Salmon River State Forest

Leesville Block & Wopowog WMA Management Plan

Connecticut
Department of Energy & Environmental Protection
FORESTRY DIVISION

Forest Health and Diversity

The Leesville Block and Wopowog WMA contain healthy and diverse forest ecosystems of dense hemlock stands, oak/hickory ridges, red maple bottomlands and the Salmon River. These landscape elements provide functional, valuable, and resilient habitats for plants and animals.

Climate Change Mitigation

Climate change is an important global issue. The management of the Leesville Block and Wopowog WMA provides the opportunity to sequester and store carbon, through sustainable forest management, in vegetation and long-lived durable wood products.

Economic Benefits

The following plan outlines timber harvesting activity on 317 acres. Sustainably harvested forest products provide jobs and raw materials that are sold in the local forest-based, green economy. “Growing What We Need, Where We Live”.

Forest Protection

The Salmon River State Forest Leesville Block and Wopowog WMA management plan addresses threats such as wildfire, extreme weather events, invasive plants and insects, and unauthorized use. Management strategies are outlined for each of these threats to protect this valuable public forestland asset.

Wildlife Habitat

The Leesville Block and the Wopowog WMA are key properties in the protection of the Salmon River watershed and its associated forest and riparian habitats. These properties also lie within one of three focus areas for the conservation of American woodcock. Management recommendations presented in this plan aim to enhance habitat for this species.

Recreational/Health Benefits

20 acres of the Leesville Block is managed specifically for recreational activities; this site, adjacent to the Salmon River, is known as Fireman’s Field and the Salmon River Recreation Area. The remaining acreage of the Leesville Block and Wopowog WMA make excellent opportunities for hiking, hunting, and fishing.

Encouraging Mature Forest Growth

34%, 267-acres of the Leesville Block is designated as an Old Forestland Management Site (OFMS) allowing this remote area of the forest to remain unaltered by vegetative management activities. This will encourage mature forest growth within this block of forestland.

STATE OF CONNECTICUT

DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION

Bureau of Natural Resources

Division of Forestry

Salmon River State Forest: Leesville Block & Wopowog Wildlife Management Area

FOREST MANAGEMENT PLAN
2025 – 2035
Leesville Block: 777 Acres
Wopowog WMA: 480 Acres

Author: Nathan Piché

Approvals:

Christopher Martin, Director Division of Forestry	8/8/24 Date	Jenny Dickson, Director Division of Wildlife	8/8/24 Date
Mason Trumble, Deputy Commissioner Outdoor Recreation & Natural Resources	10/24/2024 Date	Justin Davis, Bureau Chief Bureau of Natural Resources	8/13/24 Date

CT. Dept of Energy and Environmental Protection
Division of Forestry
79 Elm Street, 6th Floor
Hartford, CT 06106

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Introduction

Connecticut is the 14th most forested state in the United States with approximately 60 % forested cover. It is also the 4th most-densely populated state in the country. These two factors create a unique and challenging environment to develop meaningful and effective resource management strategies that will meet the needs of its citizens while protecting and enhancing its natural and ecological resources.

The 2025 – 2035 Salmon River State Forest, Leesville Block and Wopowog WMA Management Plan incorporates priorities and specific strategies developed for Connecticut's forests within the 2020 Connecticut Forest Action Plan, an implementation guide for broad statewide forest management strategies based on three national priorities;

1. Conserve and manage working forest landscapes for multiple values and uses;
2. Protecting forests from threats; and
3. Enhancing public benefits from trees and forests.

The following objectives were considered in the development of the Salmon River State Forest, Leesville Block and Wopowog WMA Management Plan with considerable site-specific input provided by DEEP, DEEP partners and various user groups.

1. **Forest Ecosystem Health and Diversity** – The Leesville Block and Wopowog WMA contain healthy and diverse forest ecosystems of dense hemlock stands, oak/hickory ridges, red maple bottomlands and the Salmon River. These landscape elements provide functional, valuable, and resilient habitats for plants and animals.
2. **Wildlife Habitat** – The Leesville Block and the Wopowog WMA are key properties in the protection of the Salmon River watershed and its associated forest and riparian habitats. These properties also lie within one of three focus areas for the conservation of American woodcock. Management recommendations presented in this plan aim to enhance habitat for this species.
3. **Climate Change Mitigation** – Climate change is an important global issue. The management of the Leesville Block and Wopowog WMA provides the opportunity to sequester and store carbon, through sustainable forest management, in vegetation and long-lived durable wood products.
4. **Encouraging Mature Forest Growth** – 34 %, 267-acres of the Leesville Block is designated as an Old Forestland Management Site (OFMS) allowing this remote area of the forest to remain unaltered by vegetative management activities. This will encourage mature forest growth within this block of forestland.
5. **Recreational/Health Benefits** – 20 acres of the Leesville Block is managed specifically for recreational activities; the site, adjacent to the Salmon River is known as Fireman's Field and the Salmon River Recreation Area. The remaining acreage of the Leesville Block and Wopowog WMA make excellent opportunities for hiking, horseback riding, hunting, and fishing.
6. **Economic Benefits** – The following plan outlines timber harvesting activity on 317 acres. Sustainably harvested forest products provide jobs and raw materials that are sold in the local forest-based, green economy.
7. **Forest Protection** – The Salmon River State Forest Leesville Block and Wopowog WMA management plan addresses threats such as wildfire, extreme weather events, invasive plants and insects, and unauthorized use. Management strategies are outlined for each of these threats to protect this valuable public forestland asset.

DEEP welcomes questions and comments regarding the management of state forest lands and encourages public engaging in the management of state resources. The Division of Forestry may be contacted by e-mail at deep.forestry@ct.gov or by phone at 860-424-3630.

Salmon River State Forest
Wopowog Wildlife Management Area (WMA)

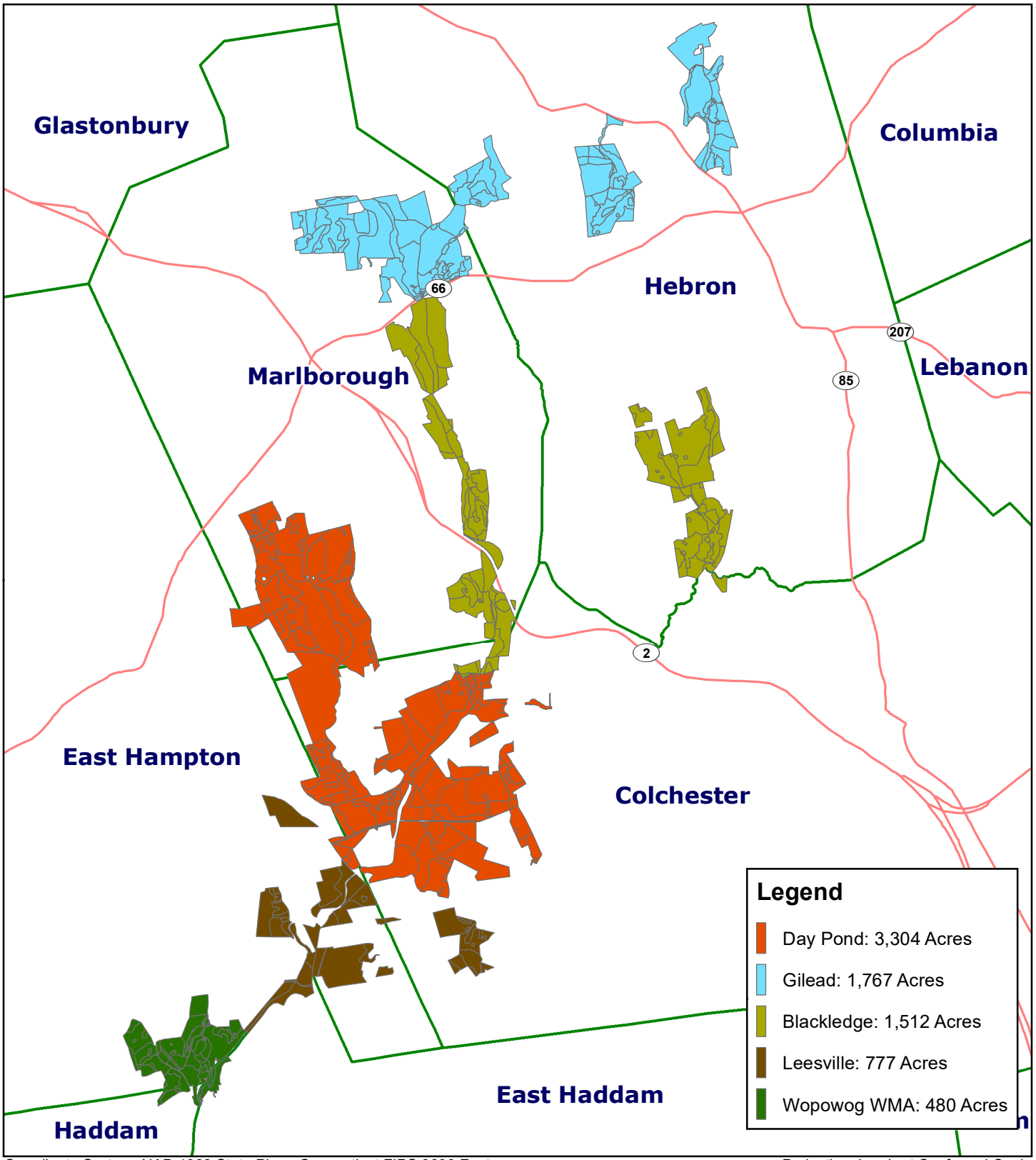
Location & Division of Forest Blocks

January 13, 2023

Map prepared by: Nathan Piché

0 4,000 8,000 16,000 Feet

Map Scale: 1 inch = 8,000 feet



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

A. Executive Summary

The Leesville Block

The Leesville Block, 777 acres in size, is the smallest of the four blocks of forestland that make up the Salmon River State Forest. The other three forest blocks being known as Blackledge, Gilead, and Day Pond. The Wopowog Wildlife Management Area (WMA), 480 acres, is located directly south of the Leesville Block, along the Salmon River. Since this WMA is similar in composition to the Leesville Block and its management goals and objectives align with that of Salmon River State Forest, it will be included in this plan. The Leesville Block, named for its proximity to the village of Leesville within the town of East Haddam, is located within the towns of East Haddam, East Hampton, and Colchester within the counties of Middlesex and New London. The Wopowog WMA, originally a summer camp named Camp Wopowog, and later Camp Halburn and Camp Ramah, is located within the towns of East Hampton, Haddam, and East Haddam within the county of Middlesex. The Leesville block is divided into eight compartments and the Wopowog WMA is divided into four compartments. Compartment separations are determined by access and are numbered in a chronological order based on when that section of the forest was acquired. Additionally, each compartment is delineated into stands, or individual management units of similar forest composition or site quality, to aid in management decisions.

The last forest management plan for Salmon River State Forest, which also included Wopowog WMA, was written in 1990. That plan covered the entire forest. Now, individual management plans will be prepared for each block separately to prioritize and schedule forest management tasks and activities over the course of the next management cycle. Since the preparation of the previous management plan, much has changed within this block of forestland. Additional lands were acquired, and the forest has continued to develop and mature. This management plan will focus on both short – and – long-term objectives aimed at improving access to the forest for forest management, maintaining and diversifying wildlife habitat, supporting recreational activities and ensuring the long-term health and productivity of the forest.

Photo 1.0. Photo of the Leesville Dam, located on the Salmon River in East Haddam.

B. History

Reason for Acquisition & Funding Sources

Recognizing the opportunity to protect and manage a significant portion of the Salmon River Watershed and its numerous tributaries, the State Board of Fisheries and Game purchased, in 1934, the first parcels of land which now make up the Salmon River State Forest. The forethought in obtaining these parcels was that they would allow the State to provide a suitable environment for trout and Atlantic salmon through the implementation of a long-term development program involving stream improvement and watershed management projects. In the 56 years from the first land purchase to the last management plan, the State acquired additional parcels of land to fulfill the goals set forth in the original development plan. In those 56 years, the forest size grew to encompass 6,993 acres, which also included 1,300 acres originally leased from the U.S. Government. Additional acreage was acquired through a land utilization program made available by the Resettlement Administration.

Development of Resource Prior to & After Acquisition

Prior to State acquisition, extensive timber harvesting was carried out throughout the forest with many areas being clearcut for charcoal production in the late 19th century. Black birch, a prolific seed producer whose seed is easily dispersed by the wind, was the dominant tree species regenerated by these cuttings. Black birch was then harvested to supply a birch oil extraction plant operated by the E.E Dickinson Company until 1930.

From 1935 to 1940 a Civilian Conservation Corporation (CCC) camp, named “Camp Stuart”, was operated in the forest. The CCC carried out forest improvement projects, built a dam at Day Pond, constructed truck roads and picnic areas, and performed many stream improvements on the rivers and streams within the Salmon River State Forest.

After the State acquired the parcels now making up the Salmon River State Forest and Wopowog WMA, the forest has been managed to protect and diversify wildlife habitat, promote a healthy watershed for the Salmon River and its many tributaries as well as sustain a healthy and productive forest. This has been carried out through timber harvests that have removed dead, dying, diseased, poor quality and mature trees to provide growing space for young trees to become established and by leaving other areas undisturbed, such as adjacent to rivers and streams so that the natural hydrology is not disrupted. Due to the States watershed management efforts in the last several decades, a healthy trout stocking program and easy access points, the Salmon River State Forest is one of the premier fishing destinations in Connecticut.

Cultural Resources

Much of this block of forestland was cleared for agricultural purposes during the colonial era. Old cellar holes, stone walls and stone piles remain as evidence of the work done by early settlers. As these fields and pastures were abandoned from agricultural uses the land gradually reverted to forest, sprouting an abundance of oak, birch, maple, hickory, and tulip trees throughout. This history has given the current forest a diversity of age classes and species compositions.

During the early settlement, colonial era, damming ponds and streams as a source of waterpower for grist mills, sawmills and tanneries was common. By the mid-19th century, the Salmon River and its tributaries had more mills trying to utilize the power of its flow than the available water sources could supply, especially during periods of dry weather and low water levels. In North Westchester, during periods of low water, grist mills operated at night and paper mills by day. The use of hydropower to power mills eventually declined as other power sources became available during the industrial revolution. In 2016 a dam on the Jeremy River in North Westchester was removed to permit migratory fish passage. However, dams remain to this day on the Holbrook Pond in Hebron and Day Pond in Westchester.

Changes Since the Last Management Plan

Since that last forest management plan expired in the year 2000, management efforts in this block of forestland have focused primarily on maintenance. Maintenance efforts have included painting property boundary lines, maintaining Fireman's Field and the Salmon River Recreation Area on Gulf Road in East Hampton, and mowing the old camp fields at the Wopowog WMA to maintain early successional habitat. 116 acres of forestland was added to the Leesville Block in 2013 between the Salmon Run housing development and Gulf Road.

C. Assessment of Resources and Infrastructure

Acres

The Leesville Block is comprised of 777 acres and the Wopowog WMA is made up of 480 acres. These acres are divided into one of nine different classifications which are active forest, old forest management site, natural area preserves, inaccessible areas, inoperable areas, recreational areas, areas managed for wildlife, wetlands, and open/non-forested areas.

Table 1.0. Acres of land that fall into each land classification category within the Leesville Block and Wopowog WMA.

Salmon River State Forest: Leesville Block

Land Classification	Acres
Active Forest	369.25
Old Forest Management Site	267.33
Natural Area Preserves	0.00
Inaccessible Areas	20.91
Inoperable Areas	60.01
Recreational Areas	26.72
Areas Managed for Wildlife	0.00
Wetlands	29.47
Open/Non-forested	3.17
Total	**776.87**

Wopowog WMA

Land Classification	Acres
Active Forest	287.70
Old Forest Management Site	0.00
Natural Area Preserves	0.00
Inaccessible Areas	0.00
Inoperable Areas	136.48
Recreational Areas	0.00
Areas Managed for Wildlife	18.87
Wetlands	31.02
Open/Non-forested	6.27
Total	**480.34**

Although there are nine different land classification categories that each acre of land falls into, these categories are not necessarily mutually exclusive. For example, land classified as “old forest management site” may have just as much wildlife benefit as land classified as an “area managed for wildlife.” Land is divided into these categories by a close analysis of their current physical condition and is done so to aid in management making decisions.

Active forestland is land actively being managed for its forest resource. Not all active forestland is prescribed to receive a management treatment in this management plan, such as a silvicultural or invasive treatment. However, this plan does prescribe management treatments to occur on 317 acres of active forestland, with the remaining acres of active forestland being left to grow and further develop. Old forest management site is a land classification that has been enacted to set aside a portion of land to allow for the natural processes of forest stand development to occur without the influence of active forest management. Natural Area Preserves are state lands designated by the Governor as “natural areas.” A natural area is defined in the Connecticut State Statutes as “…an area of land or water, or land and water containing or potentially containing plant or animal life or features of biological, scientific, educational, geological, paleontological or scenic value worthy of preservation in their natural condition.” The Leesville Block does not contain, nor does the Wopowog WMA, a designated Natural Area Preserve. Inaccessible areas are areas that cannot be accessed due to the deterioration of access roads or due to being landlocked behind un-crossable geographical features such as

wetlands, rivers or steep terrain. Inoperable areas are lands that contain physical features such as steep slopes and excessively rocky terrain that prevents active management from taking place. Recreational Areas are areas within the forest that contain features that are of significant recreational value and are managed to maintain those recreational opportunities. The Parks Division takes the primary responsibility for the management and administrative duties on recreational areas. Areas managed for wildlife are designated areas where the primary objective of any management activity will be for the benefit of wildlife. These areas may include forest stands, shrubland, fallow agricultural fields, and/or lands that were acquired with Pittman-Robertson Wildlife Restoration Act funding. The Wildlife Division takes the primary responsibility for the management and administrative duties on designated wildlife areas. Wetlands are low lying areas that either consistently hold water or feature poorly drained soils that grow wetland associated vegetation. Lastly, open or non-forested areas are old fields, recently abandoned from agricultural use, where forest succession has not advanced to the point at which the area can be considered forested at this time or a utility right-of-way that is maintained as open/non-forested for the purpose of maintaining the right-of-way. These open or non-forested areas are often maintained to benefit wildlife that depend on early successional stage habitat.

Access: Roads for Public, Truck Roads & Gates

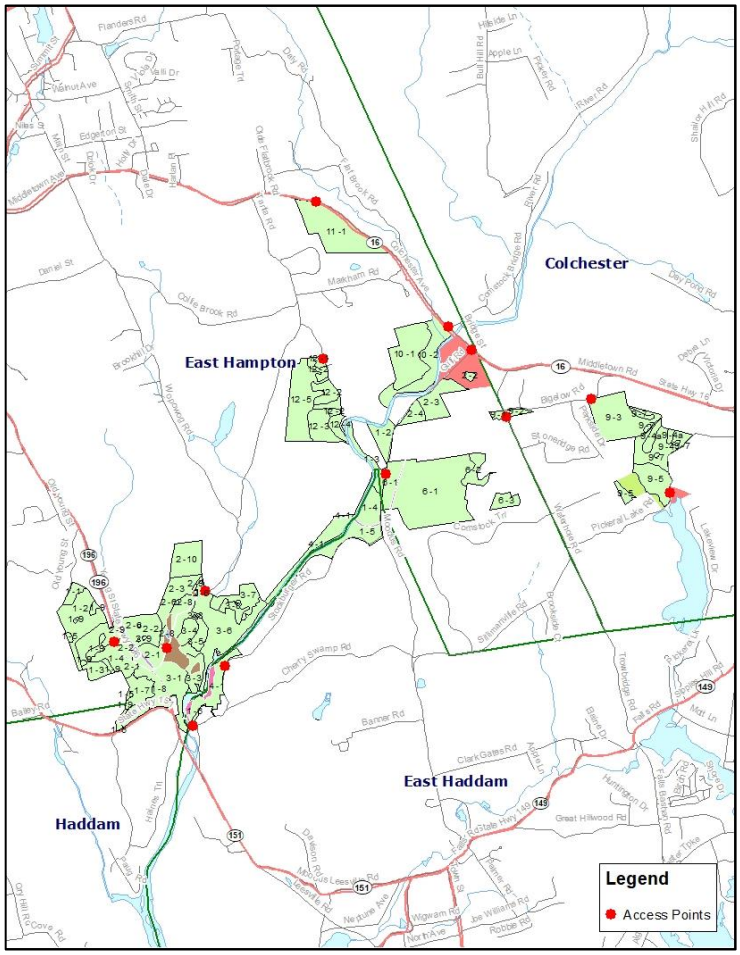


Figure 1.0. Map showing the various access points and forest roads within the Leesville Block and Wopowog WMA.

