units with focus on meeting vegetation structure goals by 2025
- **OBJECTIVE 1.2:** Maintain current information on distribution and quantity of lupine and available nectar throughout the habitat area

    - **Project 1.2.1:** Conduct lupine census, including number of plants and flowering stems with GPS location at a minimum of every 3 years, 2020, 2023
    - **Project 1.2.2**: Using data collected in vegetation monitoring (Project 1.1.1), generate a map depicting available nectar in each management unit by Spring 2023
    - **Project 1.2.3:** Identify priority units for lupine and nectar plantings by Spring 2023
    - **Project 1.2.4:** Seed and/or plant lupine and nectar in a minimum of two priority units by 2025
- **OBJECTIVE 1.3:** Reduce non-desirable plants below 10% cover in a majority of management units by 2024
    - **Project 1.3.1:** Identify and conduct vegetation monitoring plots throughout the habitat area by Fall 2022. Monitoring should be done growing season following treatment and no less than every 5 years thereafter
    - **Project 1.3.2:** Generate a list of non-desirable plant species known to occur onsite (by management unit) by Spring 2023. List should be in order of priority and threat to the integrity to the pine barrens community
    - **Project 1.3.3:** Generate a map depicting management units with greater than 10% cover of non-desirable species by Spring 2023
    - **Project 1.3.4:** Conduct treatment in a minimum of one management unit with the focus of controlling non-desirable species by 2025
- **OBJECTIVE 1.4:** Maintain current information on the distribution of invasive and non-desirable species throughout the habitat area
    - **Project 1.4.1:** Conduct annual survey throughout habitat area to identify invasive plant species. Maintain information in GIS and generate an annual map
    - **Project 1.4.2:** Annually conduct management on a minimum of one invasive plant species. This can be done either through in-house (i.e.: hand pulling), contracted (i.e.: herbicide treatment) or through habitat management activities (i.e.: prescribed fire, mechanical treatment)
    - **Project 1.4.3**: Annually conduct management on non-desirable animal species that adversely affect the Karner blue butterfly. This can be done either through in-house methods (i.e.: trapping), or by contracting out (i.e.: pesticides)
    - **Project 1.4.4**: Meet annually with WFPM to discuss potential prescribed fire treatment to control invasive species
- **OBJECTIVE 1.5:** Implement the Goals and Objectives (**Section 3.1**) outlines in the IWFMP for prescribed fire and/or mechanical treatment in support of pine barrens restoration

    - **Project 1.5.1:** Meet annually with the WFPM to discuss plans for the upcoming years prescribed fire activities

Planning level surveys are necessary to determine the flora or fauna species that utilize each installation. Certain species groups such as birds, insects or bats tend to be secretive, rare, or difficult in nature to detect. Contracting field experts to conduct planning level surveys will serve as an accurate, effective way to keep updated species lists for each installation. All major planning level surveys are listed in multiple sections throughout this plan are listed below as objectives or projects, and often in greater detail than it was described before. Those surveys not listed are considered elsewhere in this section and or plan, or are different enough in scope or size as it cannot be considered a goal, objective, or project.

GOAL 2: Conduct planning level surveys as needed to maintain a foundation for effective planning and decision making

- **OBJECTIVE 2.1:** Conduct a minimum of 1 PLS annually, or as needed
    - **Project 2.1.1:** Conduct a bat survey in 2021, 2023, 2025
    - **Project 2.1.2:** Conduct a rare plant survey in 2021 (excluding lupine, described above)
    - **Project 2.1.3:** Conduct a breeding bird survey, including nightjars, in 2022
    - **Project 2.1.4:** Conduct a moth survey by 2023
    - **Project 2.1.5:** Conduct annual butterfly survey with focus on state and federally listed species flight times
- **OBJECTIVE 2.2:** Photo monitoring can be an effective way to assess habitat condition and changes over time. Establish permanent photo monitoring points and maintain current baseline photos throughout PPSOW throughout the life of the plan
    - **Project 2.2.1:** Establish and conduct photo monitoring points throughout the habitat area by 2021 to ensure a baseline.
    - **Project 2.2.2**: For all units with mechanical or prescribed fire photo monitoring will be done both growing season preceding and following treatment and no less than every 5 years thereafter

Chapter 9 - Implementation

The INRMP will be implemented through the achievement of the goals outlined above. These goals will primarily be implemented by the NHARNG, with guidance from state and federal natural resource agencies. A variety of species and natural communities that occur throughout NHARNG's sites will benefit from the management outlined in this plan.

