Delaware State Forest Resource Management Plan

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES
BUREAU OF FORESTRY

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Data Note: Unless otherwise noted in text or caption, all data summarized in this document were compiled between February 2017 and March 2018.

Preface

The state forest system of Pennsylvania, approximately 2.2 million acres of forest land, comprise 13 percent of the forested area in the Commonwealth. The Bureau of Forestry is the steward and trustee of this land. Part of the bureau's mission is to manage state forests under sound ecosystem management, to retain their wild character, and maintain biological diversity, while providing pure water, opportunities for low-density recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources. Article 1, Section 27 of the Pennsylvania Constitution provides that, "Pennsylvania's public natural resources are the common property of all the people, including generations yet to come," and it sets forth that the Commonwealth has trustee responsibility for these resources. The bureau carries out this constitutional mandate by implementing it in both its long-term planning and every-day actions. To carry out its stewardship and trustee responsibilities for state forest lands, the bureau develops and implements planning documents that assure that the overarching goal of state forest management – ensuring sustainability – is achieved for the benefit of all the people. In 2016, the bureau revised its State Forest Resource Management Plan (SFRMP), which is the primary instrument that the bureau uses to plan, coordinate, and communicate its management of the state forest system. The SFRMP sets forth broad policies, as well as more focused goals and objectives, about state forest uses, resources, and values.

State forest management is a coordinated effort involving central office program areas and field staff in 20 forest districts located throughout Pennsylvania. Each district is responsible for managing wildland fire, destructive insects, and plant diseases on all lands throughout the district – public and private. The district staff promote wild plant conservation and private forest land conservation and stewardship. The staff also provides for the administration, protection, conservation, and management of state forest lands within the district.

Building upon the 2016 state-wide SFRMP, the bureau has developed District State Forest Resource Management Plans to provide district-level resource information and district- and landscape-level management priorities. This Delaware State Forest Resource Management Plan provides an overview of the district and its operations on state forest land and sets forth a framework for future management of Delaware State Forest. The planning horizon for this District SFRMP is approximately 5-10 years, after which time it will be revised to reflect changing conditions and priorities.

The bureau also creates District Activity Plans that describe the management activities the bureau will take within each district that may affect the public's use of state forest land. These are implementation plans that address how goals and objectives in the SFRMP and District SFRMPs are being achieved. The District Activity Plans are written at the start of each calendar year and revised mid-way through the year. They are posted on District webpages so that the public may review and comment upon them.

This Delaware SFRMP is comprised of a District Overview, a listing of District Priority Goals, and a collection of landscape management unit (LMU) plans, which are described further below.

Executive Summary

The Delaware State Forest Resource Management Plan provides an overview of the district and its operations on state forest land and sets forth priorities for future management of Delaware State Forest within the broad framework of the 2016 statewide State Forest Resource Management Plan (SFRMP). The statewide SFRMP is the primary instrument that the Bureau of Forestry uses to plan, coordinate, and communicate its management of the entire state forest system. This District-level SFRMP for Delaware State Forest focuses on local resources, opportunities, and areas of emphasis for management. The planning horizon for this District SFRMP is approximately 5-10 years, after which time it will be revised to reflect changing conditions and priorities.

The Delaware State Forest consists of nearly 85,000 acres of state forest lands and nine Landscape Management Units (described below and on page 80), some of which may span boundaries with neighboring state forest districts. The Delaware Forest District consists predominantly of Monroe and Pike Counties, with slight carryovers into Northampton and Carbon Counties, in eastern Pennsylvania, in the Glaciated Low Plateau and Glaciated Pocono Plateau eco-regions. Landforms, geology, and totality of ecosystem factors have made this forest district notable for: high occurrences of bogs, swamps and lakes, exceptional value streams and rivers, thriving brook trout populations, and high population density of human beings. Generally, soils and growing conditions on state forest lands here are of average to poor quality in terms that impact biomass production.

Major historic impacts to the forests here have included: expansive lumbering, uncontrolled wildfires, bluestone extraction, and various introduced pests and diseases including chestnut blight and Gypsy moth.

Currently, much of the forest in this district is of uniform age class and structure because of widespread deforestation in the past followed by a lack of periodic disturbance. The exception to this lies within the diversity presented amongst the many swamps and bogs found throughout the forest. For many reasons, the uniform character places limitations on the forest's ability to regenerate optimally and provide the best benefit for multiple ecosystem factors, including human values. Additionally, the forest is under continuous threat from damaging plants, animals, and diseases, and the forest's role amidst a dynamic set of social circumstances is continuously evolving. These threats are amplified in the Delaware State Forest due to the high human density in the region.

As part of a public trust, the Delaware Forest District is charged with ensuring the long-term health, viability, and productivity of the commonwealth's forests and conserving native wild plants. The overarching management goal on Delaware State Forest lands is to implement practices that enhance the sustainability of multiple ecosystem factors, including economic, environmental, and social dimensions.

Currently, most of the forest communities here are of the Dry Oak-Heath and Mixed Oak plant communities. The district manages for the maintenance and regeneration of these communities through routine silvicultural practices and overall forest health promotion.

This district's average annual timber harvest goal is 345 acres. This goal is part of a long-term, systematic plan to provide benefit for the ecosystem and to bring a continuous supply of high-quality timber to

Pennsylvania's economy. Prescribed fires, invasive species treatments, deer exclosures, supplemental plantings, and other techniques are also important land management tools in this district.

Additionally, the Bureau of Forestry is the jurisdictional agency for the conservation of native wild plants, and this district bears custodial responsibility for managing some outstanding communities and/ or ecosystems, including: Black Spruce-Tamarack Peatland forest, boreal swamps with associated species, as well as some specific plant populations of special concern.

Also, many wildlife species utilize the forest communities this district manages. By managing multiple forest communities for a diversity of age classes, the district routinely provides a suite of habitat factors that benefits a broad diversity of wildlife. However, the district may implement special management that targets specific wildlife because of some custodial responsibility, a mandated protection status, a wildlife's identity in the State Wildlife Action Plan, or the wildlife's recreational/ cultural value to people. This district practices targeted management for multiple species in a variety of short-term and long-term projects. Two specific long-term project areas are the Pecks Pond Waterfowl Propagation area and the Golden-winged Warbler Habitat project area.

Recreation is a major forest use on the state forest system and in this district. The Delaware State Forest's proximity to highly developed areas has provided a conspicuous island of rugged forest land where people can experience a wild sense of place amidst the noise of surrounding development. Popular recreational uses of this state forest include: primitive camping, car/motorized camping at designated sites, wild and stocked trout fishing, deer hunting, black bear hunting, hiking, ATV riding, snowmobile riding, and cross--country skiing.

Additionally, the district seeks to couple some recreation opportunities with education and interpretation. This district manages multiple educational features, including: Monroe County's Meesing Nature Center, Tarkill interpretive trail, wayside exhibits, trailhead kiosks, forest demonstration sites, and ecosystem management tours.

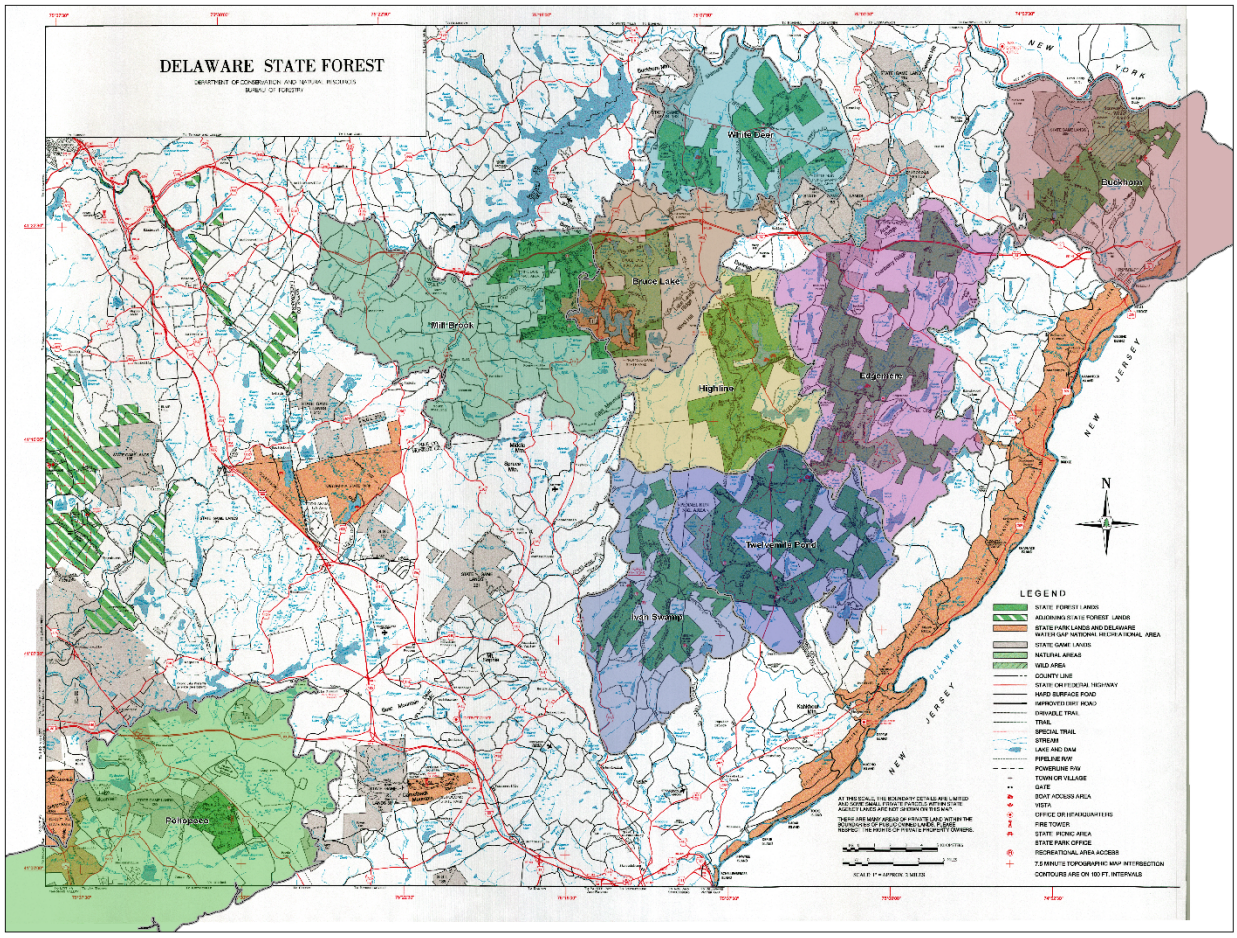
To facilitate land management objectives and meet public use demands, the district manages an array of infrastructure, including but not limited to: 39 miles of public use roads, 90 miles of administrative roads, four public water wells, 133 gates, eight dams, and a list of parking lots, bridges, culverts, trails, boat launches, etc. The district is divided into two maintenance divisions that serve as bases for work crews and equipment. Due to universal weathering, infrastructure is always in various stages of disrepair, so maintenance is an ongoing and important operation.