Much of the Salmon River State Forest, including the Leesville Block and Wopowog WMA, occupies long and narrow sections of land adjacent to the rivers and streams that define this state forest. Much of the terrain along these rivers and streams is steep and is located behind residential neighborhoods. These factors make access for active forest management purposes difficult. Over the years, land acquisition efforts have increased access points to the forest. However, most of these access points are in a state of disrepair and it is a priority to improve these access points for the future management of this forest. Access improvements discussed in this management plan will focus on improvements exclusively for forest management purposes. The forest is also managed for public access. However, it has been determined that at this time public access opportunities to these blocks of land are adequate with many parking and walk in areas located at various points.
The primary access point to the Leesville Block, including the Salmon River Trout Management Area and the recreational areas known as “Fireman’s Field Recreation Area” and the “Salmon River Recreation Area”, is Gulf Road in the town of East Hampton directly south of Route 16.

The northern most section of the Leesville Block is a triangular shaped parcel of land directly adjacent to, and accessible from, Route 16.

The western most section of the Leesville Block is accessible from Town Farm Road. This town road is a dead end with room to park a vehicle at the end. The forest has road frontage at the end of the road for walk in access.

The eastern most section of the Leesville Block is accessible from Pickeral Lake Road. There is also a small boat launch area on the east side of Pickeral Lake Road for boaters to access Pickeral Lake.

There is also one small parcel of forestland that is accessible from Waterhole Road.

The primary access point to the Wopowog WMA is Wopowog Road, in the town of East Hampton. Two parking areas are located adjacent to Wopowog Road, one on the west side of the road and one on the east side of the road.

The eastern most section of the Wopowog WMA and the Leesville Dam on the Salmon River, are accessible from Powerhouse Road where there is a small parking area adjacent to the river.

Western most sections of the Wopowog WMA are accessible from Route 196. There is no formal parking area off of Route 196.

Inaccessible Areas

Approximately 3 percent of the Leesville Block, comprised of approximately 21 acres, is inaccessible. Inaccessible areas are locations within the forest that cannot be accessed for forest management purposes due to the deterioration of access roads or due to being landlocked behind un-crossable geographical features such as wetland, rivers, steep terrain, or highways. It must be noted that much more than 3 percent of the block is inaccessible, however, much of the inaccessible land has been categorized under the Old Forestland Management Site classification. Much of the Leesville Block is made up of forestland adjacent to the Salmon River.

This land is steep, rugged, rocky, and difficult to traverse. As a result, there are many areas locked behind the river and topography that cannot be reached for active forest management purposes.

Due to the several town and state roads, as well as old woods roads built for management purposes, that traverse through the Wopowog WMA there are no inaccessible areas.

Right-of-Way's

There is one Right-Of-Way (ROW) within the Leesville Block, located parallel with and east of Gulf Road. This ROW is a buried AT & T cable that occupies a narrow transect of land, approximately 30 feet wide, cutting through the forest. This AT & T cable ROW also passes through the Wopowog WMA, east of Wopowog Road before crossing Route 196 and traversing through the western most portion of the property. The Wopowog WMA also has an Eversource powerline ROW, north of Wopowog Road and east of Route 196. Land managers will maintain communications with AT & T and Eversource to stay informed of any ROW maintenance that is being done as well as to minimize negative impacts to the ROW and their associated infrastructure during forest management activities on the adjacent forestland. Due to ROW's being corridors of open, non-forested land that is often occupied by young herbaceous growth, they add wildlife habitat diversity to an otherwise forested landscape. The Divisions of Forestry and Wildlife will work with AT & T and Eversource, whenever possible, to maintain and enhance ROW value to wildlife habitat.

Boundary Conditions, Issues & Total Miles to Maintain

There is a total of 16 miles of boundary lines in the Leesville Block and an additional 8 miles in the Wopowog WMA. Boundary lines are generally in good condition, easily located and well-marked. Within this management plans timeframe, all the boundary lines will be maintained by re-painting boundary trees, replacing old State Land signs where necessary and collecting GPS data on all points and features along each boundary line.

Acquisition Goals

Future acquisition efforts should be prioritized by the following three guidelines:

1. All interior parcels should be acquired if made available to the State. This will reduce boundary line maintenance as well as strengthen DEEP state land use policies.
2. Any parcel which currently abuts state land on two or three sides. Acquisition of properties such as these would allow the forest to expand along its bounds, reducing maintenance issues, strengthening DEEP state land use policies and will create a large, protected forest corridor.
3. Any parcel which may provide improved access to existing town roads should be acquired for management and emergency access purposes.

D. Special Use Areas

Lakes & Ponds

There is one lake within the Leesville Block of Salmon River State Forest, Pickeral Lake. Pickeral Lake is an 88.6-acre waterbody located southeast of Pickeral Lake Road in the Westchester area of the town of Colchester. The lake is 0.90 miles long with an average depth of six feet. The lake is a Connecticut Bass Management Lake and is known for its fishing and recreation opportunities. Access to the lake is available through the state-owned boat launch off Pickeral Lake Road. Although the lake itself is owned by the State of Connecticut, most of the land around the lake is privately held.

There are two small ponds within the Wopowog WMA, directly west of Wopowog Road in the town of East Hampton, known as Wopowog Marsh # 1 (0.6 acres in size) and Wopowog Marsh # 2 (0.3 acres in size). Both ponds are manmade, created by damming up water within small streams. Although these ponds are small, they add diversity to the available habitat. Originally dammed for farming or leisure, these two sites are currently managed as wetland impoundments – shallow waterbodies that provide wetland habitat for wildlife. Maintaining relatively shallow water depth in these impoundments will sustain an abundance of herbaceous emergent vegetation that provides suitable habitat for waterfowl and other waterbirds. Both earthen dams, the dam at Wopowog Marsh # 1 is named “Camp Ramah Upper Pond Dam” (CT Dam # 4220) and has a dam hazard rating of BB; the dam at Wopowog Marsh # 2 is unnamed and unclassified.

Photo 1.1. Photo of one of the ponds located within the Wopowog WMA.

Rivers & Streams

The rivers and streams are the features that define the Salmon River State Forest and Wopowog WMA. These parcels of land are located at the southern extent of the Salmon River watershed and contain a long section of the Salmon River that winds through steep hillsides of hemlock, meandering towards its terminus at the Connecticut River. This section of the Salmon River is designated as a trout management area and is a popular fishing destination.

The Leesville Dam (CT Dam # 4103) was originally constructed in 1893 and modified several times thereafter and used as a hydroelectric dam to generate electricity. The dam ceased operation and ownership was transferred to the State of Connecticut. It currently has a dam hazard rating of C. The dam does not fall within Salmon River State Forest or Wopowog WMA; but the DEEP Office of Dam Safety is assigned responsibility of the structure and DEEP staff occasionally gain access to the dam via Wopowog WMA (from the West) or Salmon River State Forest (from the East) to accomplish maintenance and monitoring tasks. An ice diverter structure, composed of concrete pillars, is located within the Salmon River directly upstream of the dam; it is owned and operated by the US Army Corps of Engineers (US ACOE). Ice and debris floating down Salmon River frequently collect behind the upstream side of the dam causing significant blockage, making it necessary for DEEP staff to enter this area via Wopowog WMA with heavy equipment to dislodge and remove debris. The debris is sometimes transported off-site and sometimes deposited at Wopowog WMA. A plan to remove this dam and restore aquatic connectivity to the Salmon River is being considered. The Office of Dam Safety is in contact with US ACOE regarding this plan and the US ACOE has agreed to determine if the upstream ice control structure is still needed. Dam removal is a long-term goal for DEEP, pending guidance from the US ACOE. The Division of Forestry and Wildlife Division are not responsible for operation or maintenance of the Leesville Dam or associated ice diverter.

Photo 1.2. Photo of the Salmon River.

Cultural Sites

There are no National Heritage sites or areas within the Leesville Block or Wopowog WMA. There are no specific sites that have significant cultural importance. However, there are many stone walls and stone cellar holes that can be found throughout these properties. These elements on the landscape are cultural reminders of our not so distant past, a past where farmers cleared land and deposited excess stone in walls to rid the land of them and establish their land ownership boundaries. Stone cellar holes give clues of how our ancestors lived, how they worked the land and the often-harsh realities under which they lived their lives. Although cultural landmarks such as stone walls and cellar holes are commonplace throughout Connecticut, they shall not be forgotten nor destroyed. During forest management operations all actions necessary should be made to avoid the destruction of stone walls to preserve these cultural landmarks within the state forest.

Photo 1.3. Photo of a colonial era cellar hole within the Leesville Block, Salmon River State Forest.

Recreation & Scenic Sites – Trails & Signs

Fireman's Field Recreation Area, directly south of Route 16 and adjadcent to the Salmon River is accessible via Gulf Road. The Salmon River Recreation Area, directly east of Fireman's Field and adjacent to Gulf Road is also accessible from Gulf Road. These are the most notable recreational assets on these properties. These areas are maintained for recreational purposes and are easily accessible, have adequate parking space, have restrooms, contain a pavilion for picnicking, have several large open spaces for playing games, and there is river access for fishing. The remainder of the Leesville Block and Wopowog WMA are open to public access and are most frequently used recreationally for hiking, fishing, and hunting. There are no designated authorized trails on these properties and there are no specific scenic sites. Signage is located at the following parking areas: Fireman's Field and Salmon River Recreational Areas, Wopowog WMA parking area on the east side of Wopowog Road, and the Leesville Dam parking area off Powerhouse Road. Any applicable public notices or land use regulations are posted at these locations.

Natural Area Preserves

Natural Area Preserves are state lands designated by the Governor as "natural areas". A natural area is defined in the Connecticut State Statutes as "…an area of land or water, or land and water, containing or potentially containing plant or animal life or features of biological, scientific, educational, geological, paleontological or scenic value worthy of preservation in their natural condition." No state-designated Natural Area Preserves are present within the Leesville Block or Wopowog WMA.

Old Forestland Management Sites

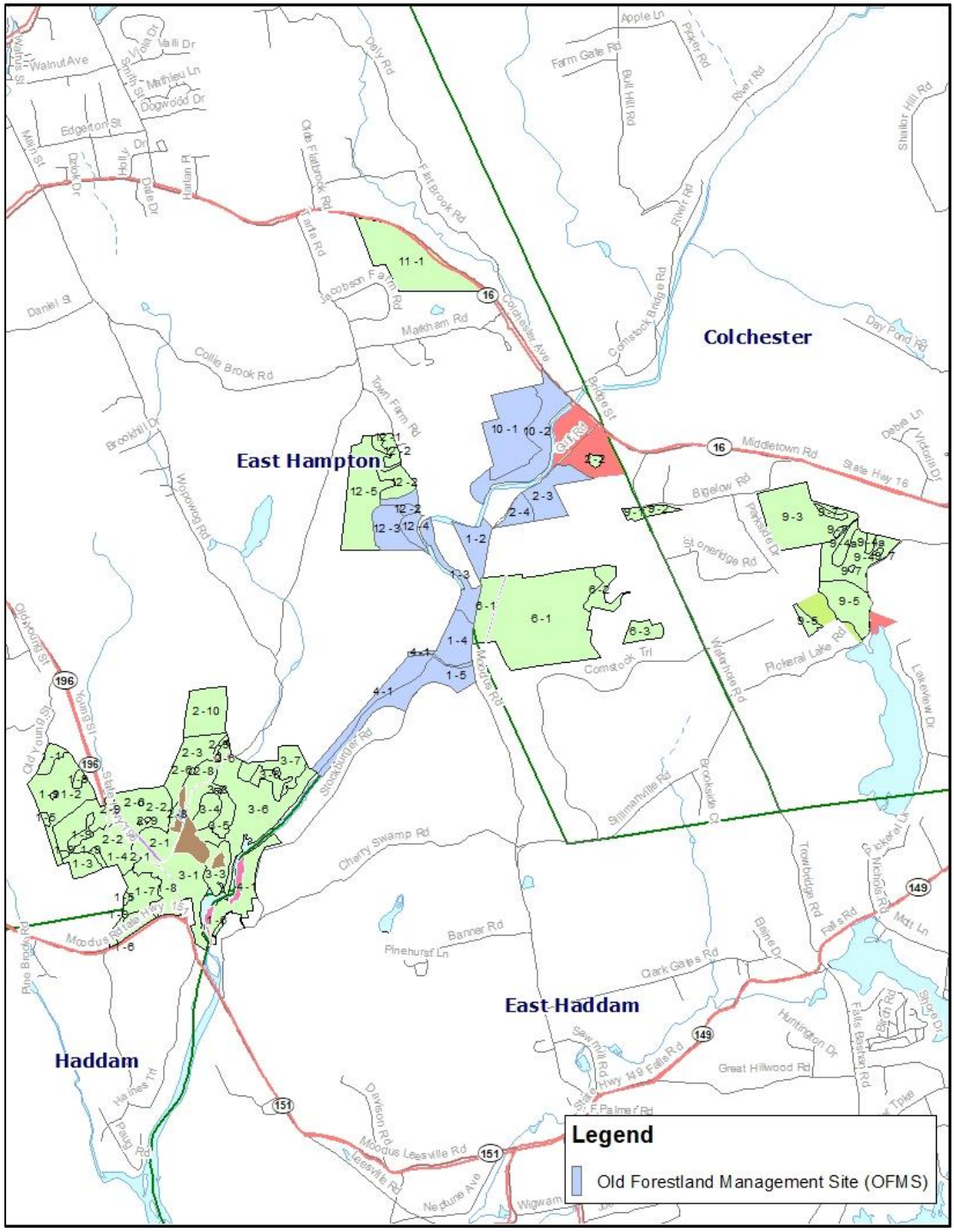


Figure 1.1. Map showing the location of Old Forestland Management Sites (OFMS) within the Leesville Block of Salmon River State Forest. The designated OFMS is the area shaded in blue.

The Old Forestland Management Site (OFMS) land classification has been enacted to set aside a portion of land to allow for the natural processes of forest stand development to occur without the influence of active forest management.

One OFMS has been designated within the Leesville Block consisting of 267.33 acres of forestland within compartments one, two, four, ten, and twelve. This area encompasses all riparian areas adjacent to the Salmon River. This area was chosen for its dense stands of hemlock which are vital for watershed protection and fishery productivity, its steep and rugged terrain as well as its proximity to the Salmon River. Although most of the OFMS area is occupied by hemlock stands, the area also features several dry oak ridges and a mix of deciduous forest tree species on moderately drained sites. The implementation of a non-active management regime in this area will allow for long term observation. These observations will help draw conclusions on how different forest cover types respond to various forest stressors in the absence of direct human influence. Overtime, these conclusions can be compared to areas that are being actively managed to help managers better understand the dynamics of forest ecosystems.

Research Areas

No research areas are currently present within the Leesville Block or Wopowog WMA. However, on occasion the forest has been utilized for research projects and will continue to be available for research proposals from DEEP partners and collaborators.

Miscellaneous (Sugarbush, homeowner firewood, water mains, aqueducts)

There have been several miscellaneous uses of these properties. In 2022 a stand of sugar maple adjacent to Gulf Road, within the Leesville Block, was utilized for maple sap and syrup production. Also, a local business has cut mountain laurel within the Wopowog WMA on an annual basis during the fall to make Christmas wreaths from the evergreen boughs. These activities are conducted under the forest products harvest permit system, administered by the Division of Forestry.

There is an artesian well on Gulf Road within the Salmon River Recreation Area, used by many people for water as an alternative to their faucets. This well was constructed in the 1930's to serve a CCC camp. In 2004 10,000 dollars in state funding was secured to make improvements to this well to prevent water contamination. Water may not be available at this site during summer drought conditions or frozen winter conditions.

E. Forest Ecosystem Health and Diversity

Landscape Context

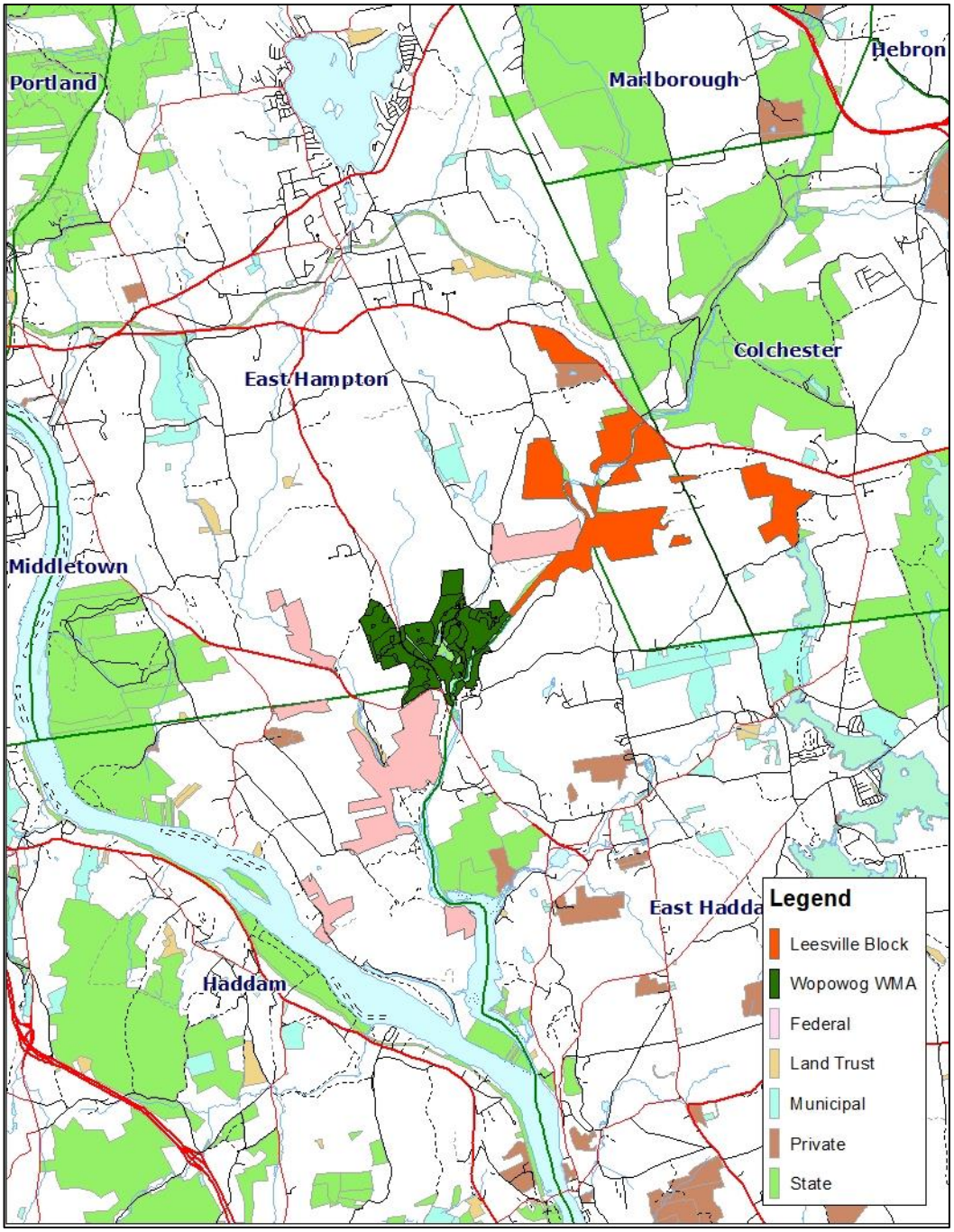


Figure 1.2. Location map showing federal, land trust, municipal, private, and state protected lands in the vicinity of the Leesville Block and Wopowog WMA.

The Leesville Block and Wopowog WMA are located within rural eastern Connecticut. These properties are at the southern end of the Salmon River watershed and are part of the much larger Salmon River State Forest. Throughout the region there are many smaller parcels, owned by the federal government, land trusts, municipalities, private individuals, and/or conservation organizations that are designated as protected open space, as shown in Figure 1.2. Efforts by the state and other entities have been vital in protecting the rural fabric of the communities that this forest lies within. Notable conserved lands within the southern terminus of the Salmon River are the state-owned Salmon River WMA, a 1.87-acre island in the Salmon River directly downstream of the Leesville Dam, the 108-acre Salmon River Cove and Haddam Neck WMA, Machimoodus State Park, and the Silvio O. Conte National Fish and Wildlife Refuge which occupies a combined 714 acres over several parcels at the confluence of the Salmon River and Connecticut River. Collectively these parcels are critical for the long-term protection and conservation of tidally influenced rivers, freshwater tidal marshes and flats, riparian meadows, cold water streams, floodplain forests, mixed hardwood forest, hemlock stands, and vernal pools within the Salmon River watershed.

The present-day conditions are recognized as good landscape level habitat, with a diversity of cover types including forestland of varying age classes, actively managed agricultural land, wetlands, ponds, and lakes as well as open land containing a diversity of herbaceous early successional plant growth. However, a much greater amount of land in this landscape is unprotected and may increasingly be under the stress of development. Therefore, management strategies for the Leesville Block and Wopowog WMA will need to be reviewed on a 10-year cycle to ensure habitat goals are met as landscape habitat is lost due to development.