The NHARNG will conduct implementation through a variety of means. Some of the work will be completed using in-house resources with full-time and part-time staff positions. Work that NHARNG staff is not able to conduct due to lack of technical expertise or time availability will be completed via a contract (subject to funding availability). The NHARNG will seek funds through the National Guard Bureau for activities that are not conducted in-house, however, funding is not guaranteed. If funding or staff time are not available for projects outlined in the Conservation Plan, the NHARNG will make adjustments to the plan as necessary.

Funding for projects may be available from sources other than NGB; staff will pursue additional funds, as needed, either internally within the NHARNG or externally for special projects. **Chapter 6** of the IWFMP describes funding as it relates to fire management onsite. The NHARNG also has the opportunity to apply for and receive funds for approved innovative projects through the Legacy Resource Management Program.

9.1 Work Plan

The work plan describes implementation activities, by site, over the life of this plan, 2021-2025. The NHARNG will review this plan annually in cooperation with the agencies and make adjustments to these tables as needed. Refer to **Appendix G** for the work plan.

9.2 Natural Resources Management Staffing

The DMAVS Environmental Office is currently comprised of five full-time staff members (state employees) and an Environmental Branch Chief (federal employee). Each staff member is responsible for a set of program areas including, but are not limited to: water resources, air resources, cultural resources, hazardous waste/materials, NEPA, endangered species, pest management and Geographic Information System (GIS). The Environmental Office also commonly has 1-3 part-time position(s) for a portion of the year, with one position generally dedicated to natural resource projects. When the DMAVS does not have the manpower or in-house expertise to conduct a project, private contractors may be used. Both part-time employees and contractors are based on the availability of funds.

9.3 Annual Review

In accordance with NGB policy dated 03/20/2019, the NHARNG will annually review the INRMP with internal and external partners. Internal partners primarily include NHNGTS, ECTC, and SMR personnel, and external partners include USFWS and NHFG. Although external partners are required to be invited, they are not required to attend. Other cooperating agencies such as NH Natural Heritage Bureau will also be invited to the meeting. The meeting

will primarily be used to document progress, maintain the INRMP, and determine whether an INRMP Update or Revision is necessary. Specifically, the meeting must address considerations in the Annual Review Template and an updated Project Implementation Table (Enclosures 1&4, NGB Policy). The Annual Review Template provides for detailed discussion about INRMP project implementation, ESA listed species and critical habitat, partnership effectiveness, fish and wildlife management and public use, and team adequacy. The Project Implementation Table visually depicts implementation status of the Goals and Objectives (Chapter 8).

The NHARNG will provide an agenda outlining major discussion points prior to the meeting and provide a memorandum for record (MFR) once the meeting has concluded. The MFR will detail the annual review (minutes), including an attendance sheet, responses to the Annual Review Template questions, and the determination of whether an Update or Revision is necessary. If agencies are not able to attend the review, a summary of the review will be provided via e-mail. Non-attending agencies will retain the opportunity for input and comment. Annual review summaries (including MFR) will be included in Appendix E.

Discussion of Updates and Revisions to the INRMP during the annual review is strongly important. Updates are changes to an existing INRMP that will not result in consequences materially different from those in the existing INRMP. INRMP Revisions are changes to an existing INRMP that may result in a significant environmental impact not included in the current INRMP. Revision and Updates must be discussed and agreed upon by all three agencies. INRMP Updates can be implemented immediately after an annual review discussion, but need to be documented with a Record of Environmental Consideration. INRMP Updates may be implemented after a new or supplemental EA is conducted.

This meeting also serves to exchange any new species specific information obtained throughout the year and review the effectiveness of management activities implemented to date. This meeting will serve as a forum for coordination and cooperation between the agencies.