District-wide priority management goals are the following (which are not in priority order):

- Conserve and manage the natural resources through sustainable practices.
- Identify, conserve, and enhance a diversity of habitats for plant species and their communities.
- Provide low density recreational opportunity while protecting the valuable natural resources.
- Conserve, manage, and enhance the wildlife habitats in the landscape and ecosystem.
- Protect the water quality of the Delaware River watershed.
- Manage the State Forest using sustainable timber management to provide wood products for the economy and set the example for private forest landowners.
- Protect life, property, and our natural resources from wildfire, having provided for public and firefighter safety first.

- Report and proactively search for insect, disease, and invasive plant issues to maximize forest health.

To facilitate consistent, structured, and integrated resource management and planning across large landscape units, state forest lands and adjoining lands are organized by *Landscape Management Unit (LMU)* (described in more detail starting on page 80). LMUs are the "building blocks" of the Delaware State Forest Resource Management Plan, as targeted plans for each individual LMU comprise the bulk of the district plan. Each LMU plan contains an overview narrative of the LMU features, a profile that summarizes relevant data about the LMU, and a list of priority goals for which that LMU is well-suited. There are nine LMUs in the Delaware Forest District (Figure i). LMU plans for this district begin on page 80.



Delaware State Forest Landscape Management Units

Figure i: LMUs for the Delaware Forest District

List of LMUs in Delaware State Forest

- Pohopoco Landscape Management Unit
- Ivan Swamp Landscape Management Unit
- Twelvemile Pond Landscape Management Unit
- Highline Landscape Management Unit
- Edgemere Landscape Management Unit
- Mill Brook Landscape Management Unit
- Bruce Lake Landscape Management Unit
- White Deer Landscape Management Unit
- Buckhorn Landscape Management Unit

District Priority Goals

The 2016 SFRMP set forth Principles, Goals, and Objectives that focus on the variety of resources, uses, and values of state forest land. These Principles, Goals, and Objectives were organized around 12 Resource Chapters:

- Communications
- Timber and Forest Products
- Native Wild Plants
- Wildlife
- Water Resources
- Soils
- Geologic Resources
- Wildland Fire
- Forest Health
- Recreation
- Infrastructure
- Cultural Resources

The Principles, Goals, and Objectives in the SFRMP apply universally across all of state forest land. Due to their broad application, they were written in relatively general terms. This District SFRMP provides an opportunity to prioritize goals that are more specifically applicable at the district level. The District Priority Goals that follow provide points of emphasis for state forest land management within Delaware State Forest over the next 5-10-year planning horizon.

Delaware State Forest Priority Goals

To conserve and manage the natural resources through sustainable practices.

To identify, conserve, and enhance a diversity of habitats for plant species and their communities.

To provide low-density recreational opportunity area while protecting the valuable natural resources.

To conserve, manage, and enhance the wildlife habitats in the landscape and ecosystem.

To protect the water quality of the Delaware River watershed.

To manage the state forest using sustainable timber management to provide wood products for the economy and set the example for private forest landowners

To protect life, property, and our natural resources from wildfire, having provided for public and firefighter safety first

To report and proactively search for insect, disease, and invasive plant issues to maximize forest health

District Overview

1) Location and Description

The Delaware State Forest is located in northeastern Pennsylvania in Pike and Monroe Counties in a roughly triangular pattern. The dimensions of the triangular patter are approximately 25 miles across the north side from Pond Eddy to Paupack in Pike County, 25 miles along the south-southwest side from Paupack in Pike county to Henryville, Monroe County, and 30 miles on the southeast side from Henryville to Pond Eddy, Pike County. Most of this area is in Pike County, with a smaller portion of the State Forest in Monroe County. There is a total of 84,216 acres of state forest land within this area.

This forest district lies in the heart of the famous Pocono Mountain region and derives its name from the Delaware River that drains the entire area. The Delaware River's name was derived from the Delaware Indians, a native American tribe of the Algonquian Nation, who inhabited its shores, valleys, and cliffs. The area is easily accessible, being within a two-hour drive of many major east coast cities including New York and Philadelphia. The scenic beauty is outstanding, and the area is visited by thousands of people annually.

The National Park Service administers the Delaware Water Gap National Recreation Area which straddles the Delaware River and runs from Water Gap to Milford. This 70,000 acre recreation area attracts 3.7 million visitors annually. The Recreation Area, protecting the low river lands, and Delaware State Forest, protecting the higher ridgetop lands, run parallel to each other through much of the region. A long-term goal exists to one day connect these two large expanses of conserved public lands.

In keeping with the popular conception of the Poconos as a mountain playground, the Delaware State Forest provides a wide variety of outdoor recreation opportunities. There are twelve lakes and ponds within the State Forest, seven of which are glacial and five are manmade. Many clear mountain streams originate on the State Forest and eventually tumble down to the Delaware River, often creating spectacular waterfalls. The streams provide excellent trout fishing, while warm water fishing is good at many of the lakes and ponds. Wildlife is plentiful throughout the area, including deer, bear, furbearers, and small game. Pike County is noted for its large population of black bears.

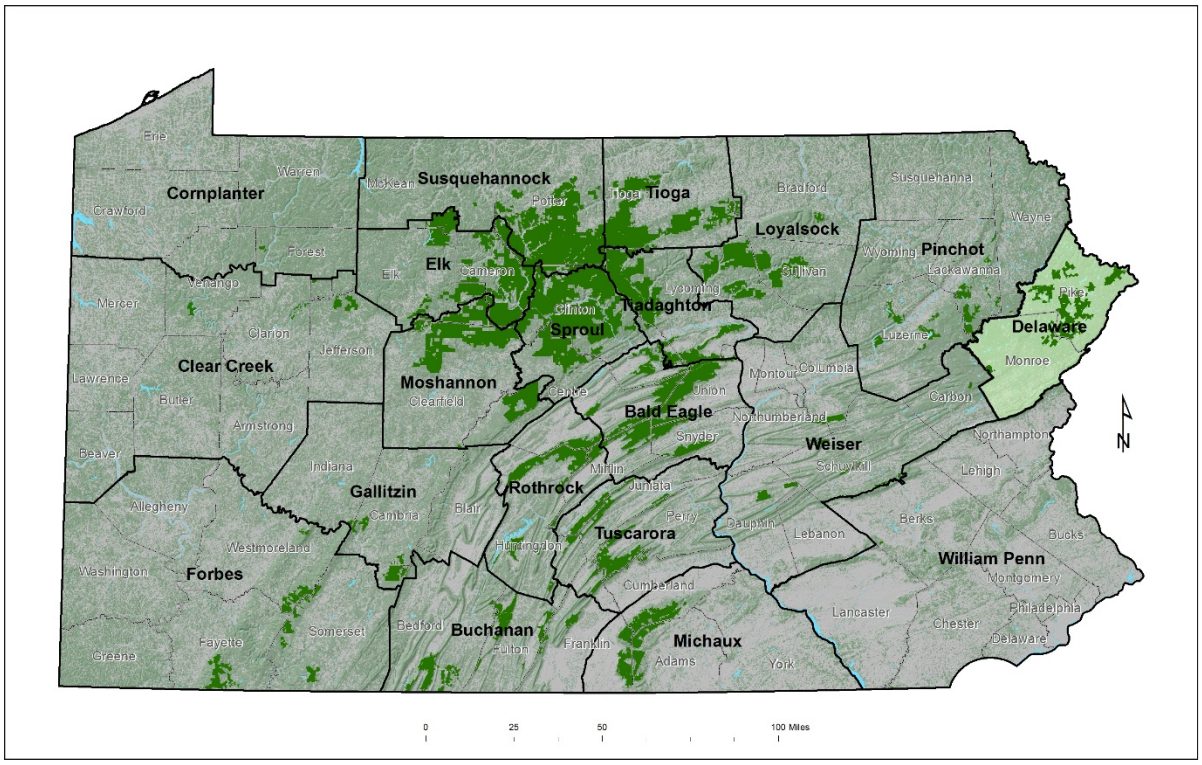


Figure 1-1. Location of Delaware Forest District with state forest land (dark green).