Current Vegetative Condition

A forest inventory of the Leesville Block and Wopowog WMA was completed to gather data to be used in the forest management planning and decision-making process. This inventory collected information on trees throughout the area such as species, diameter, merchantability, health, and quality. To accompany these quantitative data, qualitative data was also collected regarding the composition of understory vegetation, presence or absence of invasive species, infrastructure condition, boundary line condition, operability, and land use history evidence. The quantitative forest inventory data was analyzed using NED II forestry software. Data is organized at the forest stand level. Each stand is categorized into a size class and forest cover group to gain a greater understanding of how much land is considered mature forest, young forest, or anywhere in between, and what is the composition of the forest in each stand.

Size classes are divided into the following diameter ranges.

- Seedling/Sapling: 1 inch – 4.5 inches
- Pole Timber: 4.6 inches – 10.5 inches
- Saw/Pole Timber: 10.6 inches – 13.5 inches
- Saw Timber: 13.6 inches +

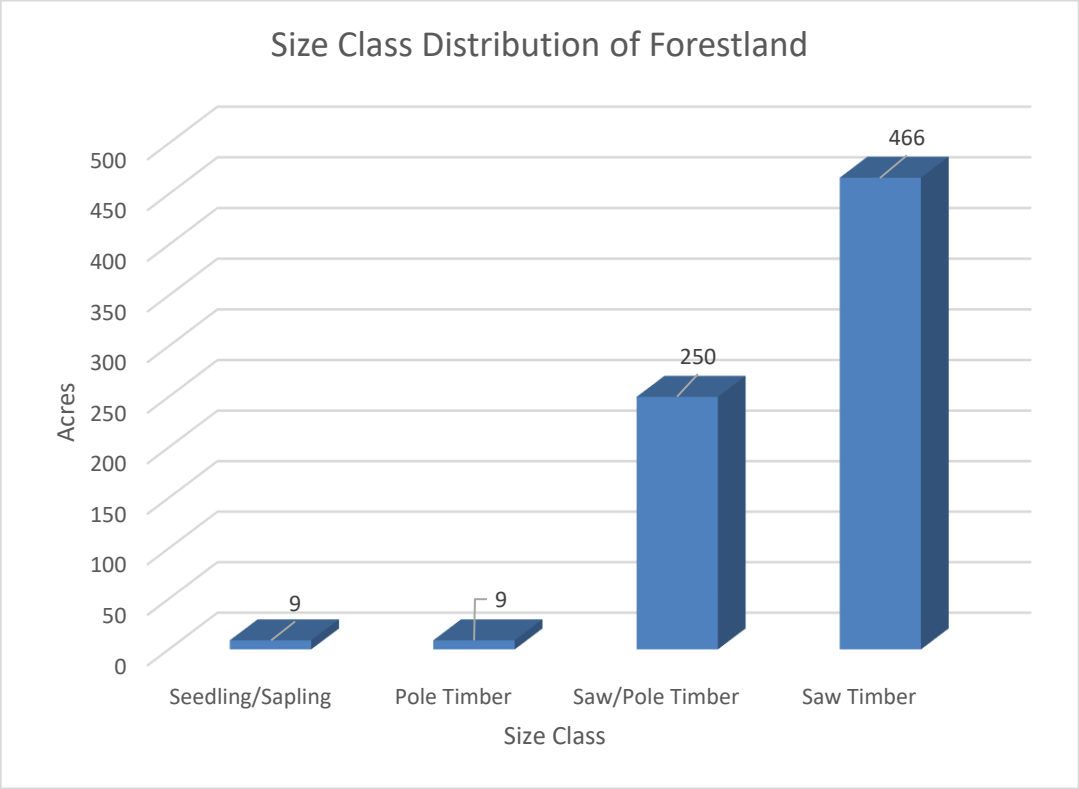


Figure 1.3. Size class distribution of forestland within the Leesville Block of Salmon River State Forest. This chart excludes areas of the block which are developed, wetlands, rights-of-way, or open land.

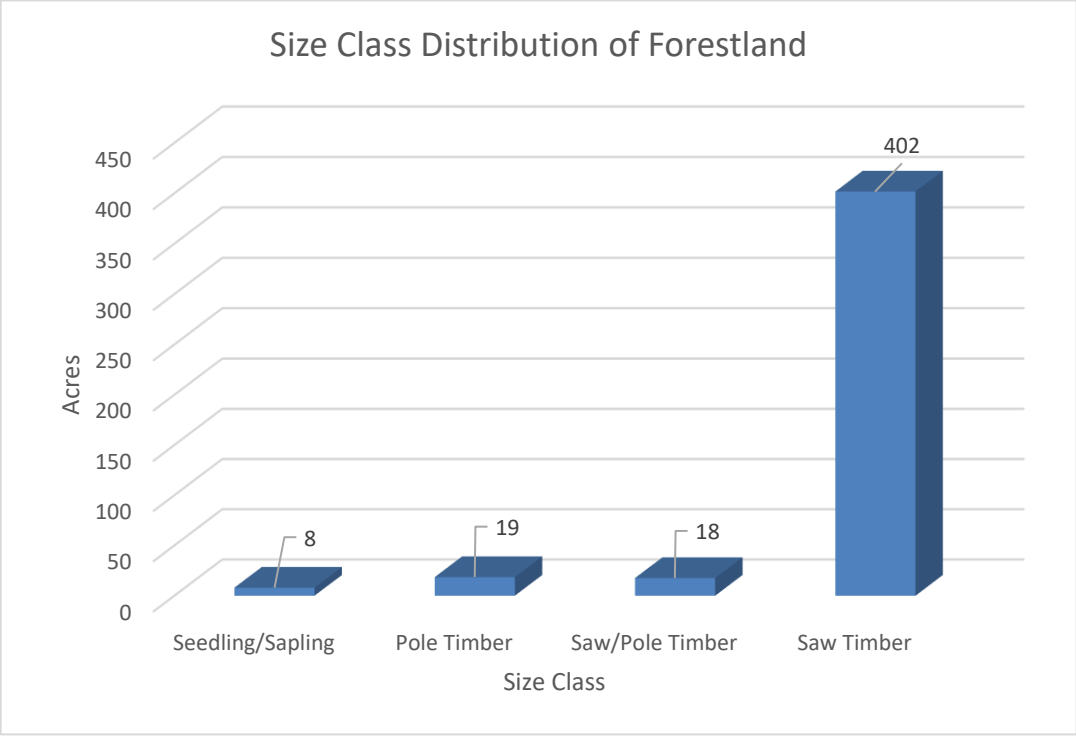


Figure 1.4. Size class distribution of forestland within the Wopowog WMA. This chart excludes areas which are developed, wetlands, rights-of-way, or open land.

The Leesville Block of Salmon River State Forest and the Wopowog WMA are comprised of a diversity of different forest types. Oak and northern hardwoods is the most dominant forest cover found throughout these properties. However, stands of red maple lowlands, white pine, and hemlock on steep riparian areas in the Salmon River valley are also common. Forest stocking, or density, varies greatly with forest type, age, site conditions, soil types and a complex of past and present forest health issues.

Each forest stand is categorized into one of the following seven forest cover groups.

Elm-Ash-Red Maple

The Elm-Ash-Red Maple group makes up 2% of the Leesville Block, 17 acres, and 1% of the Wopowog WMA, 6 acres. These areas are characterized as having wet, saturated, or poorly drained soils and, as a result, grow tree species that do well in wet conditions such as American elm, black ash, and red maple. Often these stands are referred to as red maple lowlands.

Photo 1.4. Photo of the typical stocking levels and forest structure within the Elm-Ash-Red Maple group.

Maple-Beech-Birch

The Maple-Beech-Birch group makes up 45 % of the Leesville Block, 328 acres, and 0% of the Wopowog WMA. This group is dominated by sugar maple, American beech, yellow birch, and black birch. Other species can be found within this forest group at lower densities, such as hemlock, white pine, white ash, and red oak. These stands are often referred to as northern hardwoods.

Photo 1.5. Photo of the typical stocking levels and forest structure within the Maple-Beech-Birch group.

Oak-Hickory

The Oak-Hickory group makes up 6% of the Leesville Block, 44 acres, and 67% of the Wopowog WMA, 298 acres. The dominant species found within this group are red oak, black oak, scarlet oak, chestnut oak, shagbark hickory, pignut hickory, black birch, and red maple. Within this group there are several sub-groups, referred to as forest types or stand types that are commonly found on these properties. These forest types are upland oak, characterized by a poor-quality upland site growing mostly chestnut oak and/or scarlet oak, and mixed upland hardwoods, characterized as having a medium quality site growing all the species found within the Oak-Hickory group.

Photo 1.6. Photo of the typical stocking levels and forest structure within the Oak-Hickory group.

Oak-Pine

The Oak-Pine group is not present within the Leesville Block or Wopowog WMA.

Spruce-Fir

The Spruce-Fir group is not present within the Leesville Block or Wopowog WMA.

White-Red-Jack Pine

The White-Red-Jack Pine group makes up 47 % of the Leesville Block, 346 acres, and 32 % of the Wopowog WMA, 141 acres. All of the stands that fall into this category are dominated by white pine or hemlock. This is a relatively common forest type on these properties because the riparian areas adjacent to the Salmon River are mostly occupied by hemlock.

Photo 1.7. Photo of the typical stocking levels and forest structure within the White-Red-Jack Pine group.

Pinyon Juniper

The Pinyon-Juniper group is not present within the Leesville Block or Wopowog WMA.

Table 1.1. Acres of forestland by size class and forest type within the Leesville Block of Salmon River State Forest. This chart excludes acres of the forest which are developed, wetlands, rights-of-way, or open land.

Acres of Forestland by Size Class & Forest Type					
Forest Cover Group	**Seedling/Sapling**	**Pole Timber**	**Saw/Pole Timber**	**Saw Timber**	**Total**
Elm-Ash-Red Maple	0	0	17	0	17
Maple-Beech-Birch	0	7	138	182	328
Oak-Hickory	9	34	0	0	44
Oak-Pine	0	0	0	0	0
Spruce-Fir	0	0	0	0	0
White-Red-Jack Pine	0	0	62	284	346
Pinyon-Juniper	0	0	0	0	0
				Grand Total Acres	**734**

Table 1.2. Acres of forestland by size class and forest type within the Wopowog WMA. This chart excludes acres of forest which are developed, wetlands, rights-of-way, or open land.

Acres of Forestland by Size Class & Forest Type					
Forest Cover Group	**Seedling/Sapling**	**Pole Timber**	**Saw/Pole Timber**	**Saw Timber**	**Total**
Elm-Ash-Red Maple	0	1	5	0	6
Maple-Beech-Birch	0	0	0	0	0
Oak-Hickory	8	17	12	260	298
Oak-Pine	0	0	0	0	0
Spruce-Fir	0	0	0	0	0
White-Red-Jack Pine	0	0	0	141	141
Pinyon-Juniper	0	0	0	0	0
				Grand Total Acres	**446**

Forest Health: Diseases

Chestnut blight is a fungal infection caused by the *Cryphonectria parasitica* fungus. This fungus was accidentally introduced to the United States, from nursery stock from Asia, in the early 1900s. Quickly after its identification it became evident that the mortality of the chestnut species was imminent. The fungus causes diffuse cankers to form underneath the bark of chestnut trees, ultimately cutting off the flow of water and nutrients up and down the stem of the tree. The American chestnut likely once constituted a large portion of all the trees present in the Leesville Block and Wopowog WMA. The loss of this species from this disease was a tremendous set back to the health, diversity, and quality of the forest in these areas.

Photo 1.8. Photo of a diffuse canker on an American chestnut caused by the chestnut blight.

Nectria canker, caused by *Nectria galligena* fungus, is another common disease found on these properties, often creating what are known as “target cankers” on black birch trees. Nectria fungus typically does not result in the mortality of affected individuals, however, it does significantly affect the quality of wood products produced from trees with it.

Photo 1.9. Photo of nectria canker on a black birch.

Armillaria fungus, *Armillaria mellea*, is a third disease that can be found sporadically throughout these properties. This disease is often called “shoestring root rot” because the fungus has a shoestring like appearance growing on the roots of affected trees. Branch dieback and crown thinning are common symptoms. Affected trees will typically not die from this fungus alone, however, it does act as a secondary pathogen which will develop on trees already under stress from a variety of other biotic and abiotic factors.

Photo 2.0. Photo of shoestring root rot on a standing dead tree.

Beech bark disease is commonly found on American beech individuals throughout these properties. The disease results when the beech scale insect punctures the bark of a beech tree to feed, which creates a wound where the nectria fungus can enter the tree. Once the nectria fungus is within the tree the fungus causes cankers to form, ultimately resulting in the mortality of the tree. To compound the issue, American beech sprouts prolifically from cut stumps and from roots. Furthermore, American beech is very shade tolerant, meaning it grows well in high shade conditions such as the forest floor. Therefore, as American beech individuals succumb to disease, they sprout new stems from their roots and continue the cycle of growth and disease. For long term forest management, the difficulty is establishing desirable regeneration such as red oak in an understory already dominated by disease prone beech sprouts. Silvicultural treatments will focus on even aged management techniques which will allow high amounts of sunlight to the forest floor, thereby favoring shade intolerant and intermediate shade tolerant species over the shade tolerant beech. Treating beech stumps in recently harvested areas with an herbicide to prevent re-sprouting may be recommended as another way to favor the regeneration of more desirable species.

Photo 2.1. Photo of an American beech with beech bark disease. Notice the blistering bark caused by cankers forming underneath the bark.

Beech leaf disease (BLD) is a novel disease affecting American beech. This disease has been found in several states, including Connecticut, as well as one Canadian Province. This disease is associated with a subspecies of the anguinid nematode, *Litylenchus crenatae mccannii*, which may be present in the buds and leaves of beech trees of all age classes. Nematode infection mechanisms are not fully understood at this time. Symptoms of BLD include dark stripes between lateral veins of leaves. Affected leaves also can become shrunken, crinkled, and have a leathery texture. Tree mortality can result from the disease. No treatments are currently available for BLD. Research is currently being done by the Connecticut Agricultural Experiment Station to better understand the short- and long-term implications that this disease may have on the forests of Connecticut. American beech trees throughout the Leesville Block and Wopowog WMA are being heavily affected by BLD. Management efforts will focus on monitoring this disease and salvaging dead individuals, if deemed necessary and/or feasible.

Photo 2.2. Photo of an American beech with BLD. Notice the dark stripes in the leaves.

Forest Health: Insects

Spongy moth caterpillar, previously known as gypsy moth, is a non-native moth introduced to North America that defoliates many tree species, oak species in particular. Successive years of spongy moth caterpillar defoliation and drought like conditions in 2016 and 2017 has resulted in the mortality of thousands of trees across eastern Connecticut. Damage varies greatly by locality. In the Leesville Block and Wopowog WMA, spongy moth effects vary greatly by species and site location. Although white oak, red oak, black oak, chestnut oak, and scarlet oak all have been heavily affected, the mortality of white oak seems to be the highest. Also, ridgetops and hilltops generally have a higher proportion of mortality, likely due to the trees already being drought stressed. Individuals that may have been partially defoliated are more susceptible to secondary pathogens such as two-lined chestnut borer and shoestring root rot. Overall, spongy moth has had a major impact on these properties, however, these areas do not show signs of widespread mortality that is common in many other forests throughout eastern Connecticut. Silvicultural treatments will aim to salvage spongy moth killed individuals where possible. Where it is not possible to salvage dead individuals, standing dead snags create good vertical habitat structure and diversity which is important for many bird species.

Photo 2.3. Photo of an oak tree within the Leesville Block that was defoliated by spongy moth resulting in its mortality.

Two-lined chestnut borer is an insect that is common from southern Canada through the eastern United States. The insect bores galleries underneath the bark of many species of oaks. These galleries can eventually cut off the flow of water and nutrients up and down the stem of a tree, thereby resulting in its mortality. Tree mortality rarely occurs due solely from the efforts of two-lined chestnut borer. The insect primarily attacks trees that are weakened by drought, defoliation, soil compaction or any number of other stressors. Two-lined chestnut borer, in combination with other stressors is what results in mortality. Silvicultural treatments will aim to thin overstocked stands to increase vigor and capture natural mortality caused by competition. These actions are the best ways, on a state forest wide scale, to prevent excessive two-lined chestnut borer damage.

Hemlock woolly adelgid, named for its white woolly appearance and for its preferred host, is an insect native to eastern Asia that was inadvertently introduced to the United States in 1950. Juvenile hemlock woolly adelgid feed on eastern hemlock trees by inserting their mouthparts into the base of the needles of a host tree. These insects feed on the tree's stored starches and they remain on the same needles for their entire lives. This insect has no natural predators in North America. Therefore, population levels increase exponentially and excessive feeding on infected host trees eventually results in the mortality of the host. Several predators of the hemlock woolly adelgid from Asia have been evaluated, approved, and successfully introduced into the forests of Connecticut. Salmon River State Forest was one of the original sites selected to release these predators due to the extensive stands of hemlock adjacent to the Salmon River and its tributaries. These efforts have been quite successful, and the hemlock stands along Salmon River are considered to be in fair condition at this time. If deemed necessary to control hemlock wooly adelgid, beetles may be released at Salmon River State Forest and/or Wopowog WMA in the future to protect hemlock stands.

Photo 2.4. Photo of hemlock woolly adelgid on a hemlock tree adjacent to the Salmon River.

Emerald ash borer is present throughout the forests of Connecticut. This beetle, native to northeastern Asia, feeds on all species of ash. Females lay eggs in the bark of ash trees and larvae feed underneath the bark until they mature into adults. Once they mature into adults they bore through the bark, fly to another host tree and the cycle continues. Signs of the emerald ash borer are horizontal galleries underneath the bark created by the larvae feeding as well as D shaped holes in bark created when adults bore through the bark. The larvae feeding underneath the bark cuts off the flow of water and nutrients to the rest of the tree and results in the mortality of the affected individual. Salvaging affected trees during timber harvesting operations is the only way to minimize the spread of this insect on a state forest wide scale. Fortunately, ash species make up a very low percentage of all the trees present within these properties. Therefore, this beetle is expected to have a minimal impact on these properties.

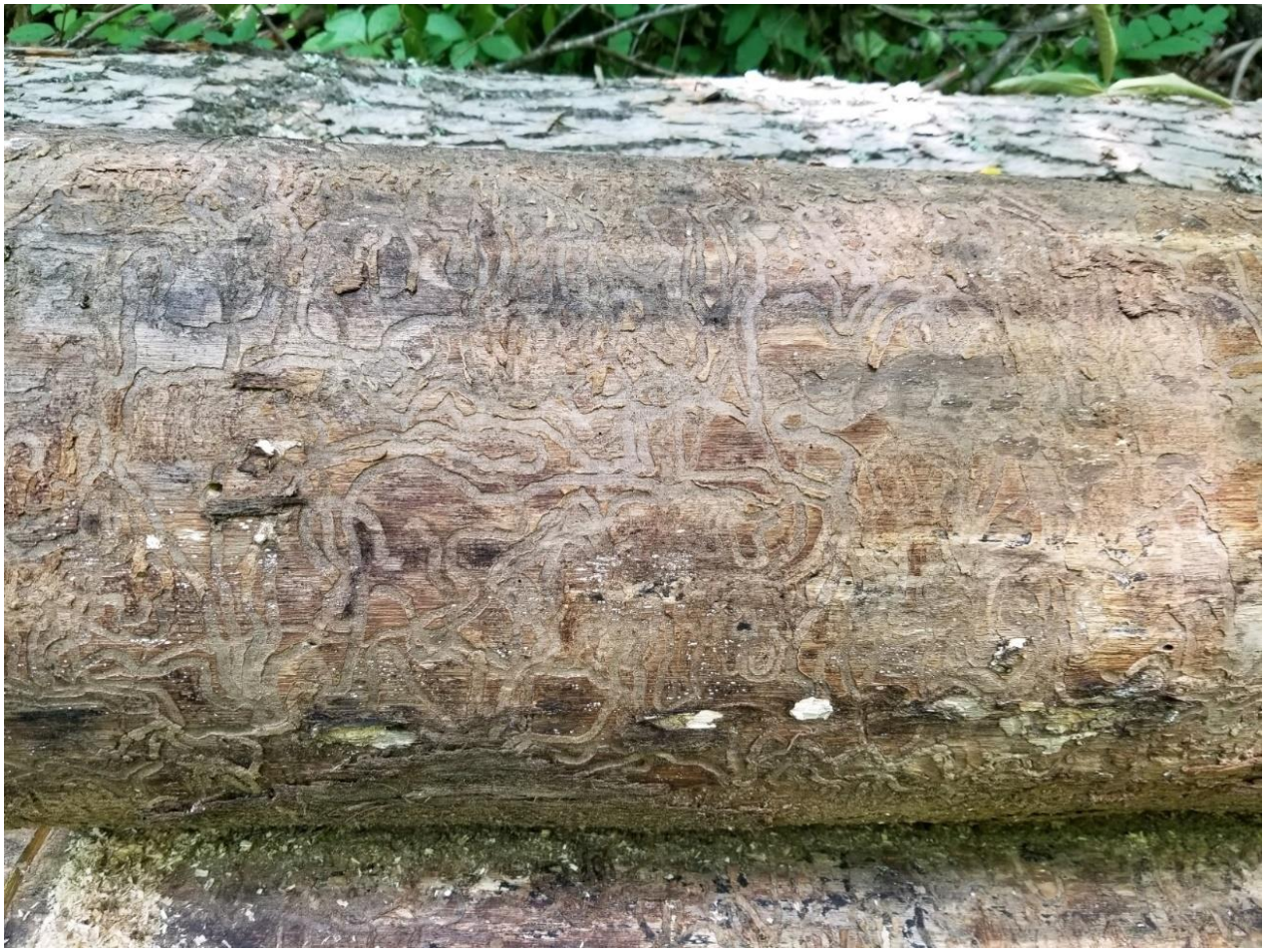


Photo 2.5. Photo of the galleries underneath the bark of a white ash tree caused by emerald ash borer which leads to the mortality of the tree.