After five years of implementation, the INRMP must be reviewed for Operation and Effect. The INRMP Review for Operation and Effect evaluates whether the INRMP is being implemented effectively and contributing to the conservation and rehabilitation of natural resources on State ARNG lands. There is no set outline for a Review for Operation and Effect, but the elements of an annual review are a good framework. This review will be conducted during an annual INRMP meeting, and well before the INRMP expires. The results of a Review for Operation and Effect will be agreement among the reviewing parties that an INRMP is currently adequate and can be re-signed, or if an Update or Revision is necessary (NGB Policy, 2019). The Review for Operation and Effect will be performed at least once every 5 years. Required attendees include NHARNG, USFWS, NHFG, and ARNG I&E.

9.4 Monitoring INRMP Implementation

DoDI 4715.03 requires each installation with a SAIA required INRMP to report annually on "Natural Resources Conservation Metrics" to access the overall health of the natural resources onsite. These metrics measure how effective conservation measures are being applied while ensuring no let loss of military training. The NHARNG annually submits this information to the National Guard Bureau ARNG-IE Directorate, which in turn gets incorporated into the DoD annual report to Congress.

Works Cited

Allender, M. C. (2018). Snake Fungal Disease Alters Skin Bacterial and Fungal Diversity in an Endangered Rattlesnake.

Allender, M. C. (2019). DoD Snake Fungal Disease Survey: Natural Resource Manager Training and Data Collection.

AMEC. (June 2007). Phase 1A Archaeological Sensitivity Assessment and Results of Phase 1B Intensive Archaeological Survey, Proposed RTI, Pembroke, NH.

Anderson, C. P. (2003). Amphibian and Reptile Inventory of the New Hampshire Army National Guard Training Site, Center Strafford, NH.

Andrews, C. (2003). Amphibian and Reptile Inventory of the New Hampshire Army National Guard Training Site, Center Strafford, New Hampshire.

Ayling, A. (1895). Revised Register of the Soldiers and Sailors of New Hampshire in the War of the Rebellion 1861-1866.

Bailey, R., Avers, P., King, T., & McNabb, W. (1995). Ecoregions and subregions of the United States (map, scale 1:7,500,000) (supplementary table of map unit descriptions compiled and edited by W.H. McNabb and R.G. Bailey). US Department of Agriculture - Forest Service, Washington, D.C.

Bartlett, R. A. (2009, October 7). Existing Conditions Plat Land of Riverwood Commercial Properties, Inc.

Board, C. P. (2008). Master Plan 2030 - Concord, New Hampshire. Concord. Retrieved 2015, from http://www.concordnh.gov/DocumentCenter/View/1456

Census Bureau, U. (2010). American Fact Finder. Retrieved November 2015, from http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml

Chandler, D. (January 4, 2017). NH Army National Guard Moth Survey at the State Military Reservation (Concord) and the Pembroke Regional Training Institute, 2016.

City of Concord, U. N. (November 2009). Concord Municipal Airport Development and Conservation Management Agreement.

Cornell. (2019). Cornell Wildlife Health Lab. Retrieved from Snake Fungal Disease: https://cwhl.vet.cornell.edu/disease/snake-fungal-disease#collapse9

Doperalski, M. (2020). Personal Communication.

FAA. (8/18/2000). Federal Aviation Administration Biological Opinion, Formal Consultation Log #FY00-001(F).

Federation, N. W. (2019). Invasive Species. Retrieved from The National Wildlife Federation: https://www.nwf.org/Educational-Resources/Wildlife-Guide/Threats-to-Wildlife/Invasive-Species

FEMA, F. E. (2014). FEMA Map Service Center. Retrieved August 2013, from https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1

FEMA. (n.d.). FEMA Flood Map Service Center. Retrieved November 9, 2015, from Federal Emergency Management Agency: https://msc.fema.gov/portal/

Fenneman, N. M., & Johnson, D. W. (1946). Physiographic divisions of the conterminous U.S. (Map). Retrieved December 2011, from United States Geological Survey: http://water.usgs.gov/GIS/metadata/usgswrd/XML/physio.xml

Flanagan, S., Nielsen, K., & Coles, J. (2011, December 19). USGS. Retrieved from Water-Quality Assessment of the New England Coastal Basins in Maine, Massachusetts, New Hampshire, and Rhode Island: Environmental Settings and Implications for Water Quality and Aquatic Biota: http://pubs.usgs.gov/wri/wri984249/pdf/

Goulet, C. (November 2010). Movement and Habitat Use of the Eastern Hognose Snake (Heterodon platirhinos) at the NHARNG Regional Training Institute, Pembroke New Hampshire.