2) District Organization and Human Resources

The Delaware State Forest is one of the 20 state forests administered by the Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry. It comprises approximately 4% of the 2.2 million-acre state forest system. Within the Bureau of Forestry, the administrative responsibility of the Delaware State Forest is delegated to the district forester, whose office is located at 2174A Route 611, Swiftwater, PA 18370. The district forester is responsible for executing all the sections of the State Forest Resource Management Plan.

The administration of district duties is broken down into several general categories, or program areas, and disseminated across two assistant district foresters and the staff they supervise. One assistant oversees the following program areas: operations, recreation, and public contact/law enforcement. These areas include the maintenance and care of all state forest infrastructure and facilities, the State Forest Rangers, right-of-way and utility agreements, private-use license agreements, and all recreational programs including the State Forest leased campsite program and State Forest volunteering opportunities. The other assistant oversees the resource management, private land forest stewardship, vehicle/fleet management, wildland fire (including the volunteer forest fire warden program), and search and rescue programs. These areas include programs such as timber management, forest health (insects and disease), rural and community forestry assistance, forest fire prevention and control, community wild fire assistance, and search and rescue. The district forester supervises the clerical staff, the assistant district foresters, and has administrative duties across all program areas and activities.

Across the forest district there are multiple maintenance stations, fire control stations, and offices. The District Office is in central Monroe County, along state route 611, approximately three miles north of the Scotrun exit off Interstate 80. The District Office is a shared Commonwealth workspace with the Department of Environmental Protection Pocono Field office staff. To the west of the District Office is the Little Summit Fire Control Station, located on Long Pond Road. East of the District Office, near the boundary between Pike and Monroe Counties, is the Snow Hill maintenance station. The Edgemere maintenance and fire control station is located along Five Mile Meadow Road near the intersection with Silver Lake Road. The Owego maintenance and fire control station is located in central Pike County along state route 6 just west of the intersection with state route 739.

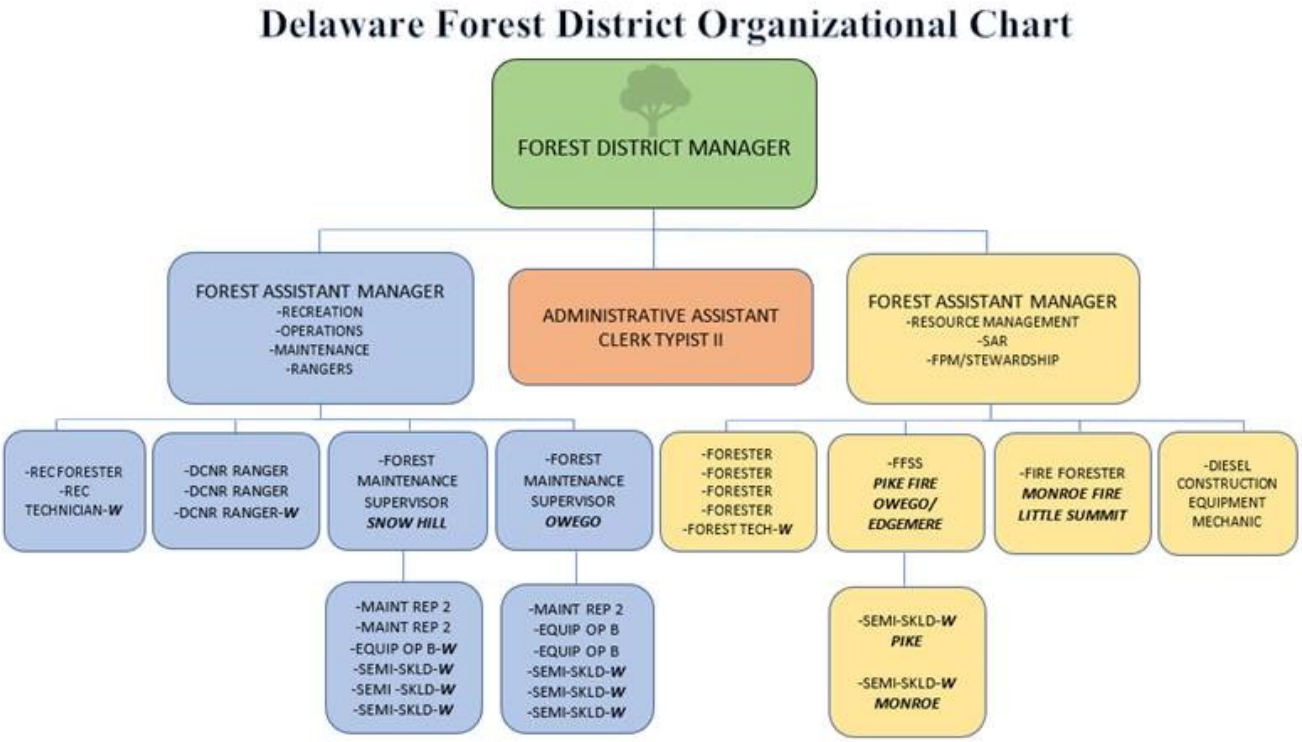


Figure 2-1. Figure 2-1. Organization chart of Delaware Forest District. Positions with "W" at end are seasonal wage positions; all others are full-time salary positions. SAR stands for Search and Rescue. FPM stands for Forest Pest Management. FFSS stands for Forest Fire Specialist Supervisor. SEMI-SKLD stands for Semi-Skilled Laborer. MAINT REP stands for Maintenance Repairman. EQUIP OP stands for Equipment Operator

3) Historical Land Use and Disturbance

In The Poconos by Thomas H. Knepp, the following quote is taken: "Originally the Northeastern part of Pennsylvania was covered with a magnificent forest of hardwoods and evergeens – oak, maple, chestnut, poplar, cherry, beech, white pine, hemlock, and spruce. Many of these trees were three to five feet in diameter and reached upward for a hundred or more feet."

Lucy Braun in her Deciduous Forests of Eastern North America indicated the presence of two main forest types in the Delaware District – the oak-chestnut type and the hemlock-white pine-northern hardwood type. These types were separated by a line running more of less southwest from Matamoras to Jonas, close to but north of the glacial terminus.

On top of some of the mountains were areas of scrub oak with pitch pine peppered throughout. The Dilldown area appears to have been one of these areas. When General John Sullivan marched through that area during the Revolutionary War, it was reported that this was the covering at that time.

In the many bogs and swamps in the District, black spruce, tamarack, and balsam fir with white pine, hemlock, red maple, and black gum could be found, some of which are the southernmost populations for those species.

Lumbering, fire, and the chestnut blight had the most profound effect on the original forests in the Poconos. As early as 1820, the area that later became the Delaware State Forest was supporting the local economy through the conversion of the abundant oak trees into barrel staves, heads, and hoops which were rafted down the Delaware River to Philadelphia. The town of Milford, founded in 1796, was the center of the white pine lumber industry. These trees were converted into planks, boards, shingles, lath, and other products and traded in Milford for farm produce brought across the Delaware River from New Jersey. These lumber products eventually found their way down the river to the port of Philadelphia. By 1860, the abundant supply of bark from oak and hemlock formed the basis for an extensive tanning industry in the region. At that time, there were at least nineteen tanneries operating in Monroe County.

After the Civil War, lumbering operations were conducted by large crews of men housed in rough lumber camps throughout the area. Only the biggest and best trees were cut and little thought was given to the remainder, thus creating incredible waste. This “wake of desolation” left abundant fuel for the great fires that were to follow the logging operations across the Poconos. This process consumed the virgin forests by 1900. The fires ensued, creating ideal habitat for the ecology of huckleberries, which the local residents tuned into a cash crop. To sustain this industry, fires were intentionally started to reduce the competition from the hardwood stump sprouts. This led to the establishment of vast stands of scrub oak and pitch pine in the fire scarred areas.

As the fire problem was brought under control, the pioneer species such as aspen and grey birch easily overtopped the scrub oak. In some stands, these pioneers still dominate; in other stands they have been replaced by more tolerant species such as oaks. Defect is high in many stands because of the past fire history. Hollow butt logs and large spreading limbs are typical of the trees that survived the fires.

By 1909, the chestnut blight had invaded the region. The American chestnut comprised over fifty percent of the growing stock in many of the stands, and by 1917 most of it was dead. This left the oaks to fill the gaps in the stands. White and chestnut oaks dominated the ridge tops while the red, scarlet and black oaks took over the lower slopes. Elimination of the chestnut resulted in and eighty percent increase in the diameter of the remaining trees, but the almost pure stands of oak that remained created ideal conditions for the insects and diseases that thrive on them.

In 1934, infestation of the gypsy moth was discovered on the Delaware State Forest. Small areas were sprayed in 1935 and periodically thereafter through Word War II. During the late 1940's large areas were sprayed with DDT.

Male gypsy moths were trapped in the area in 1955 and spraying was resumed in 1956. After three years of intensive spraying, the pest had been considered eradicated. The moth persisted and spraying was necessary again in 1962. The end of the use of DDT and the end of the eradication program both came in 1963. Starting in 1964, areas of the District were sprayed with pesticide Sevin. Various areas of the State Forest were sprayed between 1966 and 1971, with the exception of 1969 and 1970 when no state land was sprayed in the District.

The period from 1962 to 1968 saw an influx of other insects on the Delaware State Forest besides the gypsy moth. These included oak leaf tier, oak leaf roller, cankerworms, oak scale, and beech scale. First found in Pennsylvania in Promised Land State Park, beech scale/nectria fungus complex has spread to all portions of the Forest where beech grows, resulting in tree mortality and reducing the viability of beech as a crop tree in the Forest.