In areas dominated by white pine, the white pine weevil has influenced their quality. This insect lays its eggs in the topmost bud of white pine individuals. These eggs hatch and the larvae feed on the bud, thereby killing it and causing other branches to take over as the terminal leader. This results in a tree with three or more main stems. The quality of white pine with multiple stems due to this insect is typically degraded from sawlog quality to no more than pulpwood quality. This insect prefers high sunlight conditions. As a result, open grown trees are the most affected. The white pine stands in the interior of the forest that regenerated under partial shade are much less affected.

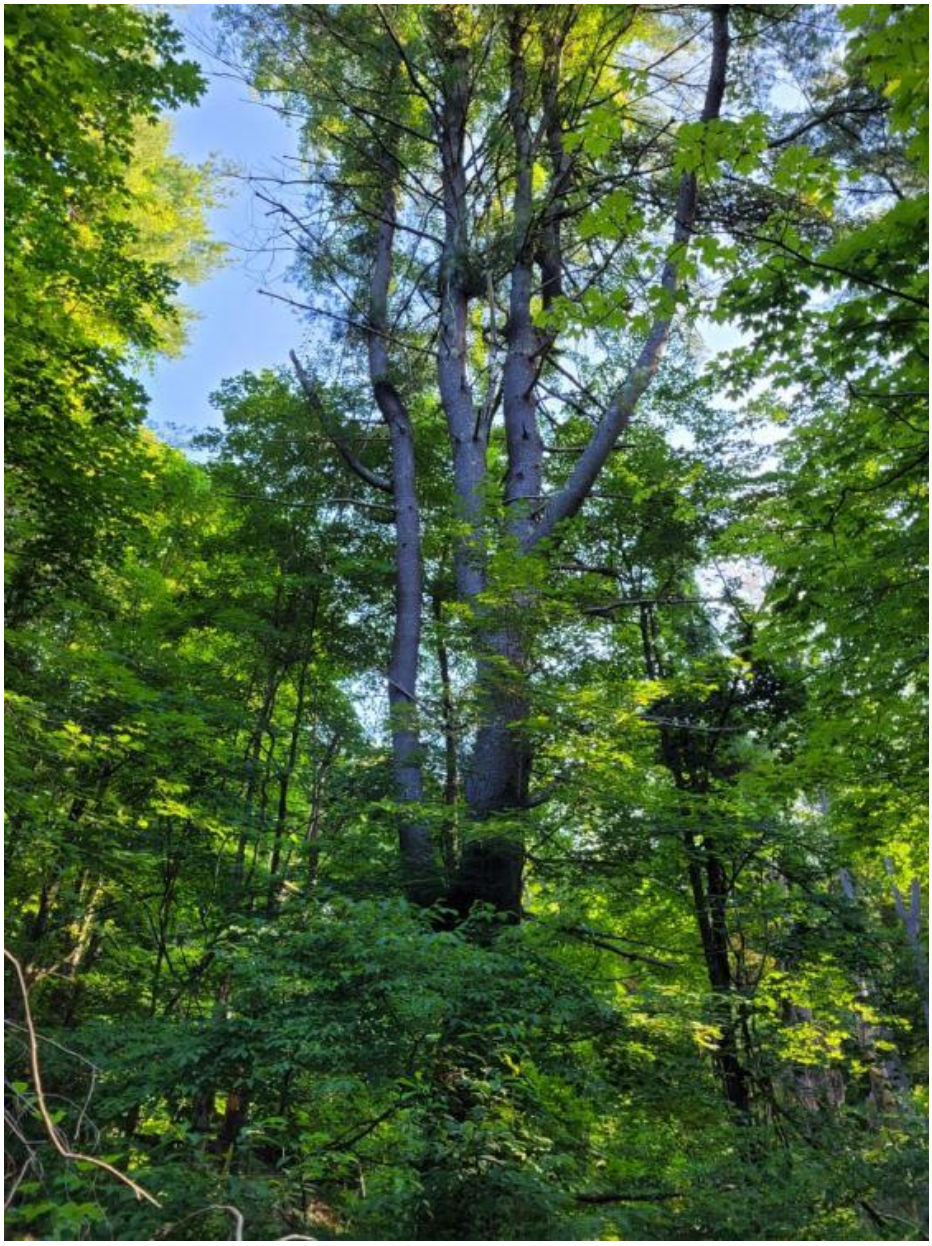


Photo 2.6. Photo of a white pine with multiple leaders, caused by white pine weevil damage.

Red pine scale is an exotic invasive insect originating from Asia that was first discovered in Easton Connecticut in 1946 and quickly became very detrimental to red pine plantations (Doane, 1959). Red pine plantations were common in state forests during that time period as a result of CCC planting efforts. The red pine scale feeds on the inner bark of host trees, eventually resulting in mortality. Some affected stands in the Leesville Block were salvaged in the 1980's and 1990's and are now young, pole sized mixed hardwood stands. Stands that were not salvaged are now most easily identifiable by red pine snags, or standing dead red pine trees, that were killed by red pine scale.

Photo 2.7. Photo of a red pine plantation that was killed by red pine scale. Notice the dead red pine stems have fallen over and are now rotting away on the forest floor while a stand of mixed hardwoods has taken their place.

Forest Health: Invasives

Invasive plant species such as multi-flora rose, Japanese barberry, honeysuckle, Japanese stilt grass, Japanese knotweed, oriental bittersweet and burning bush, sometimes called “winged euonymus” due to its twigs having a winged appearance, are commonly found in the Leesville Block and Wopowog WMA. Also, kudzu, known colloquially as “the vine that ate the south” is an invasive vine that has been found on an adjacent town of East Haddam property, directly southeast of the Leesville dam. Invasive plants can threaten to displace native understory vegetation and can overtop young trees, suppressing their growth. These shrubs tend to be most dense on roadsides, property boundary lines, and field edges with a lower density being present in the interior of the forest under the canopy of trees. Unfortunately, invasive species are so common throughout Connecticut and the rest of the northeast that eradication is not a realistic goal. However, efforts can and should be made to reduce invasive species density. Therefore, each timber harvest that is prescribed in this management plan will address invasive species. If levels are considered high enough to hinder the establishment of regeneration or will overtop advance regeneration, a treatment of the invasive plants in that area will be warranted prior to completing the silvicultural activity. Completed silvicultural activity will be monitored and treatments of invasive plants may be warranted post-harvest to ensure regeneration success. The kudzu adjacent to the Leesville dam was sprayed with herbicide, June of 2022, to control its spread. This vine will be monitored and follow up herbicide treatments will be recommended, as necessary, to the town of East Haddam.

Photo 2.8. Photo of Japanese barberry, an invasive shrub species, in the understory of the forest in the Wopowog WMA.

Forest Health: Wildlife Impacts

The impact of white-tailed deer on the productivity of forestland can be substantial. A staple in the diet of a deer is the buds and twigs of young trees. Once young trees have been browsed, they will then grow with a poor form and will be stunted from their full potential. Deer impact is a function of deer density, expressed in deer per square mile, and forage availability such as young trees, acorns, and agricultural crops. Deer densities greater than 20 deer per square mile can have significant negative impacts on forest vegetation. Herbivory is of highest concern when conducting a regeneration harvest because even a moderate to low density of deer in a given area can have a high impact on the regeneration within a recently harvested forest stand, stunting its growth, quality, and potential for decades to come. As a result, when conducting regeneration harvests on these properties strategies will be employed to reduce browsing impacts. These strategies may include leaving high volumes of down woody material to make it difficult for deer to traverse the harvested area or fencing in sprouts of desirable regeneration to protect them from browsing when they're most vulnerable (< 6 feet tall and at deer eye level).

Photo 2.9. Photo of a white tail doe with twin fawns browsing through the forest.

Forest Health: Abiotic Factors

The primary abiotic factor that has a significant effect on forest health is weather. Extreme weather events such as tornados, hurricanes, ice storms and micro-bursts cannot be planned for. However, this management plan aims to be adaptive. After significant weather events, areas that were heavily affected will be re-assessed. If any immediate action would be advantageous to mitigate forest health impacts, those actions will be taken at that time.

Photo 3.0. Two photos of storm damage within the Leesville Block, Salmon River State Forest. White pine uprooted by wind (left), broken stems (right).

A secondary abiotic factor that can impact forest health is fire. Fire is part of the natural disturbance regime of a forest. Some tree species are adapted to this disturbance and can benefit from the occurrence of a fire. An example of a tree species that is well adapted to fire is pitch pine which features thick bark that is able to withstand fire and serotinous cones that only open to release their seeds through the heat of a fire. Other tree species are less adapted to fire, such as red maple and black birch, which feature thin bark. Tree species such as this could be killed during a fire event. Frequent, low intensity fires are often part of a healthy forest disturbance regime and the flush of herbaceous growth after a fire can be beneficial to a variety of wildlife species. Connecticut has a very humid climate, making natural fires (caused by natural events such as lightning) rather uncommon. However, human caused fires, intentionally set prescribed fire as well as unintentionally set fires, are common across the state. No prescribed fires are scheduled for the Leesville Block or Wopowog WMA during this management cycle. The DEEP Forest Protection program along with support staff from various other DEEP divisions are available in the event of a wildfire situation in these stand lands.

Photo 3.1. Photo of a prescribed fire set on a state property within the Salmon River watershed in the spring of 2022 to reduce woody vegetation, maintain herbaceous growth, and retain early successional wildlife habitat on the landscape.

F. Silvicultural Strategies and Climate Change Mitigation

Forest Carbon Science

With the understanding that rising atmospheric carbon dioxide levels are a primary cause of ever-increasing global temperatures, generally referred to as climate change, forests are often looked at as a way to offset climate change impacts. This is due to the fact that forests take in an enormous amount of carbon dioxide from the atmosphere through photosynthesis, using it to maintain themselves and grow (Catanzaro & D'Amato, 2019). Forests sequester and store carbon. However, the rate at which they do these is largely influenced by a variety of factors such as forest age and natural and/or anthropogenic disturbances. Carbon sequestration is greatest in young forests, peaking when the forest is around 30 to 70 years old, but will continue to sequester carbon throughout its entire life span (Catanzaro & D'Amato, 2019). A forests carbon storage level increases with its age in the form of live and dead aboveground biomass such as trees, down woody material, and soil (Catanzaro & D'Amato, 2019). As a result, in the context of forest carbon, there is a place for both forest reserves (areas that go unmanaged and/or not harvested that serve as carbon sinks) and other areas that receive management (through silvicultural treatments aimed at regenerating the forest, creating early successional habitat, and creating a forest that is sequestering high amounts of carbon from the atmosphere). This management plan aims at striking this balance by designating 267 acres as an Old Forestland Management Site as well as 597 acres that will not be actively managed in the next 10 years that will serve as a forest reserve and carbon sink, maximizing carbon storage. This plan balances this by scheduling silvicultural activity to be done on 317 acres in order to regenerate the forest, capture natural tree mortality, improve the growing conditions for residual trees, enhance wildlife habitat, and increase the forests carbon sequestration rate.

Locally produced wood products, from prescribed silvicultural work on state lands, also reduce the carbon footprint of wood utilization due to reduced transportation. Additionally, the use of wood, a renewable resource, off sets the use of more carbon intensive materials such as concrete or steel while also avoiding carbon leakage. Reducing forest management and the production of wood products in Connecticut does not benefit the carbon cycle if those wood products are subsequently being sourced from unregulated and geographically distant forests, which would be considered carbon leakage.

Rotations & Cutting Cycles

The Leesville Block and Wopowog WMA is made up of undulating terrain, creating great contrast between riparian areas densely stocked with hemlock and upland areas filled with oak and northern hardwood species. In riparian areas either no management or uneven aged management will be recommended. This will maintain the natural hydrology of these areas and avoid sedimentation and erosion issues which could affect the water quality of the Salmon River. Un-even aged treatments will use 25 year cutting cycles. During this plan period, 139 acres of un-even aged silvicultural treatments are scheduled.

In upland oak and northern hardwood sites un-even aged management typically results in the regeneration of undesirable, shade tolerant species. As a result, even aged silvicultural treatments will be the primary focus of the management activities prescribed for this forest type. Even aged management will use 100-year rotations. During this plan period 178 acres of the forest will be scheduled to receive even aged silvicultural treatments.

The cutting cycle length and rotation age prescribed above are extended beyond the timeframes that have been historically recommended. This has been done to increase the carbon sequestration and storage potential of actively managed forest stands.

Forest Resilience

Biotic and abiotic forest health concerns, as described in the forest health section of this plan, often result in tree mortality. Considering all these forest health threats, managing for forest resilience is vitally important. A resilient forest has healthy trees of desired phenotypic traits, representing several age classes and a diversity of species. When a forest has these resilience traits, even when a forest health issue arises that results in tree mortality, there are trees already present on the site ready and able to fill the void created. In this way, the composition of the forest may change over time, but it remains a forest.

After tree mortality occurs there may be opportunities to salvage dead individuals. Salvaging can be used to recoup some value of the lost trees as well as control how much light reaches the forest floor to encourage the regrowth of desirable tree species. Salvaging may also take place in high public use areas to remove hazardous trees that could fall and create a dangerous situation to the public. In areas where tree mortality has occurred at a low density with scattered dead individuals throughout the forest, salvaging may not be warranted because retaining dead standing trees can serve as good wildlife habitat and is an important element of a healthy forest.

Active management through timber harvesting, and/or removal of invasive species aids in forest resilience by favoring native vegetation, creating space for all age classes of trees to grow, and maintaining healthy trees of desirable phenotypic traits that can withstand disturbances. However, unmanaged areas play a role as well by filtering water in riparian areas, maintaining the habitat created by older age classes of trees, and allowing natural succession to create a complex forest structure where multiple trees species and age classes are represented. As a result, 75 % of the acreage within Leesville Block and Wopowog WMA will be passively managed through this management plan, encouraging mature forest growth and the development of a more complex forest structure.

Expectations: Next 100 years in Succession

Within the next 10-year planning cycle, management actions will be taken on sections of the forest that were acquired since the last forest management plan was written and follow up treatments will be made on previously treated areas where applicable. Employing this strategy provides the opportunity for recently acquired parcels, that may have previously gone unmanaged or had been poorly managed, to be set on a long-term path of sustainable management and previously treated areas will receive the attention needed so they may continue on a long-term path of sustainable management. By the end of this 10-year planning cycle,

178 acres will have been treated using even aged silvicultural techniques. The primary silvicultural technique used will be the shelterwood method of regenerating the forest; 146 acres will be treated with this method. The shelterwood method removes all trees from a stand through two or three cuttings, stimulating the establishment of a new cohort of trees. An additional 32 acres will be treated using timber stand

improvement which consists of thinning in young stands to favor trees of desirable species and form. Additionally, un-even aged silvicultural techniques will be employed on 139 acres using the single tree and group selection method. This method is aimed at regenerating a new cohort of trees while maintaining all size and age classes of trees, thus, creating an un-even aged stand. Therefore, 25 percent of the total land area in the Leesville Block and Wopowog WMA will be receiving direct attention. This management plan also aims to be adaptive in the next 10 years. The remaining portions of the block, not actively managed, will be actively monitored. If conditions arise, that are unforeseeable at this time such as destructive weather events or insect outbreaks that pose a significant detrimental effect to the forest resource, silvicultural options will be assessed, and emergency actions will be taken as necessary.

Table 1.3. Acres to be managed through even and un-even aged silvicultural techniques within the Leesville Block of Salmon River State Forest.

Acres to be Actively Managed				
Forest Cover Group	**Regenerate - Even Aged: Clear cut/Seed tree/Shelterwood**	**Regenerate - Uneven Aged: Single tree/Group Selection**	**Thinning: Free/Crown/Low/ Mechanical/Selection**	**Intermediate Treatment Cleaning/Weeding/Timber Stand Improvement**
Elm-Ash-Red Maple	0	0	0	0
Maple-Beech-Birch	0	0	0	0
Oak-Hickory	64	0	0	0
Oak-Pine	0	0	0	0
Spruce-Fir	0	0	0	0
White-Red-Jack Pine	0	139	0	0
Pinyon-Juniper	0	0	0	0
Total Acres	**64**	**139**	**0**	**0**

Table 1.4. Acres to be managed through even and un-even aged silvicultural techniques within the Wopowog WMA.

Acres to be Actively Managed				
Forest Cover Group	**Regenerate - Even Aged: Clear cut/Seed tree/Shelterwood**	**Regenerate - Uneven Aged: Single tree/Group Selection**	**Thinning: Free/Crown/Low/ Mechanical/Selection**	**Intermediate Treatment Cleaning/Weeding/Timber Stand Improvement**
Elm-Ash-Red Maple	0	0	0	0
Maple-Beech-Birch	0	0	0	0
Oak-Hickory	82	0	0	32
Oak-Pine	0	0	0	0
Spruce-Fir	0	0	0	0
White-Red-Jack Pine	0	0	0	0
Pinyon-Juniper	0	0	0	0
Total Acres	**82**	**0**	**0**	**32**

The following 10-year planning cycle (2035 – 2045) will aim to continue the strategy outlined above. Areas that were harvested using even aged regeneration techniques, as prescribed in this management plan, will have regenerated a mixture of species. Intermediate treatments, such as timber stand improvement will be employed in order to favor the best quality individuals of the most desirable species. Also, areas that were thinned, as prescribed in this management plan, may have developed into stands favorable for regeneration harvests in order to continue producing the next generation of forests. During the next 10-year planning cycle each stand will once again be put under the management planning micro-scope and intensive management will be brought to stands previously left to grow where it would be advantageous to do so.

The current forest is a direct by-product of management actions taken, insect and disease problems arising, herbivore browsing and competing vegetation being present within the last 100 years. All management actions taken, insect and disease problems arising, herbivore browsing and competing vegetation being present from European settlement to current day has produced the forest as we now know it. With there being more and more insect and disease issues plaguing forests, a steady demand for forest products ever present, and a rising climate change issue, the forest resource is under greater stress than ever. The next 100 years of management will be critical. Due to the near complete suppression of fire on Connecticut's landscape, continual deer browsing and the competitiveness of black birch, American beech and red maple, it is likely that our forests will transition into a northern hardwoods forest type and away from an oak/hickory forest type. Also, as average annual temperatures rise due to global warming, some tree species may become less prominent due to a shifting in their native range. Extreme weather events that can cause severe damage to forest ecosystems such as ice storms and hurricanes are predicted to become more frequent. However, through sustainable management practices that will continually choose desired phenotypic traits, representing several age classes and a diversity of species, over undesirable traits and monocultures,

Connecticut's forests will be as resilient and as diverse as they can possibly be, preparing them to not only survive, but thrive over the next 100 years.

Adaptive Forest Management

The Division of Forestry understands the nature of forest management as it occurs as part of a dynamic landscape. Management actions are often affected by outside variables which influence the outcome of resource decisions. The Division of Forestry reserves the right to reasonably change our management approach as environmental change and resource needs warrant. Some of these changes may be associated with biological factors such as insect and disease, or population outbreaks. Increased unauthorized motorized recreation which erodes trails and roads may require action unforeseen during the composition of this plan. Additionally, environmental conditions such as hurricanes or record-breaking precipitation may additionally affect resource condition and work requirements. The Division of Forestry and our colleagues in Parks, Wildlife, Fisheries, and Agency Support, evaluate circumstances and use an adaptive-management philosophy and additionally reserve the right to address unforeseen circumstances should they arise during the tenure of this forest management plan.