IAC, I. A. (2013). Phase 1B Archaeological Survey, Test Area 6.

IAC, I. A. (February 2, 2010). End-Of-Field Report Archaeological Monitoring 2009, NHARNG, Pembroke NH.

IAC, I. A. (January 17, 2013). Phase 1B Intensive Archaeological Investigation, NHARNG, Pembroke RTI, Test Areas 2,3, and 4 Pembroke (Merrimack County), New Hampshire, Draft Report. Independent Archaeological Consulting.

Johnson, S. (2018). Rapid Habitat Assessment of Soucook River for Brook Floater Pembroke, New Hampshire.

Jones, V. (November 2006). New Hampshire Adjutant General's Department Moth Survey at Proposed RTI Site 2006.

Koteff, C., & Pike, T. (1998). Surficial geologic map of the Suncook quadrangle, Merrimack County, New Hampshire: U.S. Geological Survey, color, scale 1:24,000 (Formerly Geo-120).

Lyons, J., Bothner, W., Moench, R., & Thompson Jr., J. (1997). Bedrock geologic map of New Hampshire. U.S. Geological Survey. Retrieved November 2015

Magee, J. (2016, February 01). E-mail from John Magee, Fish Habitat Biologist, NH Fish & Game Department.

Magee, J. (2019). Personal Communication, direct discussion and email.

Mello, M. (January 2013). New Hampshire State Military Reservation Moth Survey and Identifications Addressing Status of Moths in Restoration Site.

Natural Resource Consulting Service. (2003). Bird Survey of the NH National Guard Training Site, Center Strafford, NH.

Natural Resource Consulting Service. (2003). New England Cottontail Survey of the NH National Guard Training Site, Center Strafford, New Hampshire.

Natural Resource Consulting Service. (2008). Reptile Survey of the NH National Guard Training Site, Center Strafford, NH.

NewEarth, E. C. (2019). 2019 Bird Survey New Hampshire Army National Guard Strafford, NH Training Site.

NH Audubon. (2013). New Hampshire Army National Guard Training Site Turtle Survey. NH Audubon.

NH Audubon. (2014). New Hampshire Army National Guard Strafford, NH Training Site Bird Survey. NH Audubon.

NH Audubon. (2014). Report on 2014 Insect Surveys at the New Hampshire National Guard Training Site, Center Strafford, NH. New Hampshire Audubon.

NH Audubon. (2015). Surveys for ground-nesting bird species at the New Hampshire National Guard Regional Training Institute Pembroke, NH. NH Audubon.

NH Audubon. (2016). New Hampshire Army National Guard Strafford, NH Training Site Amphibian Survey.

NH Audubon. (2017). New Hampshire Army National Guard Strafford, NH Training Site Turtle Survey.

NH Audubon. (2017). Use of the New Hampshire State Military Reservation by Breeding and Migratory Birds.

NH Audubon. (2019). Use of the New Hampshire National Guard Pembroke Edward Cross Training Complex by Breeding and Migratory Birds.

NHARNG. (2008). Integrated Cultural Resources Management Plan for Installations of the New Hampshire Army National Guard, 2008-2012.

NHARNG. (2011). Integrated Pest Management Plan for the New Hampshire Army National Guard.

NHARNG. (2014-2018). Conservation Plan for the New Hampshire National Guard Regional Training Institute, Pembroke, NH.

NHARNG. (2017). Final Environmental Assessment for Construction and Operation of a Readiness Center at 96 Sheep Davis Road, Pembroke, NH.

NHARNG. (December 2000). Final Environmental Assessment of the New Hampshire Army National Guard Army Aviation Support Facility, Concord, NH.