The extended drought of the 1960's has had an adverse effect on tree vigor and growth, adding to the impact of the insect defoliation that occurred simultaneously. During the 1960's, rainfall averaged 46.6 inches annually, while during the 1970's the average was 60.2 inches. Prior to 1960 the normal rainfall was 53.3 inches annually. From 1981 to 1984, rainfall averaged 56.6 inches.

White tailed deer population in the District have always been high. During the 1920's, the Poconos had the highest deer population in the State because of the vast quantities of brows that developed following logging and uncontrolled burning. This high deer population caused severe damage to the newly forming forest, especially planted seedlings. During the late 1920's, a deer damage study plot was located near the Whittaker homestead. Inside the deer exclosure fence, seedling survival averaged ninety percent after fifteen years. Outside the fence, very little survived. Only Norway spruce and Scotch pine showed a survival rate of more than one percent. At fifteen years of age the Scotch pine were four feet tall with fifteen percent survival and the Norway spruce were three feet tall with sixty percent survival. As the hardwoods reached the pole-timber stage, the available browse declined and the deer population decreased. For many years, and still to this day, deer represented a formidable obstacle to regeneration of quality hardwood stands in the region. Through the increased harvest allocations in the late 1990's and early 2000's and the allotment of Deer Management Assistance Program (DMAP) tags, deer densities decreased across much of the forest allowing the establishment of hardwood regeneration and habitat creation. Delaware State Forest has had a reduced need for the installation of deer exclosure fences at timber sales. Some areas will continue to see the installation of fences when there is a continued impact from over browsing. These areas are often near large forested residential communities that restrict or do not allow hunting.

In recent years, new invasive non-native pests have taken their toll on the forest. A host of invasive plants have become increasingly prevalent throughout urban, suburban and rural areas, often impacting the abundance, diversity and health of native plant communities. Emerald ash borer, a non-native invasive insect that attacks and kills all species of ash trees, became established in Pike and Monroe Counties in 2016. The resulting damage and mortality has reduced the ash component across the district and the region. Much the same, hemlock wooly adelgid became established several decades ago and continues to stress and kill our State tree, the eastern hemlock.

4) Acquisition History

The first purchase for the Delaware State Forest was 1,521 acres purchased at a tax sale from George Daumann on June 13, 1898, for the price of fifteen cents per acre. This was the second purchase of state forest land by the Commonwealth. Four warrants, all in Pike County, were included in the Daumann purchase: the Aces Ridge tract near Rattlesnake Creek, Dingman Township; the isolated Brights Creek tract in Greene Township; the area immediately surrounding the Hunters Range School, Porter Township; and an area on the headwaters of Shohola Creek near Bruce Lake, Blooming Grove Township.

The second major purchase was made in July of the same year when 3,716 acres, also in Pike County, were bought at a tax sale for fourteen and one-half cents per acre. The third major acquisition was made in September, 1898, when another 3,482 acres was purchased for fourteen and one-half cents an acre at a tax sale. Additional purchases from 1900 through 1904 brought the total Delaware State Forest area to more than 53,000 acres. In 1948, several large tracts were purchased, including an area of 2,000 acres in western Monroe County which was designate as the Delaware-Lehigh Experimental Forest. Numerous land exchanges and purchases to consolidate and eliminate interior holdings have taken place in recent years to bring the Delaware State Forest to its present size and shape.

Over the last 15 years, more than 5,200 acres of forest land have been acquired through a host of partnerships, grants, and land protection programs. Pike County's Scenic Rural Character Preservation Program funded the acquisition of over 1,500 acres, that were transferred to DCNR for permanent protection, between 2009 and 2013. More recently, multiple private-funded philanthropic foundations have supported land protection efforts in Delaware Forest district through the Delaware River Watershed Initiative.

5) Cultural and Historic Resources

The Delaware Forest District is home to an array of cultural and historic resources. Throughout the years, this area has seen many industries come and go. As was the case for almost all of Pennsylvania, this area saw major timbering throughout the 1800's that provided charcoal for the iron and steel industries, ties for railroads, wood for fuel, lumber for homes and buildings, and chemical distillation wood as well as wood for furniture, barrels, and boxes. Today, there is very little evidence of these events occurring. However, there are still some sites throughout the district where old rock foundations from logging camps, lumber mills, and various structures still exist. Once land was cleared during the 1800's for timber production, many areas were turned into fields for farming and other agricultural uses. As old farms became vacant, forest succession took place and what was once farmland has been reverted back to mature forestland. Throughout the forest district, it is not uncommon to find old rock walls from these farms and homesteads. In addition to these old farms and homesteads, there are two cemeteries located within the district; one at the site of the old Camp William Penn and another near Whittaker Road.

Also, occurring in the 19th century up along the banks of what is known today as the Upper Delaware Scenic and Recreational River was the beginning of a major industry in Pike County known as the Bluestone Quarrying Industry. This process involved removal of the timber first by logging. Then the top layer of earth and worthless stone was removed with dynamite. The quarrying began in the spring of the

year after the frost had begun to open seams in the sandstone deposit known as bluestone. Hand tools such as sledge hammers, drills, wedges, and chains were used to free the stone from the mountain. At the height of the industry there were thousands of men employed and hundreds of horses working on the side hill above the river. The bluestone was hauled off the mountain by horse and wagons and was shipped to cities such as New York, Boston, Philadelphia, Trenton, Passaic, Minneapolis, Scranton, and Wilkes-Barre. The stone traveled by railroad, floated downriver on rafts and on boats in the Delaware-Hudson Canal. Today there are still stone foundations and old bridge remnants of this industry found in the Stairway Wild Area. The large piles of waste rock sit idle but are an interesting peak into the region's bluestone industry history.

Another major historic event was the creation of the Civilian Conservation Corps. The CCC was created in 1933 to create jobs during the depression. Many CCC camps were located on State Forest land; including two that were located on Delaware State Forestland. Camp S-93-PA was located on Laurel Run Road and Camp S-94-PA was located near Edgemere. There were also camps located at Promised Land State Park and Tobyhanna State Park. These CCC camps fought wild fires, built trails, roads, dams, fire towers, and other projects on State Forest land that are still in use today. For example, Egypt Meadow Lake was constructed by the CCC in 1935 and still provides recreational opportunity for visitors today. The old stone foundations from the CCC camps are still evident in some areas as well as some of the buildings built and used by the CCC.

The Delaware Forest District has a rich history in wild fires. Many fire towers were erected throughout the district to aid in the detection of fires. Four fire towers still stand today, three of which are listed on the National Historic Lookout Register; Buckhorn Ridge, Big Pocono, and Pohopoco Fire Towers. In 2017, the old tower at Big Pocono was disassembled and replaced with a new, taller fire tower. The old tower that was erected in 1921 will be relocated to Grey Towers National Historic Site, the home of pioneering forester Gov. Gifford Pinchot, where it will be refurbished and re-erected.

Table 5-1. Cultural features within inventory of Delaware State Forest.

Cultural Feature	**Count of Feature**
CCC Camp	4
Old Building Foundation	1
Spring Water Collection Site	1
Cemetery	2
Quarry	6
Fire Towers	3

6) Physiography, Geology, Eco-Regions, and Land Cover

Physiographic Provinces

All the Delaware State Forest falls within the Appalachian Plateaus physiographic province. In this area, there are two sections to the province; the Low Plateaus, and the Pocono Plateaus. The Low Plateaus section, which includes all of Pike County and northeastern Monroe County, is typified by fairly flat-lying rock strata that has strata that have been eroded into an irregular and rugged topography. The tops of the hills are remnants of an ancient erosion surface dissected by the major streams. These streams have cut narrow steep-walled valleys. The great continental glaciers, which covered this area thousands of years ago, have left their imprint in the form of a somewhat streamlined appearance thorough the erosion and deposition of material in a general south- southwest orientation. The hill tops range from 1,300 to 1,500 feet above sea level with the valley floors 200 to 300 feet lower.

The Pocono Plateaus section is topographically higher than the adjoining Low Plateaus section. Elevations range from 1,900 to 2,100 feet. This section consists of a more uniform plateau in western Monroe County with a well-defined escarpment. Erosion and dissection are not as advanced as in the Low Plateaus section, hence the valleys are broad and the slopes gentle. Average local relief is about 200 feet. The advance and retreat of the glaciers did not have the same effect on the Pocono Plateaus section as they did on the Low Plateaus section. On the higher plateaus, glaciers left an abundance of bogs, swamps, and lakes as evidence of their former presence.

Geologic History

The geologic history of the Delaware Forest District is typical of much of the eastern United States from New York to Virginia. About 600 m.y. (million years) ago, at the beginning of what is called the Cambrian Period, a wide shallow trough extended across what is now New York, New Jersey, Pennsylvania, Maryland, Virginia and West Virginia. Within the trough were contained the ancient seas of that time. The first material deposited within this trough was an extensive layer of quartz sand derived from the stable mid-continental region, now called the Hardyston Formation of Early Cambrian Age. After the deposition of the Hardyston Formation the trough deepened in the area of the Delaware Forest District and limestones were deposited. During Early and Middle Cambrian time the sea level fluctuated and produced limestones and dolomites of varying characteristics such as the Leithsville Formation of Middle Cambrian Age.

About 470 m.y. ago the character of the sediment being deposited in this area of the trough began to change as evidenced by the Jacksonburg Formation of Middle Ordovician Age. At its base is a fairly pure cement limestone which grades upward into the cement rock, an increase in clay content and a decrease in carbonate content. It is the Conococheague, Beekmantown and Jacksonburg rocks which comprise the limestone belt of the Great, or Lehigh, Valley Section of the Ridge and Valley Province.