G. Wildlife Habitat

Habitat Management

The DEEP Wildlife Division has a mission to advance the conservation, use, and appreciation of Connecticut's wildlife resources; and the Wildlife Division supports the Forestry Division in planning and conducting management within State Forests. Maintaining sustainable populations of wildlife requires suitable habitat. State-owned conservation land provides large tracts of undeveloped space that contain a diversity of habitats, and habitat management can further create and enhance these spaces. A variety of techniques are employed by resource managers, including silviculture, which can play an important role in the conservation of biological diversity in forested ecosystems. Silvicultural treatments help maintain healthy forests for wildlife and can be used to provide specific conditions that certain wildlife of conservation concern require, such as young forest or pitch pine-oak woodland. Within these blocks, the silvicultural treatments carried out by the Division of Forestry have helped maintain a healthy and diverse forest, and future treatments outlined in this plan will create additional suitable habitat for a wide array of wildlife including game species and Species of Greatest Conservation Need (SGCN) identified by the Connecticut Wildlife Action Plan (DEEP, 2015) which guides wildlife conservation efforts.

Other forms of habitat management that occur within State Forests and Wildlife Management Areas include maintenance of early successional habitats by mowing, invasive plant control, and maintenance of wildlife impoundments. Early successional habitats including grassland, shrubland, and agricultural land provide important habitat diversity for wildlife within State Forests; many wildlife species rely on early successional habitats to survive or reproduce. The Wildlife Division coordinates management of these areas. At the Leesville Block and Wopowog WMA, there are six patches of grassland and shrubland habitat totaling approximately 14 acres; these areas all fall within Wopowog WMA. Most grassland and shrubland patches are maintained by the practice of conservation mowing wherein vegetation is mowed once every two to five years to maintain early successional conditions important to a variety of wildlife species. Prescribed fire, selective cutting, and selective herbicide applications may also be used to sustain these habitats. Invasive plant control aims to reduce the abundance of invasive plants through mechanical and chemical methods to allow native plants to grow and proliferate to benefit native wildlife and support healthy ecosystems. There are no areas of agricultural land managed through agricultural license agreement within the Leesville Block or Wopowog WMA.

The Wildlife Division coordinates the management of two wetland impoundments, both within Wopowog WMA: Wopowog Marsh # 1 (0.6 acres) and Wopowog Marsh # 2 (0.3 acres). Wetland impoundments are shallow dammed water bodies that can provide high quality habitat for wetland dependent wildlife. Most impoundments are maintained and repaired with funding provided by the Federal Aid in Wildlife Restoration Program, Connecticut Duck Stamp Program, and Ducks Unlimited. Impoundments typically feature a water control structure that allows managers to manipulate water levels to promote emergent wetland habitat and to provide waterfowl hunting opportunities where permitted. Water depth is set by adjusting the water control structure, to achieve habitat objectives. Controlling beaver at these sites is sometimes necessary to minimize damage to dam and water control infrastructure and to sustain important wetland habitat. Regular

maintenance is needed to ensure the structural integrity of dams and the functionality of water control structures; this maintenance is made challenging by aging infrastructure, lack of manpower, and blockage caused by beavers. The Wildlife Division and State Parks Unit cooperate to operate these water control structures and to mow the dams to ensure they remain free to woody vegetation. Impoundments here continue to be maintained at a level commensurate with staff time and resources; periodic mowing of dams is conducted, beaver debris is cleared from water control structures as needed, and beaver control is carried out when necessary.

The Wildlife Division's Migratory Bird Program maintains one wood duck box at each of these impoundments. These boxes provide nesting opportunities for wood duck and hooded merganser. Boxes are cleaned and inspected annually for evidence of nesting activity and replaced as necessary. Invasive plant control of *Phragmites* is an important component of impoundment management as this species can displace native plants thereby degrading wildlife habitat and critical habitats. *Phragmites* control by mechanical and chemical means may occur within wetland habitats as deemed necessary by the Wildlife Division.

Habitat Conditions and Landscape Context

Landscape-level conservation of wildlife requires land managers to consider actions in a regional context. The Leesville Block and Wopowog WMA intersect with significant tracts of undeveloped forestland composed of multiple large core forest blocks (> 500 acres; UConn, 2015) within the increasingly fragmented landscape of southern New England. From 1985 to 2015, Connecticut lost an estimated 115,181 acres of forestland due primarily to development (UConn, 2015); a significant habitat loss for wildlife associated with forests. The town of East Hampton (where most of this property resides) has experienced 1,002 acres (-5.4 %) change in forest cover from 1985 – 2015 (UConn, 2015). Sustaining large tracts of healthy and resilient forests is important for efforts to maintain sustainable wildlife populations in the face of ongoing land use conversion.

Following historical land clearing practices, the forest has grown since the 1920's with limited disturbance resulting in a somewhat homogenous forest that lacks structural complexity. As noted, many wildlife species require or benefit from forests that are diverse in age and structure that is mostly lacking in Connecticut. In general, a goal of maintaining at least 10-15 % of a landscape in young forest habitat is considered beneficial to wildlife and is within the historical range of what was present on the landscape and to which wildlife have become adapted (DeGraff, 2003, Dettmers, 2003). A 2021 mapping effort to assess the statewide extent of young forest and shrubland habitat (Connecticut Young Forest and Shrubland Vegetation GIS Layer) estimates Connecticut is composed of approximately 3 % young forest/shrubland habitat. The current forest inventory indicates 1.4 % of forest land here to be in the seedling/sapling age-class. A portion of the silvicultural treatments planned within these blocks of land seek to increase the proportion of seedling/sapling age-class forest to provide more of this habitat type for declining wildlife that rely on these habitats. The Leesville Block and Wopowog WMA also feature other early successional habitats (grassland and shrubland) that have become less common in Connecticut over the past 100 years due to land use conversion and forest maturation. The Wildlife Division (in cooperation with other Divisions) will continue to maintain and sustain these patches of habitat using management practices described in the pervious section.

Wildlife benefit from a diversity of habitats. Harvesting creates greater structural complexity (the size, spacing, and arrangement of live and dead vegetation) within the forest. Complexity within a forest includes multiple canopy layers (mature trees, mid-story trees, understory trees, ground, and shrub vegetation), edges, down woody material, standing dead trees (snags), and young/early successional vegetation. Gaps in the forest canopy of various sizes and shapes also adds to the complexity of the forest habitat. This diversification of the forest creates more opportunity for a wider range of wildlife species to meet their needs (food, water, cover) within the forest.

Biodiversity

The Leesville Block and Wopowog WMA support a wide range of wildlife associated with forested habitat. Sections of the Leesville Block and Wopowog WMA fall within the vicinity of known occurrences of state and/or federally listed threatened, endangered or of special concern species. The Wildlife Division maintains a spatial database of known locations of threatened, endangered and special concern species and important natural communities - the Natural Diversity Database (NDDB). As part of the planning process, a data request was submitted to inform this plan and future management, and a Determination was received August 2, 2022. This report identified one bird species of special concern, one threatened insect species, one insect species of special concern, a threatened plant species and an endangered plant species, three freshwater mussel species of special concern, three reptile species of special concern, and two turtle species of special concern. These species can be negatively affected when forestland is fragmented, converted to other uses, forest management operations take place during their active or breeding season or when forest management operations do not buffer riparian areas according to best management practices for water quality (DEEP, 2012). As a result, forest management activities in the areas covered by this plan will be largely influenced by these species in an effort to preserve and enhance critical habitat. These efforts will be made in the form of preserving habitat as is, through Old Forestland Management Sites, and harvesting trees in strategic areas to reduce negative impacts on these species. Timber harvesting activity can increase habitat diversity and structure in many cases, which can enhance habitat for both listed and non-listed species. Any timber harvesting done in the Leesville Block and Wopowog WMA will be limited to the dormant season of the listed species above and/or will use best management practices outlined by DEEP wildlife biologists for conducting work in the forest while minimizing negative impacts to listed species. The Leesville Block and Wopowog WMA also support a wide array of forest generalists such as white-tailed deer, bobcat, and wild turkey. Black bears are present but relatively uncommon when compared to other regions of Connecticut. Moose have not been documented recently in this area.

The New England cottontail (NEC) is Connecticut's only native cottontail and has declined more than 85% throughout its historic range in the New England and Eastern New York. It is associated with young forest habitats and dense forest understory conditions and is a Species of Greatest Conservation Need (SGCN) in Connecticut and regionally due in part to habitat loss and forest maturation (CT WAP 2015). The Wildlife Division has created Focus Areas that encompass extant NEC populations to better direct conservation efforts such as habitat creation and enhancement. A portion of the Leesville Block and nearly all of the Wopowog WMA fall within a disjunct section of the Lower Connecticut River Restoration Focus Area (map included in

Appendix). Focus Areas were delineated via computer modelling based on historic NEC range and landscape capacity to support

suitable habitat conditions. However, despite the broader Focus Area containing an estimated 1,900 acres of suitable habitat, NEC have not been documented within the Leesville Block or Wopowog WMA blocks since the Wildlife Division began closely assessing the species' distribution in Connecticut in 2000. Silvicultural treatments that encourage dense vegetative growth may sustain existing populations that have yet to be documented.

American woodcock is an important migratory game bird that has experienced population declines throughout the northeast due in part to habitat loss and forest maturation. A SGCN, it is associated with young forest and other early successional habitats, and the Wildlife Division has created Focus Areas to help direct conservation efforts such as habitat creation and enhancement where existing environmental conditions are suitable. The Leesville Block and Wopowog WMA are located within an American woodcock Focus Area. While American woodcock is a focal species for young forest habitat creation, over 50 SGCN rely on young forest or shrubland. This includes many birds such as eastern towhee, indigo bunting, prairie warbler, and chestnut-sided warbler; several State Listed reptiles; several small mammals; and many invertebrates including pollinators. Additionally, many birds that nest within mature forest use areas of young forest for foraging and raising young. The silvicultural treatments indicated in this plan will benefit many species in this suite of disturbance dependent wildlife. Alternatively, large tracts of sawtimber size class forest are important for many forest nesting birds such as ovenbird and wood thrush. Significant amount of suitable habitat will remain unmanaged in this planning period and be available to these species; and silvicultural practices that promote growth in the midstory and understory while retaining intermediate to high levels of canopy cover are consistent with maintaining or creating suitable habitat for these species.

Wildlife-Based Recreation

The Leesville Block and Wopowog WMA are open to all forms of regulated hunting, fishing, and trapping. Hunting opportunities include small game, waterfowl, wild turkey, and white-tailed deer. There are no lottery restrictions for deer hunting in these blocks and there are no Designated Deer Bowhunting Only Areas. Regulated trapping is permitted with a State Lands Trapping Certificate. Public access maps for these lands are available for viewing or printing on the DEEP Public Hunting Areas in CT Webpage which can be found by following this link CT Hunting and Trapping. These maps may also be obtained by contacting the Eastern District Headquarters in Marlborough. For additional information pertaining to hunting regulations, seasons and fees visit the DEEP hunting and Trapping Webpage which can be found by following this link CT Hunting and Trapping. Opportunities for passive wildlife-based recreation such as birding, wildlife photography and wildlife viewing are available year-round throughout the entire property.

Fisheries Habitat and Best Management Practices

The Salmon River is the major fisheries resource that flows through the Leesville Block and Wopowog WMA. Efforts by the state to preserve and manage the forestland adjacent to this river have helped protect the quality of this resource. Watershed management efforts combined with fisheries efforts to protect, sustain, and diversify fish habitat have resulted in this river being a vital habitat resource for a variety of fish species.

In conjunction with these efforts to manage and protect streams and adjacent forestland, is a robust stocking program aimed at enhancing and diversifying recreational fishing. The Salmon River is stocked annually with thousands of brown trout, rainbow trout, among several other species creating great opportunities for anglers.

To protect the Salmon River and is associated fisheries habitat from erosion and sedimentation resulting from land management activities, Best Management Practices (BMP's) for water quality will be followed before, during, and after all management activities, such as timber harvesting. These practices are outlined in Best Management Practices for water quality while harvesting forest products (DEEP, 2012). Practices include considerations for trail layout, landing/staging location, stream crossings, silt fencing, water bar placement and spacing, as well as clean up and close out post-harvest.

H. Recreation

The Leesville Block and Wopowog WMA are primarily utilized for consumptive recreation such as fishing and hunting. Fishing is the primary draw to these areas due to the Salmon River flowing directly through these properties. Passive recreation such as hiking, cycling, and horseback riding are also common recreational activities on these properties, although there are no formal DEEP authorized trails.

The Leesville Dam, located on the Salmon River west of Powerhouse Road in East Haddam, is closed to fishing to protect migrating Atlantic salmon in a vulnerable area where they become funneled through the dam. Fishing is permitted below and above the dam with a current state issued fishing license.

The primary recreational concern on these properties is the use of off-road vehicles such as motorcycles (dirt bikes), All-Terrain Vehicles (ATV's), and 4 x 4 Jeeps and trucks. Public lands in Connecticut are a finite resource that have a limited number of staff available for maintenance of trails and remediation of rutted and eroded areas of concern. Off-road vehicles create a visual and noise disturbance to wildlife and trails fragment and degrade habitat. Continued use of unmaintained trails by off-road vehicles often results in rutting, erosion, and sedimentation. As a result, the use of off-road vehicles on state lands is prohibited. Regardless, individuals continue to ride their off-road vehicles on state lands. There are many non-authorized off-road vehicle trails throughout the Leesville Block and Wopowog WMA. Gates have been installed and access points blocked with boulders where possible to discourage this use, however, persistent individuals continue to ride on these properties including through streams and within the Salmon River. Greater enforcement actions need to be taken to protect public lands in Connecticut from this incompatible, unauthorized use. Increased EnCon patrolling in problem areas is recommended, such as along Gulf Road, where the powerlines cross Route 16 directly west of the Comstock Bridge, areas where the AT & T right-of-way crosses Gulf Road and Route 196, and along Wopowog Road. Furthermore, increased collaboration between EnCon and local town and state law enforcement will be done to improve patrolling and enforcement efforts. Also, because of the interest in off-road vehicle use across the state, more thought should be put into creating additional designated riding areas to provide the public with the opportunity to use their off-road vehicles in a safe, legal manor.

Trails through State Forests facilitate a variety of recreational opportunities. Authorized trails are approved by the Department only after formal consideration for forest, water, and wildlife resources, and after considering the impacts to wildlife-based recreation. Trails can degrade wildlife habitat through sedimentation, erosion, and the introduction of invasive species; trails also cause negative impacts to wildlife by the ongoing disturbance of human use (Stevens & Oehler, 2019). Where appropriate, low density trail networks better

sustain and protect wildlife populations, wildlife habitat, and wildlife-based recreational opportunities while

high-density trail networks can compromise the ecological integrity of an area. Unauthorized trails and illegal off-road motor vehicle use further degrade habitat and disturb wildlife. Closing unauthorized trails can benefit wildlife and wildlife-based recreation. No formal trails currently exist within the Leesville Block or Wopowog WMA. Recreational opportunities on the landscape scale, within surrounding forest and park properties, are available. As a result, future trail requests for these properties will be limited or not supported due to much of the terrain being steep, highly erodible soils, and sensitive floodplain wetland soils, along the Salmon River and its tributaries. Trails are a vital tool for connecting people with nature and are highly valued by the public. Trails are a common feature on most DEEP properties and are some of our greatest recreational amenities. Trails can even help protect rare habitats and sensitive resources by concentrating use on designated, sustainable pathways. However, state forestland is intended to be managed for the ecological integrity of forest ecosystems and wildlife management areas are intended to be managed for the purposes of wildlife conservation and wildlife centered recreation. Unauthorized, user created trails often erode the intended management purpose of these properties and limit their management potential. Recreationalists are asked to obey by the rules and regulations that govern the use of these properties and to follow formal channels through DEEP for proposing the creation, use, and maintenance of trails (DEEP Policy/Procedure # 310, 2019).

I. Economic Benefits

According to the Forest Products Industries Economic Contributions: Connecticut 2020, the total output of Connecticut's Forest Products Industry was $ 3.96 billion. Of that, primary wood product manufacturing was $ 198 million, secondary wood product manufacturing was $ 402 million, wood furniture was $ 781 million, and paper manufacturing was $ 2.5 billion. Connecticut does not have pulp and paper mills and/or manufacturing facilities. As a result, the paper manufacturing economic contributions represent recycling of paper waste and cardboard, not the use of Connecticut grown wood fiber. Forestry and logging accounted for an additional $ 26 million in output (Public Sector Consultants & Emmerthal, 2020). State forestland in Connecticut is, collectively, the largest landholding in the state. The Division of Forestry, state lands management program has a diversity of goals for this landholding, one being to supply a sustainable source of forest products. According to the 2020 Annual Report Summary prepared by the Forestry Division's Forest Practices Act Program, between 2015 and 2018, Connecticut averaged 27.5 million board feet for sawtimber and veneer purchased from all lands in the state. Approximately 7.6% of this harvest came from state land during this time period which is below the average of 10.2% between 1997 and 2018.

This management plan prescribes silvicultural work to be completed on 317 acres. Through this work, trees are removed to improve the growth and quality of residual trees and to allow for natural regeneration to become established. The trees removed are sold as a forest product and depending on their size, species, and/or quality they will be sawn for lumber, peeled for veneer, ground into wood chips, or burned as firewood. These products contribute to a local forest economy and support many individuals such as foresters, loggers, truckers, sawyers, and carpenters.

J. Public Involvement

Public involvement and receiving stakeholder input are critical aspects of public lands management. Therefore, a preliminary draft of this forest management plan was shared with the towns that this forest resides within, East Hampton, East Haddam, Haddam, and Colchester as well as the Connecticut Horse Council, Connecticut Forest & Park Association (CFPA), the southeast Connecticut chapter of the New England Mountain Biking Association (NEMBA), the New England chapter of Back Country Hunters & Anglers (BHA), the Connecticut Conservation Advisory Council, Audubon Connecticut, the Thames Valley Chapter of Trout Unlimited, and the Salmon River Watershed Partnership. These municipalities and organizations are considered major stakeholders in the management of this forest because collectively they represent the constituents of the community the forest is located within, recreational opportunity, trail stewardship, and the conservation of vital wildlife habitat. Theses stakeholders were asked to review the plan, over a month-long period, and provide any comments or concerns they might have. Through this process comments were received from the Connecticut Horse Council, the Salmon River Watershed Partnership, and the Thames Valley Chapter of Trout Unlimited. Revisions were made to the plan accordingly to reflect issues and concerns expressed in the comments received.

To increase transparency between DEEP and the public an additional outreach process as been adopted to provide the public with the opportunity to review management plans and submit comments, suggestions, and/or concerns. This involved posting a notice on DEEPs list of e-alerts for a duration of one month. The notice stated that DEEP Division of Forestry intends to adopt with final approval the Salmon River State Forest: Leesville Block & Wopowog WMA Forest Management Plan. The notice included contact information for the plans author, a map of the management plan area as well as the infographic included at the beginning of this plan. Interested individuals could then contact the author of the plan, requesting a copy of the plan. Subsequent comments are welcome as they are incorporated into the final copy of the plan before final approval and publishing on the CT DEEP website.

This plan will be made available to the public. State forest management plans are published on the CT DEEP website and can be found by following this link Forest Management on State Lands. Comments and questions regarding the plan are always encouraged. Also, this plan may serve as a resource for local municipalities and non-profit organizations that are actively planning for open space protection and conservation.

K. Management Goals

- Support sustainable recreation while discouraging non-authorized uses that threaten the integrity of the forest resource
- Establish 267 acres of Old Forestland Management Sites
- Promote, enhance, and protect significant habitat
- Maintain areas of mature forest to serve as carbon storage
- Create young forest to increase the rate of carbon sequestration
- Create young forest and early successional habitat to diversify wildlife habitat
- Control invasive species, particularly in managed areas, to prevent them from suppressing regeneration and to prevent their establishment throughout the forest
- Make improvements to Gulf Road for public and forest management access
- Adaptive management principles will be utilized in the event that damage to the forest is caused by events that are unforeseen at this time such as adverse weather and insect or disease infestations.

L. Work Plans

Silvicultural Operations Schedule

Table 1.5. Table of the silvicultural activities scheduled for the next 10 years within the Leesville Block and Wopowog WMA.

Year	Property	Compartment	Stand	Acreage	Activity
2025	Wopowog WMA	1	4	18	Shelterwood
2025	Wopowog WMA	1	7	18	Shelterwood
2027	Wopowog WMA	2	10	27	Shelterwood
2027	Wopowog WMA	3	7	19	Shelterwood
Worked on periodically as resources are available	Wopowog WMA	2	1	15	Timber Stand Improvement
Worked on periodically as resources are available	Wopowog WMA	3	5	17	Timber Stand Improvement
2029	Leesville Block	6	1	139	Single Tree/Group Selection
2031	Leesville Block	11	1	64	Shelterwood
			Total Acreage	**317**	

Prescribed Fire

No prescribed fire is scheduled for this management cycle within the Leesville Block or Wopowog WMA.