NHARNG. (July 2009). Final Environmental Assessment for Land Acquisition, Construction and Operation of New Hampshire Regional Training Institute 195th Training Regiment.

NHARNG. (June 2014). Integrated Wildland Fire Management Plan for Concord and Pembroke.

NHDES. (2012, February 9). Preliminary Draft INRMP Comments. . Letter from Paul Susca, Supervisor - Planning, Protection & Assistance, Drinking Water and Groundwater Bureau, NHDES.

NHDHR. (May 15, 2014). Letter to NHARNG re: Phase 1B Intensive Archaeological Investigation, NHARNG, Pembroke RTI Test Area 6, Pembroke (Merrimack County) NH and Draft Phase 1B Intensive Archaeological Investigation NHARNG, Pembroke RTI test Areas 2,3, and 4.

NHDOT. (2018). Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire.

NHFG. (2015). NH Wildlife Action Plan. Retrieved from http://www.wildlife.state.nh.us/wildlife/wap.html

NHFG. (2016). The Identification and Documentation of Vernal Pools in New Hampshire, Third Edition.

NHFG. (2016, 12 27). Retrieved from White-nose syndrome: A new threat to New Hampshire's bats: http://www.wildlife.state.nh.us/nongame/white-nose-syndrome.html

NHFG. (2017). Wildlife Species of Special Concern. Retrieved from https://www.wildlife.state.nh.us/nongame/documents/species-special-concern.pdf

NHFG. (February 2016).

NHFGD. (2006). New Hampshire Wildlife Action Plan.

NHFGD. (August 2007). Habitat Management and Monitoring Plan for the Concord Municipal Airport.

NHNHB. (2004). Vegetation Mapping and Floristic Inventory of the New Hampshire National Guard Training Site in Center Strafford, NH. New Hampshire Natural Heritage Bureau.

NHNHB. (2006). NHNHB Animal Record, request dated 5/11/2006.

NHNHB. (2012). About Us - The Natural Heritage Bureau. Retrieved January 10, 2012, from http://www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/about-us/rare-plants.aspx

NHNHB. (2018, June 14). Natural Heritage Bureau. Retrieved from https://www.nhdfl.org/About-Us/Natural-Heritage-Bureau

NHNHB. (February 2018). IICEP Agency Response, NHB Field ID: NHB18-0526.

NHNHB. (February 2018). IICEP Agency Response, NHB File ID: NHB18-0524.

NHNHB. (February 2018). IICEP Agency Response, NHB File ID: NHB18-0525.

NHNHB. (January 2012). Natural Community and Floristic Survey of the New Hampshire National Guard Regional Training Institute Pembroke, NH.

NHNHB. (July 2013). Rare Animal List for New Hampshire.

NHNHB. (March 2018). Rare Animal List for New Hampshire.

NHNHB. (July 2020). Rare Animal List for New Hampshire.

NHNHB. (March 2018). Rare Plant List for New Hampshire.

NHNHB. (January 2020). Rare Plant List for New Hampshire.

Nichols, W. (2010, July 6). E-mail, Re: Goat's rue on Military Reservation.

NOAA, N. O. (2013). Worksheet for Monthly Station Normals. Retrieved August 2013, from http://www.erh.noaa.gov/er/gyx/climo/NH_STATS_NEW.htm

NOAA. (2015). Northeast Regional Climate Center, NOWData. Retrieved October 2015, from http://www.nrcc.cornell.edu/wxstation/nowdata.html

Northeast Wood Turtle Working Group. (December 2015). Long-Term Intensive Monitoring Protocol: Step-by-Step.

NRCS. (2013, December 06). Web Soil Survey. Retrieved 2014, from http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Oehler, J., Covell, D., Capel, S., & Long, B. (2006). Managing Grasslands, Shrublands and Young Forests for Wildlife. Northeast Upland Habitat Technical Committee.

PARC. (2017, 11 20). Partners in Amphibian and Reptile Conservation. Retrieved from http://parcplace.org/about/what-is-parc/

Reynolds, S. (2014). Bat Survey of the New Hampshire National Guard Training Institute, Pembroke, NH.