By the end of the Silurian Period 400 m.y. ago the influx of sediment had decreased in amounts. Carbonate rocks and quartz sandstones prevailed. Middle and Upper Silurian strata in the Delaware Forest District consist of five clastic materials with some clayey limestones, sandstones, and some red

beds. Rocks of the Manlius, Rondout, Decker, Bossardville, and Poxono Island formations represent this depositional environment. This situation continued into the Early Devonian with the deposition of the quartz sands of the Oriskany Formation and the carbonaceous beds of the Port Ewen shale and Becraft limestone.

Rocks of the Silurian and Early Devonian ages are exposed in the Appalachian Mountain Section of the Ridge and Valley Province beginning with Kittatinny Mountain where the Shawangunk Formation is exposed, northward to the Appalachian Plateaus Province.

The Devonian rocks deposited more than 350 m.y. ago are the youngest rocks now present in the District. Other rocks had been deposited upon them but have subsequently been removed by erosion. After the Devonian came the Mississippian and Pennsylvanian Periods. During the first of these two periods there occurred a great influx of coarse sediment from the east. During the second period vast coal swamps covered great areas of what is now Pennsylvania and West Virginia.

The long period of deposition which began at the start of the Cambrian Period ended more than 300 m.y. later in the Early Permian. The Permian history of eastern Pennsylvania was one of uplift and tectonic activity. The gradually subsiding trough which had received such tremendous amounts of sediments over 300 m.y. was transformed into a rigid part of the continent by this activity. Called the Alleghenian orogeny it produced extensive folds, faults, and thrusts.

With the close of the Alleghenian orogeny eastern United States became a land area undergoing erosion. For almost 40 m.y. erosion greatly subdued the rugged topography. Then in Late Triassic time, 190 m.y. ago, a series of linear fault troughs formed and in them accumulated thousands of feet of land-laid sediments. In Pennsylvania the area affected by these faults is limited to a belt, 5 to 25 miles wide, which crosses the state from Bucks and Montgomery counties in the east to York and Adams counties in the south.

At the end of the Triassic Period, 180 m.y. ago, the only location of major sedimentation was the coastal plain to the east. Erosion reduced the area of central and eastern Pennsylvania to a low, flat plain called the Schooley erosion surface. Then about 70 m.y. ago the Appalachian area was warped upward in a low, broad arch as the coastal plain subsided. The streams began cutting downward and formed another erosion surface leaving only the most resistant rocks rising above it. This newer surface was called the Harrisburg erosion surface. The sequence of uplift, erosion with the production of another surface, the Somerville erosion surface, and uplift was repeated once more with this last uplift occurring about two m.y. ago.

After the uplift of the Somerville surface the Pleistocene Period began which lasted from two m.y. to about 10,000 years ago. The Pleistocene Period was the time of the great continental glaciation in North America, Europe, and Asia. The glaciers covered extensive areas of the United States with ice hundreds of feet thick. At their maximum extent in eastern Pennsylvania, the glaciers covered all but the southwest corner of the Delaware Forest District.

A glacial stage involved a major advance of ice to some maximum extent, with any number of minor advances, then an overall retreat of the glacial ice by melting. The advance and retreat of the ice in a glacial stage took many thousands of years. Each glacial stage was followed by a similarly long warm

period. Soil horizons developed on the material left by the glaciers, and erosion partially destroyed many of the depositional forms produced by the ice.

In the Delaware Forest District the limits of an earlier stage are recognized beyond those of the last known glacial stage. However, it is this last major ice advance that has had the most profound effect on the landscape as it is today. Since the melting of the glacial ice was completed only a little more than 10,000 years ago, erosion has not had time to significantly alter the morphology and/or composition of these final glacial deposits.

After the retreat of the last glacier, there has been some minor deposition in the larger valleys of the District and erosion of the higher areas.

Eco-Regions

The Delaware State Forest lies in the two following Eco-Regions: The Glaciated Low Plateau and the Glaciated Pocono Plateau.

The Glaciated Low Plateau Section includes an area of diversified topography in northeastern Pennsylvania. The topography consists of rounded hills and broad to narrow valleys all of which have been modified by glacial erosion and deposition. Swamps and peat bogs are common in the eastern part of the Section. The Section reflects the interplay between bedrock of various types, mainly sandstones and siltstones, and glacial erosion and deposition. The more erosion-resistant rocks from the hills, while the less erosion-resistant rocks occur in the valleys. Glacial deposits, mainly glacial till or sand and gravel may occur anywhere but are found mainly in the valley bottoms and margins. The Section is in northeastern Pennsylvania and is mainly prevalent in most of Bradford, Susquehanna, Wyoming, Wayne, and Pike Counties and parts of several adjacent counties.

The Glaciated Pocono Plateau Section is a broad upland surrounded on all but its western side by a steep to moderately steep slope that marks the boundary with an adjacent Section. The upland is underlain mainly by tough, erosion resistant sandstones that are relatively flat lying. Relief on the upland is generally less than 200 feet but can be as much as 600 feet where small hills rise above the general level of the upland. Elevations on the upland range from 1,200 to 2,320 feet. Weather in this area can be severe. The upland is drained by several small streams that flow from the upland interior to and away from the margins. The low relief and relative smoothness of the upland surface results from both the flatness of the underlying rock and the scouring of the surface by glacial ice. The area was glaciated at least three different times in the past million years. In addition to erosion, the most recent glacier also left behind a variety of glacial deposits that occur on the surface of the upland. Particularly notable is the abundance of sandstone boulders that litter the surface, in many places. Swamps and peat bogs have developed in small undrained depressions created by glacial scour and deposition. The Section occurs in parts of Carbon, Luzerne, Monroe, Lackawanna, Pike, and Wayne Counties in Northeastern Pennsylvania.

Land Cover

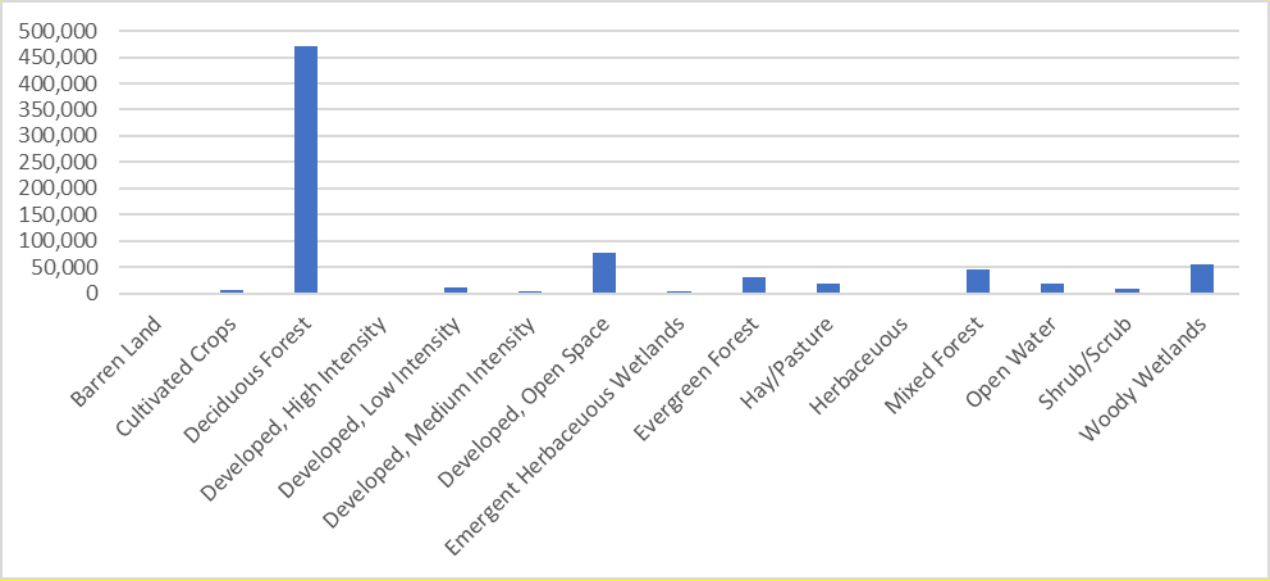


Figure 6-1. Acres of land cover types from National Land Cover Database for entire district. The Delaware Forest District is a within a predominantly forested region with limited amounts of cultivated agricultural lands and heavily developed urban areas. There is a moderate to low level of developed suburban rural areas and a higher level of wetlands and waterways than typically found in other regions.

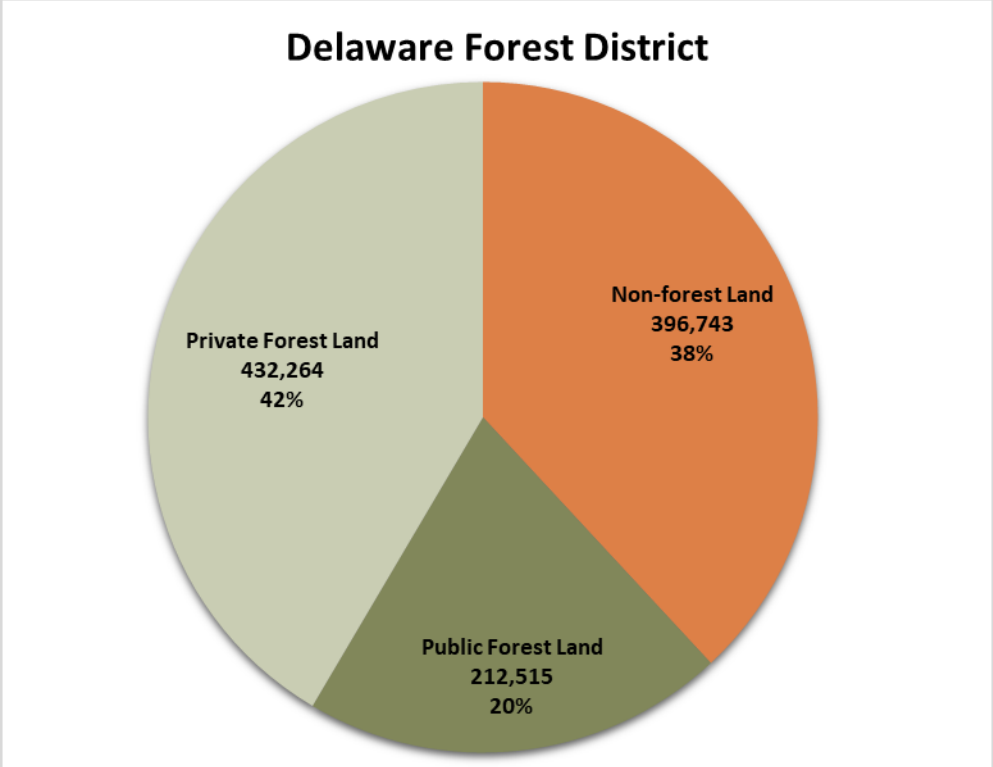


Figure 6-2. Percentage of total acreage within Delaware Forest District that is forested vs. non-forested and the ownership breakdown of the forestland (public vs. private), (based on US Forest Service FIA plot data: https://www.fia.fs.fed.us/).