Forest Product Permits

Several forest products will be available to the public periodically on these properties throughout this management plans timeframe. These products are firewood, mountain laurel boughs and branches, and maple taps for sap collection. The harvesting of these products is conducted under the forest products harvest permit system. To learn more about forest product harvest permits or to acquire a permit, e-mail the Division of Forestry at DEEP.Forestry@ct.gov. Products are available on a first come, first serve basis, availability may be limited, and may only be available seasonally.

Invasive Treatments

It is imperative that invasive plants be treated so they do not suppress regeneration efforts. Invasive species are common and well established across the landscape. Eradication is not a realistic goal. Therefore, invasive control efforts will be concentrated to areas where harvesting is scheduled. Fortunately, in much of the upland forest stands where harvesting has been scheduled the density of invasive plants is low or non-existent. Invasive control will focus on areas where invasive plants are most prevalent, along boundary lines and access points. Chemical treatment, such as the use of herbicides, is the preferred invasive treatment method. This is because chemical treatments can target individual plants or large groups and they are effective at killing an entire plant above and below ground. Also, from a time and economic management perspective, herbicide treatments are more efficient than alternative mechanical control methods.

Table 1.6. Table describing where, when and the extent of invasive treatments planned in the next ten years within the Leesville Block and Wopowog WMA.

Year	Property	Compartment	Stand	Acreage
2025	Wopowog	2	4	4
2025	Wopowog	3	2	14
2028	Wopowog	2	8	11
2028	Wopowog	2	3	24
2028	Wopowog	3	8	8
2030	Leesville	11	1	64
			Total Acreage	**125**

Road Work

There are two primary roads of concern that pass through the Leesville Block and Wopowog WMA. Gulf Road traverses the Leesville Block in East Hampton to East Haddam and Wopowog Road passes between compartments two and three within the Wopowog WMA, also in East Hampton. The surface of these roads is gravel, and they are both town owned and maintained. Wopowog Road is currently in good condition with functional drainage and minimal issues such as scattered potholes. Annual roadside mowing, re-grading, and drainage maintenance, as needed, is all this road needs to keep it in good condition in the coming years. Gulf Road is in very poor condition with ruts, large/deep potholes, washouts, erosion of surface material, and little to no functional drainage. This road has had minimal maintenance for years by the town because there are no residences on the road, and it has received very little attention from the state because there has not been a significant need to improve it for state forest and/or public access. However, this is an important road for access to state forestlands, access to the Salmon River as well as access to several parcels of private property. Although it is still passable, the State of Connecticut nor the Town of East Hampton can take this road for granted in the future. There are hundreds of roads, exactly like Gulf Road across the state, that eventually get deemed discontinued or unmaintained and their continued use and weathering inevitably puts them in such a state of disrepair that they become completely unpassable and repairing them cost-prohibitive. During the lifespan of this management plan DEEP and the Town of East Hampton should collectively take responsibility for this road. Sharing resources, labor, and funding for the improvement of this road would make the task more manageable. Early in this management plans duration DEEP staff, including representatives from forestry, parks, wildlife, support services, and EnCon, will arrange for a meeting with the town of East Hampton and the town of East Haddam to discuss a collaborative approach to the maintenance and repair of this road in the future.

Other Infrastructure Improvements -culverts, gates, boundary surveys

In 2004, 107 acres of forestland were purchased by the state between Salmon Run and Gulf Road which were incorporated into the Leesville Block. This property was surveyed, however, multiple corner pins were not set on the south side of the property. As a result, the boundary line on the entire south side of this property is unmarked. The DEEP Land Acquisition and Management (LAM) office has been notified of this surveying error and the unmarked boundary line was inspected by the DEEP Surveyor. During the duration of this management plan, a survey will be completed to set these corner pins so that this boundary line can be marked with confidence. DEEP LAM will take the lead on the survey and/or contracting the survey work to be completed.

Installing gates on either end of Gulf Road has been proposed by the town of East Hampton. These gates could be closed during winter months to block motor vehicle traffic when the road and ground conditions are wet and most vulnerable to rutting and erosion. Also, this road tends to retain water and does not thaw out quickly, being located within a thick, dark canopy of hemlock. As a result, the road is typically icy in the winter, which has led to stuck vehicles and vehicles off the road. Therefore, gating the road in the winter is a good safety precaution for users of the forest. DEEP staff will continue discussions with the town of East Hampton to install these gates during the duration of this plan.

Habitat Enhancement Work

The Wildlife Division will continue to coordinate periodic mowing and selective treatments as necessary to maintain non-forested upland areas. Fields will be evaluated annually and mowed once every two to five years to sustain grassland and shrubland habitat. Herbicide application and selective cutting may also be employed to maintain desired habitat conditions. Also, the Wildlife Division will continue to maintain wood duck next boxes and a mix of open water and emergent vegetation in the wildlife impoundments. Management activities will include maintenance of each dam and water control structure (i.e., annual mowing, removal of beaver debris, beaver population management and water level manipulation). The State Lands Habitat Management Program will continue to aid in monitoring beaver activity within the property and addressing problems where public health and safety and/or important habitats are being threatened. Assistance from Agency Support Services, Parks, and the Wetlands Habitat and Mosquito Management Program in providing equipment and personnel may be requested.

Non-Commercial Forest Products Work

Non-commercial forest products work includes timber stand improvement efforts. Timber stand improvement is an important step to take on a site where the goal is to grow healthy, quality trees of the species composition that is desired. Silvicultural regeneration efforts made within the Leesville Block and Wopowog WMA in the last 40 years have resulted in an abundance of black birch, red maple, and American beech regeneration. To favor the growth of the best quality individuals of these species for future sawtimber production as well as to prevent oak species from being outcompeted and maintain the oak component within the forest, timber stand improvement is necessary. Timber stand improvement is analogous to weeding a vegetable garden, in that poor quality and/or undesirable individuals are removed to provide additional growing space to neighboring good quality, desirable individuals.

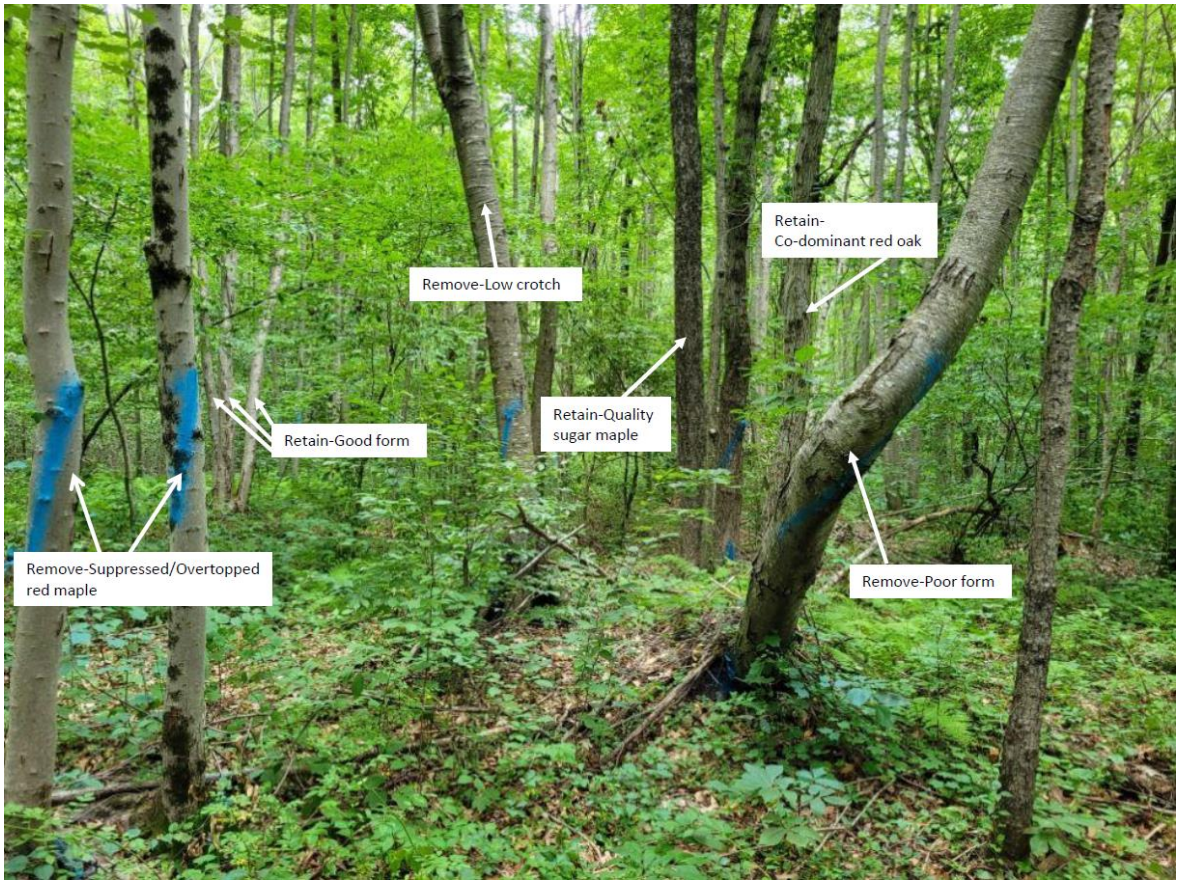


Photo 3.2. Example of how timber stand improvement is applied to improve the growth, value, and species composition of the forest.

Opportunities to conduct this work within the Leesville Block and Wopowog WMA are available in several stands, most notably in stands that have had a regenerative silvicultural operation within the last 40 years and now have young growth of sapling to pole sized trees. These stands include Wopowog WMA Compartment 2, Stand 1, which was thinned in 1985, and Compartment 3, Stand 5, which was harvested using the shelterwood method in the early 1980's. Timber stand improvement work within these stands will be worked on periodically throughout the duration of this management plan utilizing DEEP forestry staff and/or independent contractors as time and funding are available.

Hazardous Trees

With the plethora of forest health concerns described in this management plan, the mortality of some trees is inevitable. Although having some dead trees in the forest is normal and part of a healthy forest ecosystem, too many dead trees can create potentially hazardous situations in highly trafficked areas. Within the Leesville Block, the Parks Division has removed hazardous trees at the Fireman's Field and Salmon River Recreational Areas, resulting from spongy moth defoliation in 2016, 2017, and 2018. Early in the lifespan of this management plan and as part of the overall maintenance of the road, DEEP Forestry will be assessing and removing trees that are found to be hazardous along Gulf Road. Tree maintenance along Wopowog Road is the responsibility of the town and Eversource since this road has powerlines running beside it. The town and Eversource can assess and remove trees as they deem necessary.

Table 1.7. Work plan of management activities scheduled in the next 10 years within the Leesville Block of Salmon River State Forest and Wopowog WMA.

Salmon River State Forest: Leesville Block & Wopowog WMA Work Plan by Year					
Year	**Scheduled Activity**	**Property/Forest Compartment**	**Forest Stand**	**Restrictions**	**Area**
2025	Boundary Line Maintenance	Wopowog WMA	N/A	None	8 Miles
2025	Invasive Treatment	Wopowog WMA / 2	4	Seasonal	4 Acres
2025	Invasive Treatment	Wopowog WMA / 3	2	Seasonal	14 Acres
2025	Shelterwood	Wopowog WMA / 1	4	Seasonal	18 Acres
2025	Shelterwood	Wopowog WMA / 1	7	Seasonal	18 Acres
2025	Schedule meeting between DEEP and Towns to discuss Gulf Road maintenance/repair	Leesville Block	N/A	None	1.5 Miles
2026	Survey	Leesville Block / 6	1	None	1 Mile
2026	Gulf Road Gate Installation	Leesville Block	N/A	Seasonal	2 Gates
2027	Shelterwood	Wopowog WMA / 2	10	Seasonal	27 Acres
2027	Shelterwood	Wopowog WMA / 3	7	Seasonal	19 Acres
2028	Gulf Road Maintenance/Repair	Leesville Block	N/A	None	1.5 Miles
2028	Invasive Treatment	Wopowog WMA / 2	8	Seasonal	11 Acres
2028	Invasive Treatment	Wopowog WMA / 2	3	Seasonal	24 Acres
2028	Invasive Treatment	Wopowog WMA / 3	8	Seasonal	8 Acres
2029	Single Tree/Group Selection	Leesville Block / 6	1	Seasonal	139 Acres
2030	Invasive Treatment	Leesville Block / 11	1	Seasonal	64 Acres
2031	Shelterwood	Leesville Block / 11	1	Seasonal	64 Acres
2031	Boundary Line Maintenance	Leesville Block	N/A	None	16 Miles
2033	Update Forest Management Plan	All Compartments	All Stands	None	1257 Acres

DEEP Division of Forestry will complete timber stand improvement within Wopowog WMA Compartment 2, Stand 1 and Compartment 3, Stand 5 as personal and funding resources allow.

DEEP Division of Wildlife will complete brush mowing and the cutting of woody stems and/or trees to maintain early successional habitat, as needed, within Wopowog WMA Compartment 2, Stand 4 and Compartment 3, Stand 2.

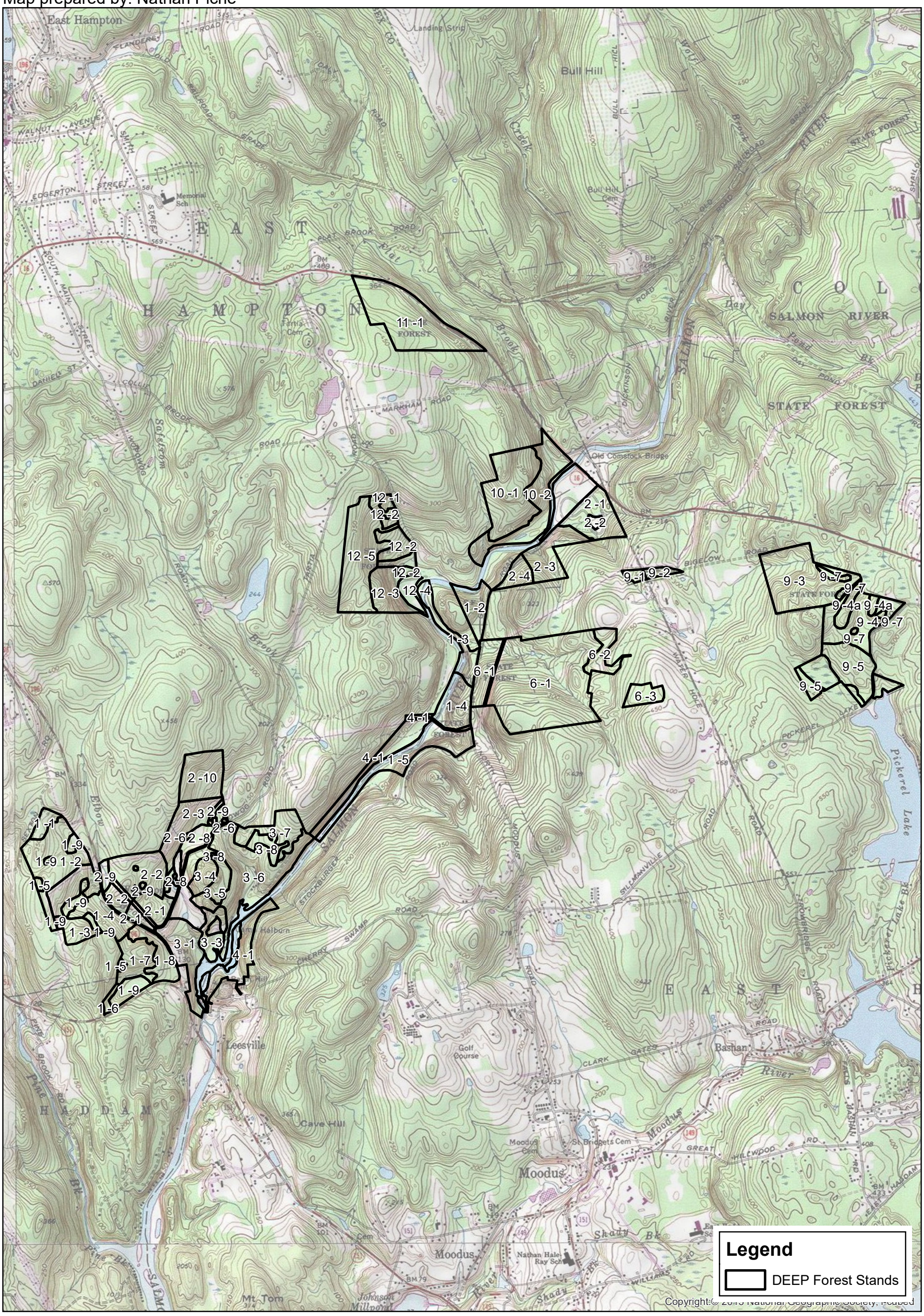
Map A - Topography
Salmon River State Forest: Leesville Block
Wopowog Wildlife Management Area

Project: Forest Management Plan
Located in the Towns of Colchester, East Hampton, East Haddam & Haddam
1,257 Acres

September 5, 2023
Map prepared by: Nathan Piché

Map Scale: 1 inch = 2,250 feet

0 1,125 2,250 4,500 Feet



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

Map B - Base
Salmon River State Forest: Leesville Block
Wopowog Wildlife Management Area

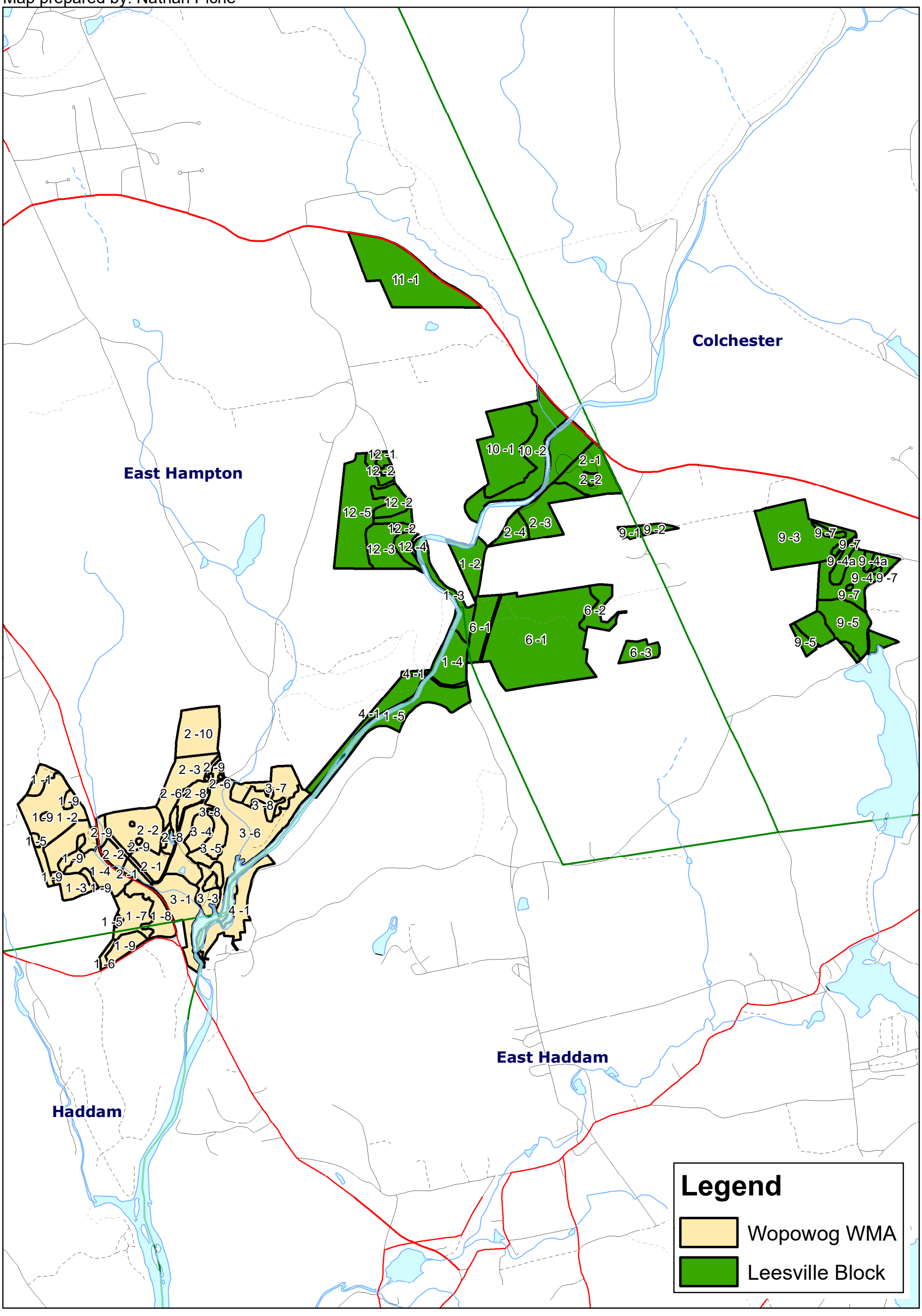
Project: Forest Management Plan
Located in the Towns of Colchester, East Hampton, East Haddam & Haddam
1,257 Acres