Reynolds, S. (2015). Acoustic Bat Survey of Six New Hampshire Army National Guard Sites. North East Ecological Services.

Reynolds, S. (2015). Acoustic Bat Survey of the New Hampshire National Guard State Military Reservation Concord (Merrimack County), NH. North East Ecological Services.

Reynolds, S. (2017). Acoustic Bat Survey of Three New Hampshire Army National Guard Sites.

Reynolds, S. (2019). Acoustic Bat Survey of Four New Hampshire Army National Guard Sites.

Spertudo, D., & Kimball, B. (2011). The Nature of New Hampshire. Natural Communities of the Granite State.

Sperduto, D., & Nichols, W. (2004). Natural Communities of New Hampshire. New Hampshire Natural Heritage Bureau and The Nature Conservancy.

Sperduto, D., & Nichols, W. F. (2012). Natural Communities of New Hampshire, Second Edition. The New Hampshire Natural Heritage Bureau.

State of New Hampshire. (2017, December 5). The State of New Hampshire. Retrieved from Adjutant General's Department: https://www.nh.gov/adjgeneral/

Stewart, G. (1961). The Geology of the Alton Quadrangle New Hampshire. The New Hampshire State Planning and Development Commission.

Thompson, A. (2013a). 2013 Bat Acoustic Inventory at the New Hampshire National Guard Training Site, Strafford, NH. Northern Stewards.

Thompson, A. (November 2013). 2013 Bird Inventories at the New Hampshire National Guard regional Training Institute Pembroke, NH.

Thompson, N. E. (2018). Snake fungal disease in North America: U.S. Geological Survey updates Fact Sheet 2017-3064.

Town of Pembroke, N. (2004). Town of Pembroke 2004-05 Master Plan. Retrieved August 2013, from http://www.pembroke-nh.com/plan_master.asp

Town of Strafford. (2013). Zoning and Land Use Ordinances Subdivision Regulations Non-Residential Site Plan Regulations and Building Regulations.

Turtles.org, N. (2017, 01 06). Northeast Wood Turtle Project. Retrieved from http://www.northeastturtles.org/NE/GLIN.html

USFWS. (1992). Small Whorled Pogonia (Isotria medeoloides) Recovery Plan, First Edition.

USFWS. (2011). A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats. U.S. Fish and Wildlife Service, Hadley, MA. 18pp.

USFWS. (2017, April). Migratory Bird Treaty Act. Retrieved from https://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php

USFWS. (2019). National Listing Workplan: 5-Year Workplan (September 2016 Version).

USFWS. (December 2008). Birds of Conservation Concern.

USFWS. (March 2020). Range-Wide Indiana Bat Summer Survey Guidelines

USFWS. (May 2013). Revised Range-Wide Indiana Bat Summer Survey Guidelines.

USFWS. (May 2015). Revised Range-Wide Indiana Bat Summer Survey Guidelines.

USFWS. (May 2017). Range-Wide Indiana Bat Summer Survey Guidelines.

USFWS. (September 2003). Karner Blue Butterfly Recovery Plan (Lycaeides melissa samuelis).

VanLuven, D. (1994). Site Conservation Plan for the Concord Pine Barrens, Concord, NH. The Nature Conservancy.

Weidman, T., & Litvaitis, J. (2009). Survey of Grassland Habitats for Snakes and Nesting and Migrating Birds at the Center Strafford National Guard Training Site.

Wilkes, K., & Peter, W. (2016). Wetland Reconnaissance NH Army National Guard - Pembroke Readiness Center.

Zawatski, M., & Ecrement, S. (2019). Wetland Delineation Memorandum NHARNG Pembroke Obstacle Course.

Regulations

Figures

Appendix Items

Appendix A Supporting Information

Appendix B DMAVS Survey Information

Appendix C NHARNG DMAVS and NHFG Memorandum of Understanding

Appendix D Agency Comments and Response to Comments

Appendix E Annual Agency Meeting Minutes

Appendix F Integrated Wildland Fire Management Plan

Appendix G Work Plan / Implementation Table