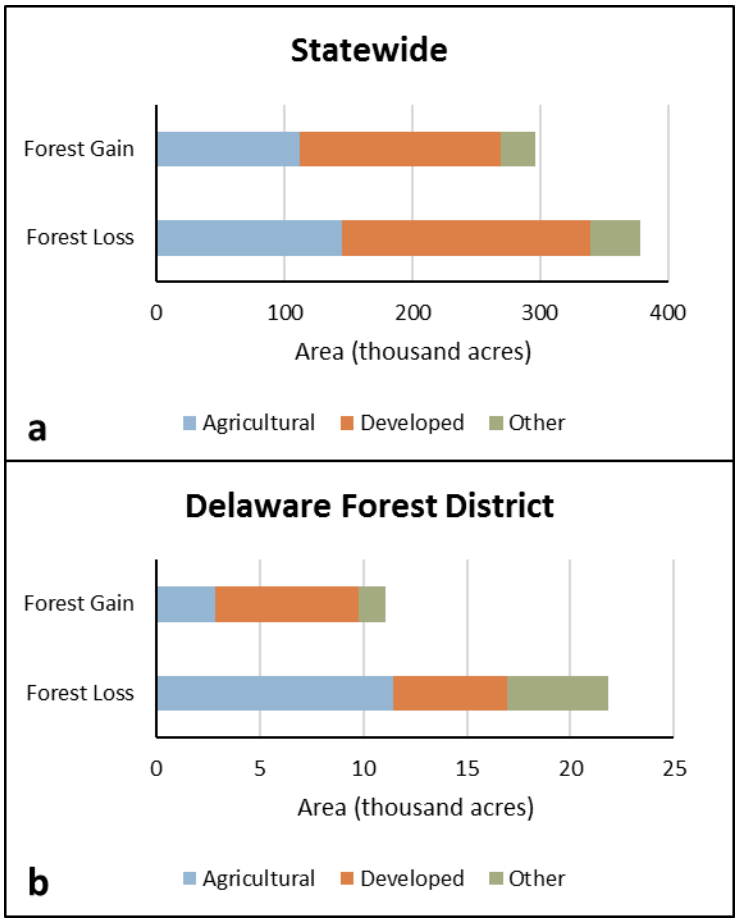


Figure 6-3. Gross forest loss and forest gain 2011-2016 (based on US Forest Service FIA plot data: https://www.fia.fs.fed.us/) by land-use categories for (a) the entire state; and (b) within Delaware Forest District. The colors in *forest gain* represent the type of land cover FROM WHICH the forestland came (e.g. agricultural could be an old farm field that gained enough tree cover in that period to now be classified as forest). Similarly, colors in *forest loss* represent the categories TO WHICH forestland was converted (e.g. agricultural could be a forest that was cut and converted to pasture).

7) Vegetation Communities and Native Flora

On state forest land, more than 50 typed plant communities have been identified in accordance with the bureau's typing manual. The bureau recognizes seven aggregated forest types on state forest land, and each forest type includes one or several dominant plant communities (see Table 7-1). For definitions and characteristics of each plant community, see http://www.naturalheritage.state.pa.us/communities.aspx.

Table 7-1. Dominant plan communities of each aggregated forest type.

Aggregated Forest Type	Dominant Plant Communities
Allegheny hardwoods	Black cherry-northern hardwood forest
Northern hardwoods	Northern hardwood forest Sugar maple-basswood forest
Red oak	Red oak-mixed hardwood forest
Other oak	Mixed oak — mixed hardwood forest Dry oak — heath forest
Red maple	Red maple forest
Conifers	Dry white pine (hemlock) — oak forest Hemlock (white pine) — northern hardwood forest Hemlock (white pine) — red oak — mixed hardwood forest Red pine — mixed hardwood forest Spruce plantation
Other	Aspen-Grey (paper) birch forest Pitch pine-mixed oak forest Tuliptree-maple forest Black gum ridgetop forest

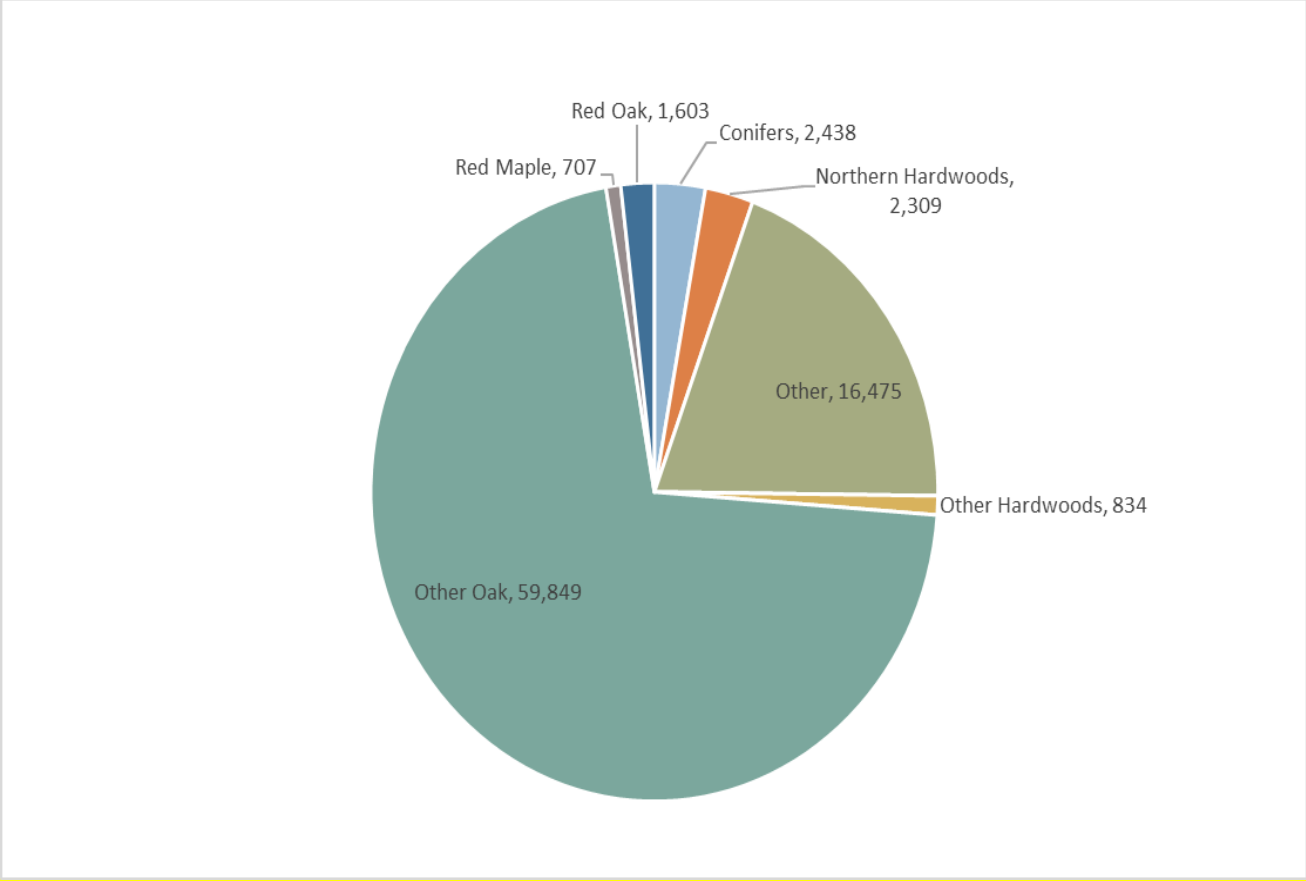


Figure 7-1. Acreage of state forest land in this district by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. A mixed oak forest type dominates nearly three quarters of the Delaware Forest district. The second most dominant category, listed as Other, includes the large volume of forested wetlands, bogs and swamps, which are a common occurrence through the district. The remaining portions of the district are composed of conifer stands, northern hardwoods, and other hardwood species.