September 5, 2023
Map prepared by: Nathan Piché

Map Scale: 1 inch = 2,250 feet

0 1,125 2,250 4,500 Feet

N W E S



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

Map C - Site Quality
Salmon River State Forest: Leesville Block
Wopowog Wildlife Management Area

Project: Forest Management Plan
Located in the Towns of Colchester, East Hampton, East Haddam & Haddam
1,257 Acres

September 8, 2023
Map prepared by: Nathan Piché

Map Scale: 1 inch = 2,250 feet

0 1,125 2,250 4,500 Feet

N W E S

Colchester
East Hampton
East Haddam
Haddam

Legend

DEEP Forest Stands

DEEP Forest Stands
Site Index
Low
Medium
High

DEEP Forest Stands
Stand Class
Swamp
Waterbody

Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

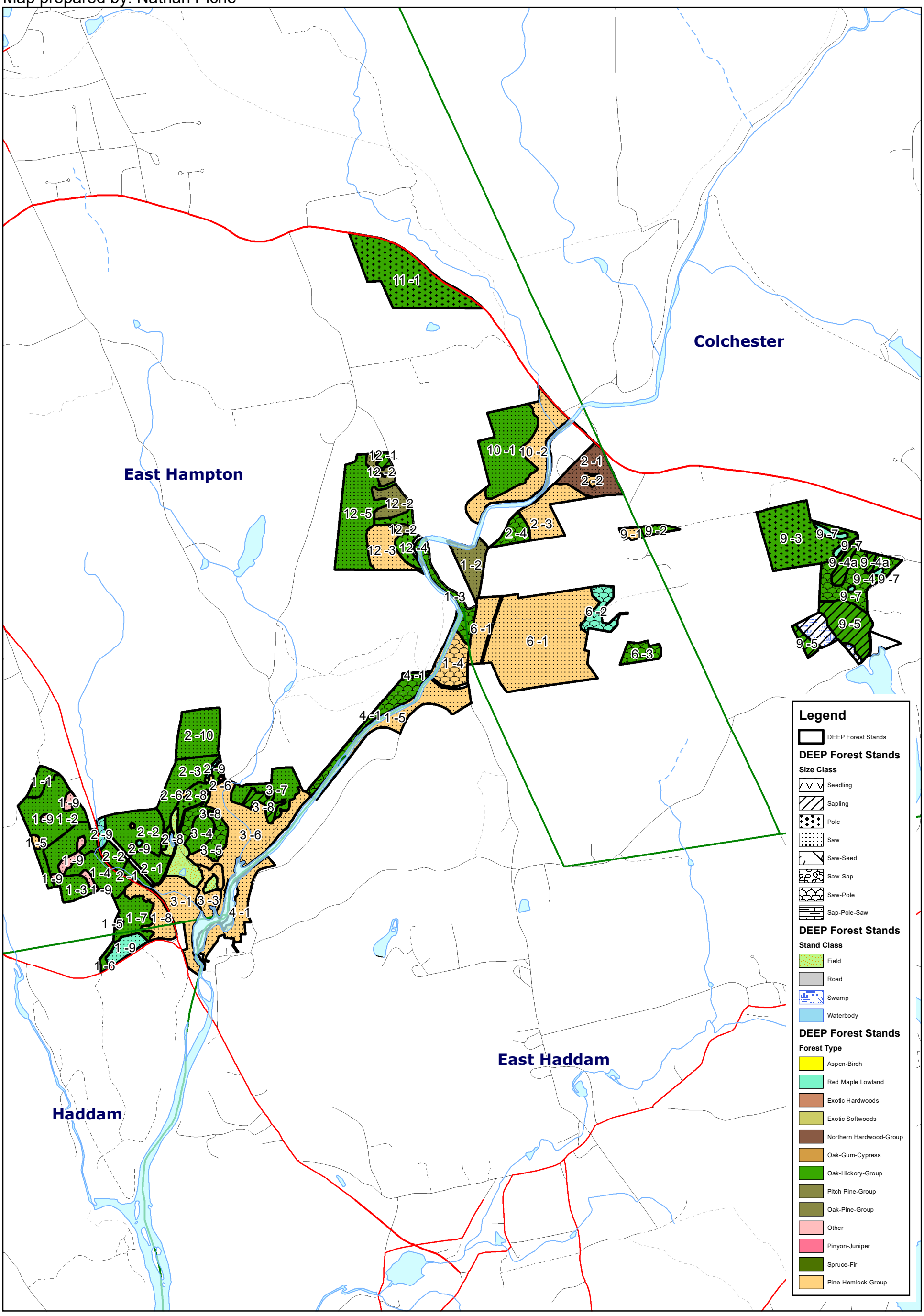
Map D - Forest Type & Size Class
Salmon River State Forest: Leesville Block
Wopowog Wildlife Management Area

Project: Forest Management Plan
Located in the Towns of Colchester, East Hampton, East Haddam & Haddam
1,257 Acres

September 8, 2023
Map prepared by: Nathan Piché

Map Scale: 1 inch = 2,250 feet

0 1,125 2,250 4,500 Feet



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

Map E - Special Features
Salmon River State Forest: Leesville Block
Wopowog Wildlife Management Area

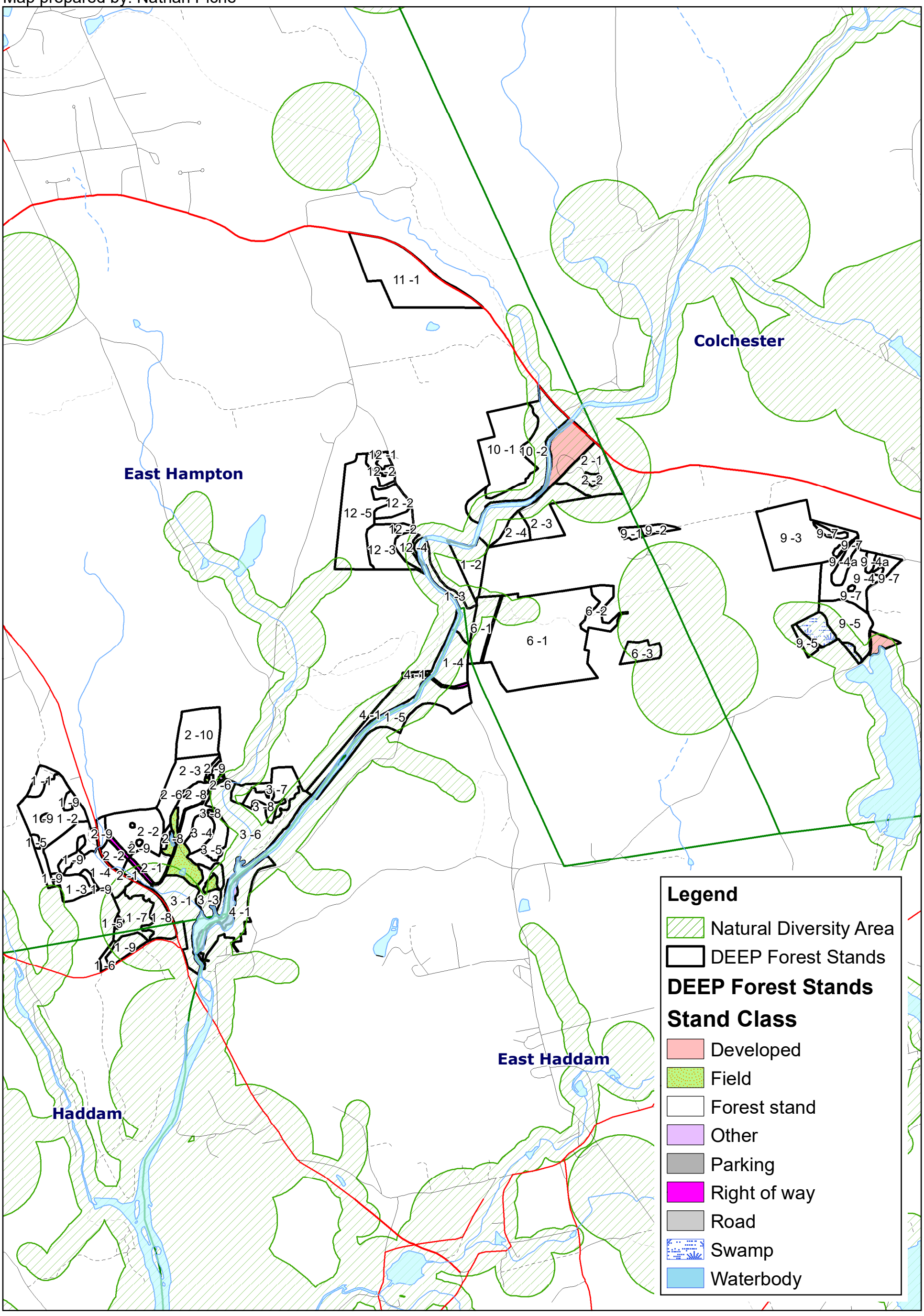
Project: Forest Management Plan
Located in the Towns of Colchester, East Hampton, East Haddam & Haddam
1,257 Acres

September 8, 2023
Map prepared by: Nathan Piché

Map Scale: 1 inch = 2,250 feet

0 1,125 2,250 4,500 Feet

N W E S



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

Map F - Work Plan
Salmon River State Forest: Leesville Block
Wopowog Wildlife Management Area

Project: Forest Management Plan
Located in the Towns of Colchester, East Hampton, East Haddam & Haddam
1,257 Acres

September 8, 2023
Map prepared by: Nathan Piché

Map Scale: 1 inch = 2,250 feet

0 1,125 2,250 4,500 Feet

N W E S

Colchester
East Hampton
East Haddam
Haddam

Legend

DEEP Forest Stands

DEEP Forest Stands

Harvest Type

- 1st Shelterwood
- 2nd Shelterwood
- Clear Cut
- Final Shelterwood
- Irregular Shelterwood
- Selection Harvest
- Thin
- Timber Stand Improvement

Work Plan

- Growing

Work Plan

- Growing

DEEP Forest Stands

Management Status

- active
- inaccessible
- inactive
- inoperable
- wildlife
- Natural Area
- Old Forest Management Site
- Recreation Area

Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

Appendix

Appendix Section

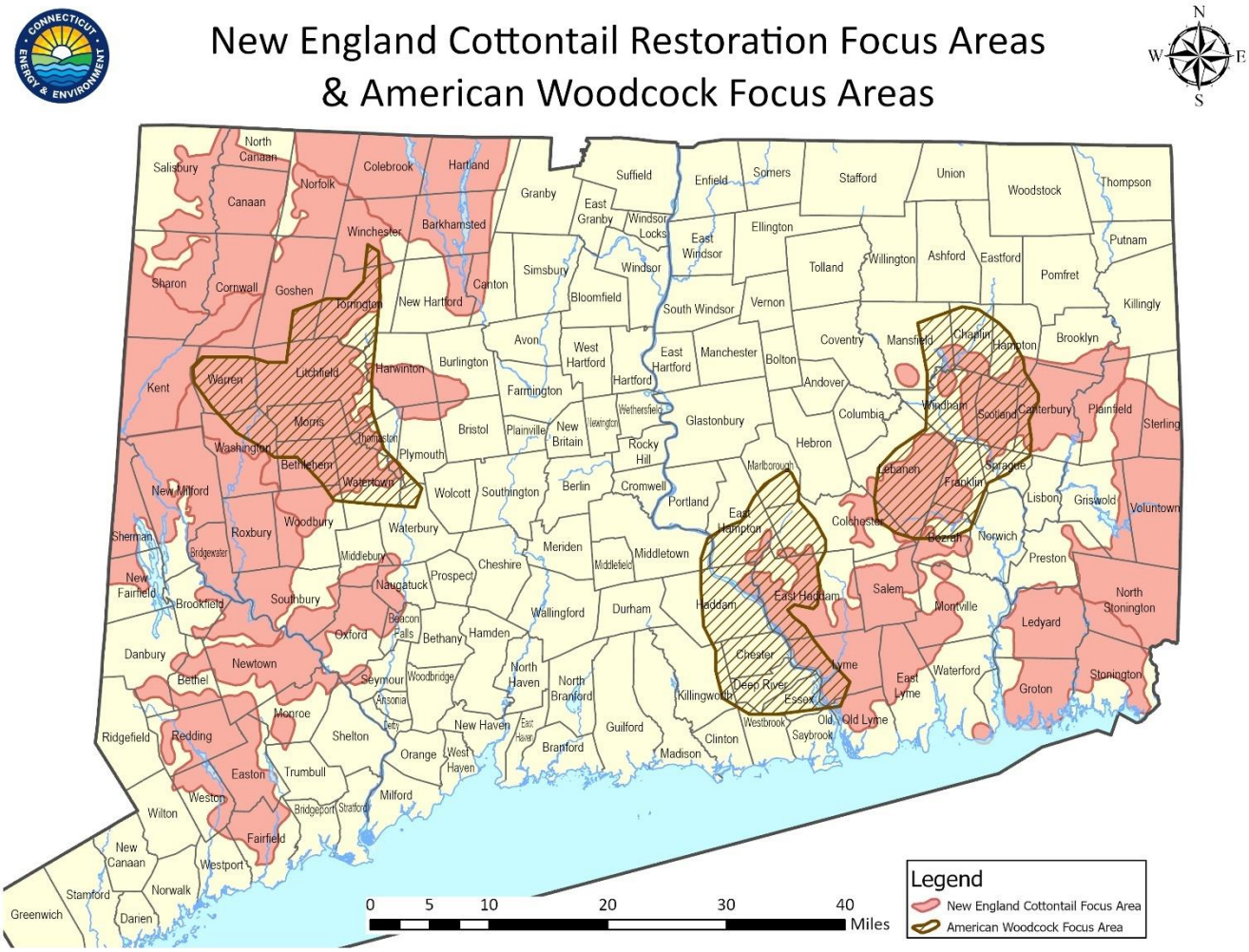
List of Tables, Figures & Photos

Salmon River State Forest Land Acquisition			
Grantor	**Town**	**Date Acquired**	**Acres**
Pettipaug Co.	Haddam	10/6/1933	0.34
Haraczkiewicz, Joe & Anto	Colchester	5/28/1952	5.00
Haraczkiewicz, Joe & Anto	Colchester	6/19/1952	63.00
Pettipaug Company	Haddam	10/6/1933	0.34
Carrier, Edgar A.	Colchester	7/19/1934	3.00
Clark, Fred B.	Colchester	11/14/1934	5.00
Gerhardt, William	Colchester	11/20/1934	25.00
E. Hampton Bank & Trust	East Hampton	12/1/1934	162.50
Adams & Phelps	East Hampton	1/1/1935	6.00
CL&P	East Hampton	1/1/1935	20.90
Partridge, William	East Hampton	1/7/1935	38.00
Partridge, William F.	East Haddam	1/17/1935	50.00
Adams, Elizabeth P.	East Hampton	2/7/1935	3.00
Phelps, William N.	East Hampton	2/7/1935	3.00
CL&P	East Hampton	5/7/1935	25.00
Pettipaug Company	Haddam	10/25/1935	0.30
Clark, William E.	Marlborough	12/27/1935	50.00
Bunce, James H.	East Haddam	3/8/1937	2.00
Markham, H.& A.	Colchester	12/8/1937	5.00
CL&P	East Haddam	12/28/1938	20.00
Brown, Howard Est.	East Hampton	9/11/1941	170.00
Larson, Andrew G.	Colchester	9/27/1941	240.00
Phelps, Flora C.	Colchester	9/27/1941	100.00
Brown, Curtis P.	East Hampton	9/30/1941	22.00
Clark, Guy	Colchester	11/28/1941	85.00
Ellsworth	East Hampton	1/1/1942	18.00
Williams Susan D.	Marlborough	1/16/1942	85.00
Williams, Susan D.	Colchester	1/16/1942	235.00
Rankl, John P.	Marlborough	1/30/1942	250.00
Williams, Susan D.	Colchester	3/6/1942	24.00
Lord, Leona	Marlborough	3/18/1942	115.00

Furlong, Frank P.	Marlborough	6/22/1942	260.25
Harrackieiwcz, A. T.	Colchester	7/14/1942	10.00
Ellsworth, Oliver B.	Colchester	9/8/1942	458.00
Phelps, Flora C.	East Hampton	9/9/1942	0.00
Ellsworth, Oliver B.	Marlborough	9/11/1942	106.10
Ellsworth, Oliver B.	East Hampton	9/19/1942	30.00
Christenson, Chris S.	Marlborough	6/16/1943	400.00
Kennedy, Robert C.	Marlborough	8/25/1943	112.00
Handley, Jesse J. Estate	Hebron	1/13/1944	40.00
Wilcox, J.&G.	Hebron	1/15/1944	115.00
Wilcox, J.&G.	Hebron	3/18/1944	115.00
Wimmer, John A.	Hebron	8/28/1944	90.00
Hewitt, John N.	Hebron	8/29/1944	136.00
Azcher, Edmond l.	Colchester	9/20/1944	7.00
Kellogg, Rachael	Hebron	9/21/1944	25.00
Zacher, L.E.	Hebron	9/21/1944	214.50
Ranel, John	Marlborough	9/27/1944	100.00
Rankl, John	Colchester	9/27/1944	20.00
Brown, Howard Est.	Hebron	9/30/1944	170.00
Tyler, Dorothy	East Haddam	9/8/1945	2.50
Murphy, Anna Mae	Hebron	9/12/1945	268.00
Murphy, Anna Mae	Marlborough	9/12/1945	75.00
Seliew, Ralph G.	Marlborough	3/18/1947	267.00
Savitsky, Stanley J.	Colchester	11/2/1950	3.00
Savitsky, Stanley J.	Colchester	11/2/1950	2.00
Carrier, Edgar A.	Colchester	3/28/1953	40.00
USA	East Hampton	1/1/1954	204.00
USA	Colchester	12/17/1954	294.70
USA	East Hampton	12/17/1954	204.10
USA	Marlborough	12/17/1954	106.10
USA	Hebron	12/18/1954	198.20
Brown Estate, H.C.	Colchester	9/10/1957	30.00
Brown Estate, H.C.	Colchester	11/6/1957	2.00
Connwood Inc.	Colchester	8/4/1961	50.00
Camp Raman	East Haddam	3/21/1969	2.00
DOT	Hebron	2/25/1981	0.21
Rossi Corp.	East Hampton	8/18/1986	27.00
DOT	East Hampton	2/2/1987	27.08

DOT	Lebanon	6/18/1987	0.00
Milton Arnold	Colchester	11/20/1987	55.00
DOT	Hebron	5/31/1988	34.41
DOT	Colchester	4/5/1990	0.68
Thereault, Robert & Carol	East Haddam	5/6/1991	2.80
Bernstein, Myron R.	East Haddam	12/23/1991	1.70
Bernstein, Myron R.	East Haddam	12/23/1991	1.40
Bernstein, Myron R.	East Haddam	12/28/1992	1.10
Bernstein, Myron R.	East Haddam	12/22/1993	1.10
Green, Carl	East Haddam	12/22/1993	9.35
Foot, Edward A. etal	Hebron	11/15/1994	59.60
Bernstein, Myron R.	East Haddam	12/19/1994	1.20
Martin, R.Y.	Colchester	12/5/1995	3.57
Epstein Pearl	Colchester	4/9/1996	15.12
Mailhot, Lionel	Hebron	8/6/1997	0.51
Jones, Robert L.	Hebron	6/19/2000	59.02
Holcombe, Thomas H.G.	Marlborough	10/10/2000	157.70
Campbell, W. & M.	Hebron	6/26/2001	92.31
Coropinski, John	Hebron	3/28/2002	46.28
DOT	East Hampton	11/10/2002	40.69
Fireman's Association	East Hampton	10/19/2006	8.00
Strong, Myron et al	Marlborough	4/13/2007	53.59
Reneson, Peter & Virginia	Colchester	6/16/2008	14.86
Rechovous Corp	East Hampton	12/20/2013	116.95
Regional Capital Management	Colchester	2/3/2015	60.03
Saner, Robert & Mary	Marlborough	4/27/2015	289.50
Lord, Arthur & Virginia	Marlborough	10/16/2020	207.68

Wopowog WMA Land Acquisition			
Grantor	**Town**	**Date Acquired**	**Acres**
CL & P	Haddam	2/2/1939	20
Camp Ramah	East Hampton	3/21/1969	436.6
Camp Ramah	Haddam	3/21/1969	34.4
Warren M. Edwards	East Hampton	12/30/2004	1.91


New England Cottontail Restoration Focus Areas
& American Woodcock Focus Areas
N
W
E
S
Legend
New England Cottontail Focus Area
American Woodcock Focus Area
0 5 10 20 30 40
Miles

Bird species observed as Probable or Confirmed breeding: CT Breeding Bird Atlas Blocks 69C, 69E (2018-2021).
*Species of Greatest Conservation Need (CT Wildlife Action Plan)

Acadian Flycatcher	Hooded Warbler
American Goldfinch	House Finch
American Redstart	House Sparrow
American Robin	House Wren
American Woodcock*	Indigo Bunting*
Baltimore Oriole*	Mallard
Barn Swallow	Mourning Dove
Barred Owl	Northern Cardinal
Black and white Warbler*	Northern Flicker*
Black capped Chickadee	Northern Mockingbird
Black throated Green Warbler	Northern Rough winged Swallow
Blue gray Gnatcatcher	Orchard Oriole
Blue Jay	Ovenbird*
Brown headed Cowbird	Pileated Woodpecker
Canada Goose	Pine Warbler
Carolina Wren	Prairie Warbler*
Cedar Waxwing	Red bellied Woodpecker
Chipping Sparrow	Red eyed Vireo
Common Grackle	Red shouldered Hawk
Common Merganser	Red tailed Hawk
Common Yellowthroat	Red winged Blackbird
Cooper s Hawk	Rose breasted Grosbeak*
Downy Woodpecker	Ruby throated Hummingbird
Eastern Bluebird	Scarlet Tanager*
Eastern Kingbird*	Song Sparrow
Eastern Phoebe	Tree Swallow
Eastern Towhee*	Tufted Titmouse
Eastern Wood Pewee*	Veery*
European Starling	Warbling Vireo
Field Sparrow*	White breasted Nuthatch
Gray Catbird	Wild Turkey
Great Crested Flycatcher	Wood Thrush*
Great Horned Owl	Worm eating Warbler*
Hairy Woodpecker	Yellow throated Vireo

Glossary

Acceptable Growing Stock: Saleable trees that are of good form, species and quality and would be satisfactory as crop trees.