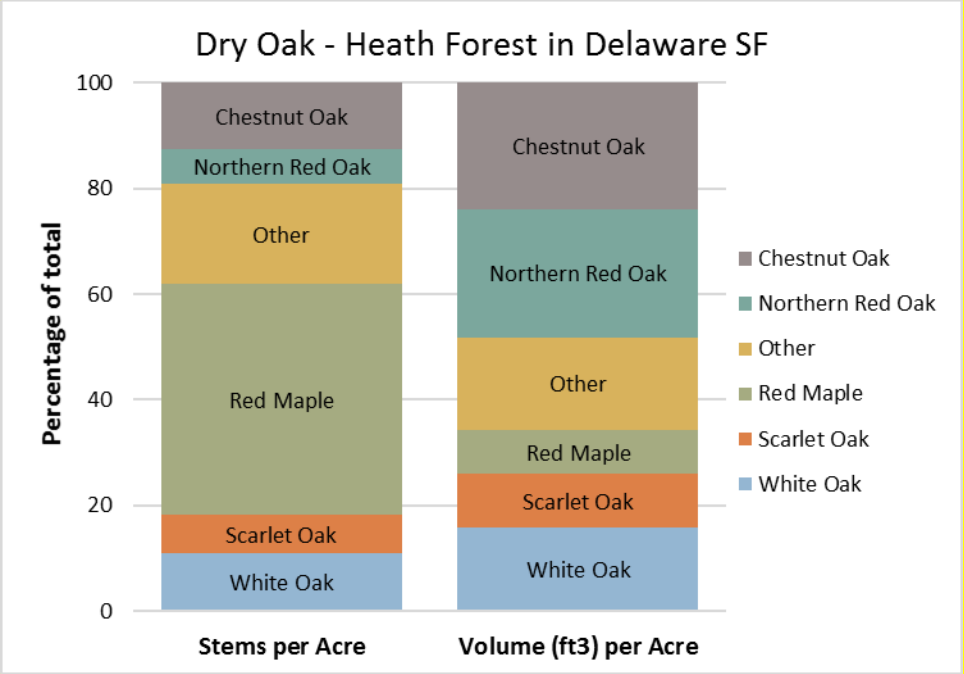


Figure 7-2. Species composition (top 5 species) of all stems over 4.5 inches dbh in the forest communities that have over 15 Continuous Forest Inventory (CFI) plots in a district. Delaware State Forest has over 49,000 acres of dry oak-heath forest, which comprises about 59% of the total state forest acreage in this district. For more information and summaries of the Bureau's CFI data, see the online interactive tool here: https://pa-forestry.shinyapps.io/cfi_explorer/

The most common forest type (by total acres) on the Delaware state forest is the Dry oak – heath forest. These forests occur on xeric to moderately dry, acidic sites, often on shallow or sandy soils and/or steep slopes. In this oak dominant community, the determining factor for this type is the ericaceous shrub layer, which is typically greater than 30% relative cover. The most characteristic tree species for this type are Quercus montana (chestnut oak), usually occurring with a mix of Quercus velutina (black oak), Quercus coccinea (scarlet oak), and/or Quercus alba (white oak). Other tree species often include Sassafras albidum (sassafras), Nyssa sylvatica (black-gum), Betula lenta (sweet birch), Acer rubrum (red maple), Carya glabra (pignut hickory), Pinus rigida (pitch pine), Pinus virginiana (Virginia pine), and Pinus strobus (eastern white pine). Total cover by conifers does not exceed 25% of the overstory. Castanea dentata (American chestnut) stump sprouts are occasionally present.

The shrub layer of the dry oak -heath forest is dominated by ericaceous species — common species typically include: Kalmia latifolia (mountain laurel), Kalmia angustifolia (sheep laurel), Gaylussacia baccata (black huckleberry), Vaccinium pallidum (lowbush blueberry), Vaccinium angustifolium (low sweet blueberry), and in more open areas, Comptonia perigrina (sweet fern). Owing largely to the thick oak/ericaceous leaf litter, the herbaceous layer is generally sparse. Common constituents often include Gaultheria procumbens (teaberry), Carex pensylvanica (Pennsylvania sedge), Carex communis (a sedge), Epigaea repens (trailing arbutus), Aralia nudicaulis (wild sarsaparilla), Pteridium aquilinum (bracken fern), Medeola virginiana (Indian cucumber-root), Melampyrum lineare (cow-wheat) and Cypripedium acaule (pink lady’s-slipper).

The second most common forest type (by total acres) on the Delaware state forest is the mixed oak – mixed hardwood forest. This type occurs on less acidic to somewhat calcareous, moderately dry soils. It is most often found on south and southwest-facing slopes. Dominant species include Quercus alba (white oak) and/or Quercus montana (chestnut oak), which either alone or in combination account for a greater percentage of overstory basal area than Quercus rubra (northern red oak). Common trees typically include Betula lenta (sweet birch), Carya cordiformis (shellbark hickory), Acer rubrum (red maple), Acer saccharum (sugar maple), Quercus velutina (black oak), Carya glabra (pignut hickory), Fraxinus americana (white ash), and Tilia americana (basswood). Total cover by conifers does not typically exceed 25% of the overstory. Often Pinus strobus (Eastern white pine) seedlings are present in the understory, as well as a variety of shrubs and mid-story trees including: Cornus florida (flowering dogwood), Carpinus caroliniana (hornbeam), Corylus cornuta (beaked hazelnut) and Ostrya virginiana (hop- hornbeam). Ericaceous shrubs are sparse, accounting for less than 30% of relative cover in the understory. When present, they may include Vaccinium pallidum (lowbush blueberry), Vaccinium angustifolium (low sweet blueberry), Gaylussacia baccata (black huckleberry) and Kalmia latifolia (mountain laurel). Herbaceous species may include Smilacina racemosa (false Solomon's-seal), Uvularia sessilifolia (sessile-leaved bellwort), Asplenium platyneuron (ebony spleenwort), Desmodium spp. (tick-trefoils), Hieracium venosum (rattlesnake weed), Aralia nudicaulis (wild sarsaparilla), Carex pensylvanica (sedge), Carex communis (sedge), Eurybia macrophylla (bigleaf aster) and Lysimachia quadrifolia (whorled loosestrife).

Unique Plant Communities:

While dry oak – heath forests and mixed oak – mixed hardwood forests are the most common forest types, many acres of the Delaware district are also classified as palustrine forests and wetlands. Hemlock-palustrine forests are found in many low areas, surrounded by the oak forests on the hill and ridgetops. Other types of palustrine forests can often border glacial lakes or more open acidic wetlands. Typically, glacially-derived lakes or kettleholes are surrounded by wetlands in varying stages of succession. Immediately adjacent to the water's edge, "quaking" sphagnum bogs can be present which harbor a wide variety of uncommon plants in Pennsylvania, including species like bog sedge (*Carex paupercula*) cranberry, sundews, pitcher plants and rare orchids. Moving away from the sphagnum mat, shrubs like steeplebush, alder, highbush blueberry, and bog rosemary (*Andromeda polifolia*) become more common. Moving through the shrub wetland habitat, palustrine forests of red spruce, tamarack, black spruce, and balsam fir dominate many acres before a transition back to upland oak forests.

Many of the lakes and ponds within the Delaware state forest are classified by the Bureau of Forestry as Plant Sanctuaries and often host a variety of submerged aquatic vegetation. Species like purple bladderwort (*Utricularia purpurea)*, floating heart (*Nymphoides cordata*), horned bladderwort (*Utriculata cornuta*), and small beggars ticks (*Bidens discoidea*).

8) Forest Health

Acid Precipitation

Acid precipitation is a long-term and complex concern that has potential negative impacts on Pennsylvania's water and forest ecosystems. While the extent and significance of its effects are not yet fully defined, Pennsylvania receives some of the most acidic precipitation in the country originating from industrial centers in Chicago and the Ohio Valley regions. Although many forest soils in Pennsylvania are naturally acidic, the added effects of acid precipitation are changing soil chemical properties and affecting the health of some tree species. As soils become more acidic, calcium and magnesium (important for tree nutrition) become less available to trees, and aluminum, which is toxic to trees, becomes more available. Research conducted by the U.S. Forest Service and the Bureau of Forestry on the Susquehannock State Forest indicates that sugar maple, white ash, and basswood are most sensitive to soil acidification; while species such as black cherry, American beech, and birch are mostly insensitive and not affected. Research results are not conclusive on the effects of acid precipitation on oak species. Additionally, the buffering capacity of soils is highly variable, thus complicating efforts to understand the impacts of acid deposition on forest ecosystems.

Scientists and natural resource professionals are currently debating the effects of acid deposition on forest regeneration. Some believe that acid precipitation is the most significant factor affecting forest regeneration, while others attribute it to a combination of factors, including white-tailed deer browsing. The Bureau of Forestry recognizes that while acid precipitation is changing soil chemistry and could be affecting tree growth, the impact of the overpopulated white-tailed deer herd complicates the issue even further. The Bureau of Forestry supports research attempts to determine the effects of acid precipitation and deer overabundance on forest ecosystems. Additionally, the Bureau of Forestry recognizes that silvicultural treatments could be modified in certain situations to minimize adverse changes to soil chemistry, such as:

- Leaving non-commercial wood and tops of trees on site by restricting whole-tree harvesting to allow for nutrient cycling. Note: Only about 20% of the nutrients in a tree occur in the merchantable stem.
- Managing for longer rotations and partial removals on nutrient-poor sites.
- Limiting nitrogen fertilization on low base cation sites and during stand establishment, which could accelerate calcium and magnesium leaching, thus causing soil acidification.

Invasive Plants

Invasive plant is a name for a species that has become a weed pest, a plant that grows aggressively, spreads, and displaces other plants. Invasive plants tend to appear on disturbed ground, and the most aggressive can actually invade existing ecosystems. Invasive plants are generally undesirable because they are difficult to control, can escape from cultivation, and can dominate whole areas. In short, invasive plant infestations can be extremely expensive to control, as well as environmentally destructive. Invasive plants are continually becoming more common as they advance into more areas of the forest.