Adaptive Management: A dynamic approach to forest management in which the effects of treatments and decisions are continually monitored and used to modify management on a continuing basis to ensure that objectives are being met (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Adverse Regulatory Actions: Written warning, citations or fines issued by law enforcement or regulatory bodies.

Aerial Photo: Photo taken from an elevated position like on an aircraft.

Afforestation: The establishment of a forest or a stand in an area where the preceding vegetation or land was not forest. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Age Class: A distinct aggregation of tree that originated at the same time, from a single natural event or regeneration activity or a grouping of trees (e.g. ten year age class) as used in inventory or management. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Aspect: The direction that a slope faces (north, south, etc.).

Basal Area: The cross-sectional area of a tree, in square feet, at 4.5 feet from the ground (at breast height). When the basal area of all the trees in a stand are added together, the result is expressed as square feet of basal area per acre, which is a measure of a stand's density.

Biomass: A renewable energy source of biological materials derived from living, or recently living organisms, such as wood, waste, and crop residues.

Biodiversity: The variety and abundance of life forms, processes, functions and structures of plants, animals and other living organisms, including the relative complexity of species, communities, gene pools and ecosystems at spatial scales that range from local through regional to global (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Board Feet: A unit for measuring wood volumes. It is commonly used to express the amount of wood in a tree, sawlog, or individual piece of lumber. A piece of wood 1 foot long, 1 foot wide, and 1 inch thick (144 cubic inches).

Broadcast: To spread or apply seed, fertilizer, or pesticides more or less evenly over an entire area. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Canopy: The more or less continuous cover of branches and foliage formed collectively by the tops, or crowns of adjacent trees.

Carbon Sequestration: The incorporation of carbon dioxide into permanent plant tissue. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Chip: A small piece of wood used to make pulp or wood composite or fuel. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Clearcut:

1. A stand in which essentially all trees have been removed in one operation – note depending on management objectives, a clearcut may or may not have reserve trees left to attain goals other than regeneration.

2. A regeneration or harvest method that removes essentially all trees in a stand. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Contour Map: A map where each line represents a change in elevation.

Crop Tree: A tree identified to be grown to maturity for the final harvest cut, usually on the basis of its location with respect to other trees and its timber quality.

Cull: A tree, log, lumber or seedling that is rejected because it does not meet certain specifications for usability or grade. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Culvert: A device used to channel water. It may be used to allow water to pass underneath a road, railway, or embankment for example. Culverts can be made of many different materials; steel, polyvinyl chloride (PVC) and concrete are the most common. Formerly, construction of stone culverts was common.

Cutting Cycle: The time interval between harvesting operations when uneven-aged methods are employed using group or single tree selection.

Den Tree: A living tree with a cavity large enough to shelter wildlife.

Desired Species: Those species of flora and fauna designated in the landowner's management plan and not known to cause negative impacts on the local environment.

Diameter Breast Height (DBH): The diameter of a tree at 4.5 feet above the ground.

Endangered Species: Any species of plant or animal defined through the Endangered Species Act of 1976 as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Even-Aged Management: Forest management with periodic harvest of all trees on part of the forest at one time or over a short period to produce stands containing trees all the same or nearly the same age or size.

Forest Owner: Landowner or designated representative such as, but not limited to, professional resource manager, family member, trustee, etc.

Forest Product: Any raw material yielded by a forest. Generally defined in Forest Acts or Ordinances, and subdivided conventionally into major forest products, i.e. timber and fuelwood, and minor forest products, i.e. all other products including leaves, fruit, grass, fungi, resins, gums, animal parts, water, soil, gravel, stone and other minerals on forest land (F. C. Ford –Robertson, Terminology of Forest Science Technology, Practice, and Products, Society of American Foresters, 1971).

Forest Stand Improvement: See timber stand improvement.

Forest Type: A category of forest usually defined by it trees, particularly its dominant tree species as based on percentage cover of trees, e.g. spruce fir, white pine, northern red oak.

Forest vitality: The health and sustainability of a forest.

Fuel Management: The act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire in support of land management objectives. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Group Selection: Trees are removed and new age classes are established in small groups. The width of groups is commonly approximately twice the height of the mature trees with smaller openings providing microenvironments suitable for tolerant regeneration and large openings providing conditions suitable for more intolerant regeneration. The management unit or stand in which regeneration, growth and yield are regulated consists of an aggregation of groups. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Girdling: Completely encircling the trunk of a tree with a cut that severs the bark and cambium of the tree. Herbicide is sometimes injected into the cut to ensure death of the tree.

GPS (Global Positioning System) Coordinates: A commonly hand held, satellite based navigational device that records x, y, z coordinators and other data allowing users to determine their location on the surface of the earth. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Hack-n-Squirt: A tree treatment method where an axe or hatchet is used to make “hacks” (injections) into the tree’s cambium layer. A plastic “squirt” bottle is used to spray a specific amount of herbicide into the cuts placed around the tree.

Harvesting: The felling skidding, on-site processing, and loading of trees or logs onto trucks. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

High conservation value forests (HCVF): Forests of outstanding and critical importance due to their environmental, social, biodiversity or landscape values. Due to the small scale and low-intensity of family forest operations, informal assessment of HCVF occurrence through consultation with experts or review of available and accessible information is appropriate.

High-Grading: Cutting only the high-value trees from a forest property, leaving a stand of poor quality with decreased future timber productivity.

Incentive Programs: State and federal agencies will offer landowners the opportunity to apply for incentive programs that will provide support and financial assistance to implement forestry and agroforestry related practices through conservation programs. Assistance can also provide for multi-year and permanent easements to conserve forest land to meet program goals.

Integrated Pest Management: The maintenance of destructive agents, including insects, at tolerable levels by planned use of a variety of preventative, suppressive, or regulatory tactics and strategies that are ecologically and economically efficient and socially acceptable (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Intermediate Cut: Removing immature trees from the forest sometime between establishment and stand harvest to improve the quality of the remaining forest stand. Contrast this technique with a harvest cut.

Invasive species: Non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112 (Feb. 3, 1999). Invasive Species: is a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and other organisms (e.g., insects, microbes, etc.). Human actions are the primary means of invasive species introductions. (Invasive Species Definition Clarification and Guidance White Paper Submitted by the Definitions Subcommittee of the Invasive Species Advisory Committee (ISAC), Approved by ISAC Apr 27, 2006.)

Landings: A cleared are in the forest to which logs are yarded or skidded for loading onto trucks for transport. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Landowner: Entity that holds title to the property for which the management plan is being written.

Large Woody Debris: Any piece(s) of dead woody material, e.g. dead boles, limbs and large root masses, on the ground in the forest stands or in streams. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Log Rules: A table showing estimated amount of lumber that can be sawed from logs of given lengths and diameters. The log rule commonly used in Connecticut is the International ¼ -inch Rule. The International ¼-inch Rule is a formula rule allowing 1/2 – inch taper for each 4 feet of length and 1/16-inch shrinkage for each one-inch board. This measure approximates the actual sawmill lumber tally.

Management Plan: Documents that guide actions and that change in response to feedback and changed conditions, goals, objectives and policies. Management plans may incorporate several documents including, but not limited to, harvest plans, activity implementation schedules, permits and research.

Mast: Nuts of trees, such as oak, walnut, and hickory, that serve as food for many species of wildlife.

Mature Tree: A tree that has reached the desired size or age for its intended use.

MBF: Abbreviation for 1,000 board feet.

Noxious Plant (weed): A plant specified by law as being especially undesirable, troublesome and difficult to control (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Nutrient Cycle: The exchange or transformation of elements among the living and nonliving components of the ecosystem. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Overstocked: A forest stand condition where too many trees are present for optimum tree growth.

Overstory: That portion of the trees in a stand forming the upper crown cover.

Overstory Removal: The cutting of trees constituting an upper canopy layer to release trees or other vegetation in an understory. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Pesticide: Pesticides include chemicals commonly known as herbicides and insecticides.

Pole Timber: Trees from 6 inches to 12 inches in diameter at breast height.

Prescribed Burn/Fire: To deliberately burn natural fuels under specific weather conditions, which allows the fire to be confined to a predetermined area and produces the fire intensity to meet predetermined objectives. A fire ignited by management to meet specific objectives (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Pruning: Removing live or dead branches from standing trees to improve wood quality.

Pulpwood: Wood cut primarily for manufacture of paper, fiberboard, or other wood fiber products.

Qualified Contractor: Forest contractors who have completed certification, licensing, recommended training and education programs offered in their respective states.

Qualified Natural Resource Professional: A person who by training and experience can make forest management recommendations. Examples include foresters, soil scientists, hydrologists, forest engineers, forest ecologists, fishery and wildlife biologists or technically trained specialists in such fields.

Rare species: A plant or animal or community that is vulnerable to extinction or elimination.

Reforestation: The reestablishment of forest cover either naturally (by natural seeding, coppice, or root suckers) or artificially (by direct seeding or planting) – note reforestation usually maintains the same forest type and is done promptly after the previous stand or forest was removed. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Regeneration: The number of seedlings or saplings existing in a stand. The process by which a forest is renewed by direct seeding, planting, or naturally by self-sown seeds and sprouts.

Regeneration Cut: Any removal of trees intended to assist regeneration already present or to make regeneration possible.

Release: To free trees from competition by cutting, removing, or killing nearby vegetation.

Riparian: Related to, living or located in conjunction with a wetland, on the bank of a river or stream but also at the edge of a lake or tidewater – note the riparian community significantly influences and is significantly influenced by, the neighboring body of water. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Riparian Zone: The area adjacent to or on the bank of rivers and streams.

Rotation Age: The age at which a stand is considered ready for harvest under the adopted plan of management or the culmination of mean annual increment.

Sapling: Trees from 2 inches to 6 inches in diameter at breast height.

Sawtimber: Trees at least 12 inches in diameter at breast height from which a sawed product can be produced.

Scale: The extent of forest operations on the landscape/certified property.

Seedling: A young plant.

Seed-Tree Harvest: A harvest and regeneration method where nearly all trees are removed at one time except for scattered trees to provide seed for a new forest.

Selection Harvest: Harvesting trees to regenerate and maintain a multi-aged structure by removing some trees in all size classes either singly or in small groups.

Shelterwood Harvest: A harvesting and regeneration method that entails a series of partial cuttings over a period of years in the mature stand. Early cuttings improve the vigor and seed production of the remaining trees. The trees that are retained produce seed and also shelter the young seedlings. Subsequent cuttings harvest shelterwood trees and allow the regeneration to develop as an even-aged stand.

Single Tree Selection: Individual trees of all size classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees and to provide space for regeneration. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Site Index: An expression of forest site quality based on the height of a free-growing dominant or co-dominant tree at age 50 (or age 100 in the western United States).

Skid: 1. To haul a log from the stump to a collection point (landing) by a skidder. 2. A load pulled

by a skidder. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Skid Trail: A road or trail over which equipment or horses drag logs from the stump to a landing.

Skidding: Pulling logs from where they are cut to a landing or mill.

Slash: The residue, e.g., treetops and branches, left on the ground after logging or accumulating as a result of storm, fire, girdling, or delimbing. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Snag: A standing, generally un-merchantable dead tree from which the leaves and most of the branches have fallen – note for wildlife habitat purposes, a snag is sometimes regarded as being at least 10 inches in diameter at breast height and at least 6 feet tall; a hard snag is composed primarily of sound wood, generally merchantable, and a soft snag is composed primarily of wood in advanced stages of decay and deterioration. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Soil Compaction: The process by which the soil grains are rearranged, resulting in a decrease in void space and increasing bulk density. Can occur from applied loads, vibration or pressure from harvesting or site preparation equipment. Compaction can cause decreased tree growth, increased water runoff and soil erosion. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Soil Map: A map showing the distribution of soils or other soil map units in relation to prominent physical and cultural features of the earth's surface. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Special Sites: Those areas offering unique historical, archeological, cultural, geological, biological or ecological value.

Special Sites include:

A. Historical, archaeological, cultural and ceremonial sites or features of importance to the forest owner;

B. Sites of importance to wildlife such as rookeries, refuges, fish spawning grounds, vernal ponds and shelters of hibernating animals;

C. Unique ecological communities like relic old-growth, springs, glades, savannas, fens and bogs; and

D. Geological features such as terminal moraines, cliffs and caves.

Stand: A group of trees with similar characteristics, such as species, age, or condition that can be distinguished from adjacent groups. A stand is usually treated as a single unit in a management plan.

Stand Density: A measure of the stocking of a stand of trees based on the number of trees per area and diameter at breast height of the tree of average basal area.

Stand Management Recommendations: The recommended management activities that should be done in that stand, based on the landowner's goals and objectives.

Stand Structure: The horizontal and vertical distribution of plants in the forest, including the height, diameter, crown layers, and stems of trees, shrubs, understory plants, snags and down woody debris. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

State Forestry Best Management Practice(s) (BMPs): Forestry BMPs are generally accepted forest management guidelines that have been developed by state forestry agencies with broad public stakeholder input.

Stocking: An indication of the number of trees in a stand in relation to the desirable number of trees for best growth and management.

Sustainability: The capacity of forests, ranging from stands to ecoregions, to maintain their health, productivity, diversity and overall integrity, in the long run, in the context of human activity (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Sustainable Forest Management: The practice of meeting the forest resource needs and values of the present without compromising the similar capability of future generations (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998). Note – AFF's Standards of Sustainability reflect criteria of sustainability based on the Montreal Process, 1993, and the PanEuropean Operational- Level Guidelines (PEOLGs).

Thinning: A cultural treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or recover potential mortality. Types of thinning include: chemical, crown, free, low, mechanical, selection. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Threatened Species: A plant or animal species that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future. A plant or animal identified and defined in the Federal Register in accordance with the Endangered Species Act of 1976. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Timber Stand Improvement (TSI): A thinning made in immature stands to improve the composition, structure, condition, health, and growth of the remaining trees.

Undesirable Growing Stock (UGS): Trees of low quality or less valuable species that should be removed in a thinning.

Understocked: Insufficiently stocked with trees.

Understory: All forest vegetation growing under an overstory. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Uneven-Aged Management or Stand: A stand of trees containing at least three age classes intermingled on the same area.

Visual Quality Measures: Modifications of forestry practices in consideration of public view, including timber sale layout, road and log landing locations, intersections with public roadways, distributing logging residue, tree retention, timing of operations and other factors relevant to the scale and location of the project.

Volume: The amount of wood in a tree, stand of trees, or log according to some unit of measurement, such as board foot, cubic foot, etc.

Watershed: The area of land where all of the water that is under it or drains off of it goes into the same place. For example, the Mississippi River watershed includes all the land that drains into the Mississippi River. This watershed is the fourth largest in the world and includes water from 31 states.

Wetland: A transitional area between water and land that is inundated for periods long enough to produce wet soil and support plants adapted to that environment. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

Wolf Tree: A very large, over-mature tree that is or was open grown. These trees tend to have large full crowns and numerous branches.

Woody Debris: Any piece(s) of dead woody material (e.g. dead tree trunk, limbs, large root ball) on the ground in the forest or in streams. (Helms et al, The Dictionary of Forestry, Society of American Foresters, 1998).

References

Catanzaro, P. & D'Amato, A. (2019). *Forest Carbon: An essential natural solution for climate change.* https://www.uvm.edu/rsenr/tonydamato/pubpdfs/Catanzaro%20and%20D'Amato%202019%20Forest%20Carbon.pdf

Connecticut Department of Energy and Environmental Protection Forestry Division, Forest Practices Act Program. (2019). "*Summary of Forest Practice Activity Report Conducted by Certified Forest Practitioners, 2007 – 2017".* Hartford, CT: Connecticut Department of Energy and Environmental Protection.

DEEP. (2012). *Best Management Practices for water quality while harvesting forest products.* State of Connecticut Bureau of Natural Resources, Division of Forestry. Hartford, CT: Department of Energy and Environmental Protection (DEEP).

DEEP. (2015). *Connecticut's Wildlife Action Plan.* State of Connecticut Bureau of Natural Resources, Wildlife Division. Hartford, CT: Department of Energy and Environmental Protection (DEEP). Connecticut Wildlife Action Plan

DEEP. (2019). *Policy/Procedure # 310: Multiple Use Trail Policy for DEEP Properties.* State of Connecticut Bureau of Natural Resources. Hartford, CT: Department of Energy and Environmental Protection (DEEP).

DEEP. (2017). *Title 23 – Parks, Forests and Public Shade Trees.* Sec. 23-4-1 General Regulations. https://eregulations.ct.gov/eRegsPortal/Browse/RCSA/Title_23Subtitle_23-4Section_23-4-1/

DeGraaf, R.M. & Yamasaki, M. (2003). *Options for managing early successional forest and shrubland bird habitats in the northeastern United States.* Forest Ecology and Management, 185(1-2), pp.179-191.

Dettmers, R. (2003). *Status and conservation or shrubland birds in the northeastern US.* Forest Ecology and Management, 185(1-2), pp.81-93.

Doane, C.C. (1959). *The Red Pine Scale.* The Connecticut Agricultural Experiment Station, New Haven.

Edmonds, R.L., Agee, J.k., Gara, R.I. (2011). *Forest Health and Protection (2nd ed.).* Long Grove, IL: Waveland Press, Inc.

Helms, J. A. (1998). *The Dictionary of Forestry.* Bethesda, MD: Society of American Foresters.

McEvoy, T. J. (2004). *Positive Impact Forestry.* Washington, DC: Island Press.

Nyland, R.D. (2007). *Silviculture: Concepts and Applications* (2nd ed.). Long Grove, IL: Waveland Press, Inc.

Potter, E., Walter, D., Maier, Frederick, Wang, Jin, Dass, Mayukh, Uchiyama, Hajime, Glende, Astrid, Hoffman, Robin, E. (2005). *NED-2: A decision support system for integrated forest ecosystem management*. Elsevier, Computers and Electronics in Agriculture. 49: 24-43.

Public Sector Consultants & Emmerthal, D. (2020). *Forest Products Industries Economic Contributions: Connecticut.* Lansing, MI: Public sector Consultants.

Roach, Benjamin & S. Gingrich. (1968). *Even-Aged Silviculture for Upland Central Hardwoods.* Agriculture Handbook 355, U.S. Forest Service.

Robertson, F. (1971). *Terminology of Forest Science, Technology, Practice, and Products; English-Language Version [The Multilingual Forestry Terminology Series, NO. 1].* Bethesda, MD: Society of American Foresters.

Stevens, R. & Oehler, J. (2019). *Trails for People and Wildlife: A Guide to Planning Trails that allow People to Enjoy Nature and Wildlife to Thrive.* http://wildlife.state.nh.us/trails/documents/trails-for-people-wildlife.pdf

UConn. (2015). *Center for Land Use Education and Research.* College of Agriculture, Health, and Natural Resources. Home | Center for Land Use Education and Research (uconn.edu)