Invasive plants are noted for their ability to grow and spread aggressively. Invasive plants can be trees, shrubs, vines, grasses, or flowers, and they can reproduce by roots, shoots, seeds, or all three.

Invasive plants tend to:

- Not be native to North America;
- Spread, reproducing by roots or shoots;
- Mature quickly;
- If spread by seed, produce numerous seeds that disperse and sprout easily;
- Be generalists that can grow in many different conditions; and
- Be exploiters and colonizers of disturbed ground.

Some of the most common invasive plants in the Delaware State Forest are Japanese barberry, multiflora rose, *phragmites*, autumn olive, mile-a-minute and Japanese stilt grass**.** This most likely will continue to grow over time.

Currently the District is treating many invasive species at multiple sites. It would be impossible to completely eradicate every invasive form the landscape. Many of the invasive species are being chemically treated. Mile-a-minute weevils have been released at two different locations in an attempt to use a biocontrol strategy on mile-a-minute.

Invasive Insects

Emerald ash borer is an invasive insect from Asia. It was first discovered in Michigan in 2002. It spread to Pennsylvania in 2007 and was confirmed in the Delaware State Forest in 2017. Ash species in the forest are starting to show the early signs of decline as a result of the insects. Large-scale ash mortality will happen in the coming years as a result. Emerald ash borer is host specific and only feeds on the various ash species.

Currently we are chemically treating a total of 200 white ash trees at various locations throughout the District in an effort to combat the emerald ash borer. The purpose of the treatment is to keep some remaining pockets of ash on the landscape and retain their unique genetics. Seed from these trees potentially could be used to re-establish ash on the landscape, if a permanent long-term solution is developed to deal with emerald ash borer.

Hemlock woolly adelgid continues to be present on the eastern hemlocks. Most of the hemlock stands are showing declining health, resulting from the adelgid. Extended periods of cold winter weather are necessary to reduce the adelgid population. Temperatures of 5° Fahrenheit and lower are fatal to the adelgid.

Spotted lantern fly is a relatively new invasive insect. The first discovery of this insect, in United States, was in Berks County, Pennsylvania in 2014. Since its discovery, it has been expanding its territory into neighboring counties and states. It is known to feed on over 60 plant species and that list is continually expanding. At this time, it is unknown what the long-term effects of this insect will be. In 2017, the spotted lantern fly was confirmed in Monroe County. At this time, there has not been a confirmed case of spotted lantern fly in the Delaware State Forest. Our staff will continue to monitor for this insect.

Gypsy moth populations are currently on the decline over the District. The cold-wet spring of 2018 led to a collapse of the population. Prolonged wet weather, when the gypsy moth larvae are actively feeding, leads to an increase in natural fungal and viral pathogens. These pathogens are fatal to the larva. Our staff will continue to monitor the population in the coming years.

The last major gypsy moth defoliation that led to large-scale tree mortality, occurred between 2006 and 2008. The areas hardest hit were northern Monroe county and southern Pike County. Remnants of that gypsy moth related mortality can still be seen in the form of standing dead oak trees throughout the District. Historically gypsy moth populations work on a six to eight-year cycle between large defoliation events. Many of the oaks can survive a single defoliation event. When defoliations happen in consecutive years, it increases the likelihood of tree mortality.

9) Timber Management and Forest Regeneration

The bureau created a harvest allocation model that sets timber harvest schedules for state forest land in each district. The goals of the model are to promote and maintain desired landscape conditions, create a diversity of successional stages and native forest communities, balance the age class distribution, and provide a sustained yield of quality timber. The model uses the bureau's forest inventory data, economic information, bureau policies, and desired ending target forest conditions to develop timber harvest schedules that best meet the bureau's silvicultural and timber management goals. A detailed discussion of the harvest allocation model can be found in the 2016 SFRMP, beginning on page 93.

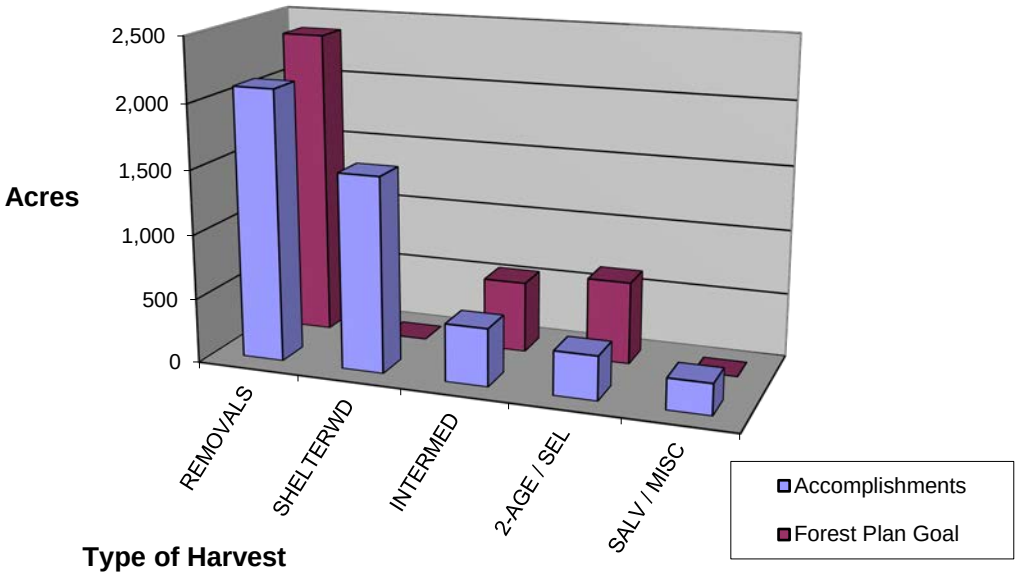


Figure 9-1. Chart of comparison between actual harvested acreage and harvest allocation model goals from the first decade of implementation of the harvest allocation model. From left to right, the treatment categories are: Overstory Removals (even-aged), Shelterwoods (even-aged), Intermediate Treatments (even-aged), Two-age and Uneven-age Buffer Treatments, and Salvage/Miscellaneous.

The accomplishments from the first period are very close to the allocation model. The overstory removal was slightly below the recommended amount because of a lack of acceptable forest regeneration. The number of shelterwood acres implemented is much higher than the model because of the need to establish regeneration before the removal. The allocation model has a goal of zero acres for shelterwood because the acreage total for shelterwood harvests does not factor in the final regeneration goal. Many times, shelterwood harvests are needed before the final overstory removal. This is a tool for foresters to use but it is not always necessary. The shelterwood cut will establish regeneration, which enables the manager to do the final overstory removal regeneration harvest.

The bureau is presently in the second harvest allocation period of the model. The district's timber harvest goals for the second period are shown in the table below.

Table 9-1. Target shelterwood (Shelt), overstory removal (OR), intermediate (Int), and buffer treatment acreages for the second decade of the timber harvest schedule, aggregated by forest type, site class, and treatment. Additional shelterwood treatments for 3 or more stage shelterwoods are not represented in these targets.

Aggregated Forest Community Type	Site 1		Site 2		Site 3		Totals			
	Shelt	OR	Shelt	OR	Shelt	OR	**Shelt**	**OR**	**Int**	**Buffer**
Northern Hardwoods	0	269	0	37	0	0	**0**	**307**		
Allegheny Hardwoods	0	0	0	0	0	0	**0**	**0**		
Red Oak	0	120	0	106	0	0	**0**	**225**		
Other Oaks	0	0	0	1,726	0	0	**0**	**1,726**	**550**	**640**
Red Maple	0	0	0	0	0	0	**0**	**0**		
Other Hardwoods	0	0	0	0	0	0	**0**	**0**		
Conifers	0	0	0	0	0	0	**0**	**0**		
Totals	**0**	**389**	**0**	**1,869**	**0**	**0**	**0**	**2,258**	**550**	**640**

The above table is the district's timber harvest allocation model. It tells the type of harvests and acres targeted by forest type. It also takes into consideration the quality of the site while determining the overall goals.

10) Wildlife

BOF's Policy in the 2016 state-wide SFRMP states, "State forest lands will be managed to ensure the conservation of a diversity of native wild forest animals and the provision of suitable habitats for these creatures."

The first comprehensive management plans for state forest lands were developed in 1949. Most forest resources were adapted to fit in with timber management as time and money allowed. In the early 1960's it became apparent that there must be a formal plan for the protection, development and use of all forest resources.

Between 1965 and 1970, work was completed on Forest Resource Plans for the 1970-1984 management period. These plans established objectives for all forest resources and coordinated their use and development. For the first time, the plans specifically addressed wildlife and fisheries resources. Matters pertaining to wildlife and fisheries were considered under the Recreation Section of the Forest Resource Plan.

In the 1970-84 Plan, habitat guidelines were developed in cooperation with the Pennsylvania Game Commission to promote a diversified forest suitable for all wildlife. Fisheries guidelines were also developed with assistance from the Pennsylvania Fish & Boat Commission to address such topics as in-stream restoration and improvement and wilderness trout stream management. Also, the coordination of the wildlife and fishery resources was accomplished through the consideration and integration of these values into the management of the other forest resources.

The 1985-2000 State Forest Resource Plan acknowledged that animals and plants are distinct forest resources and should be managed as such, thus a new section of the Plan was developed, the Fauna and Flora Management Section.

The 1985-2000 plan recognized that the forest is a complex ecosystem composed of animal and plant communities integrated with the physical environment. Animals in this ecosystem range from large mammals such as the black bear and white-tailed deer to invertebrates such as honeybees. Animals, plants and physical environment integrate to form a multitude of combinations all of which form the whole, the forest. The management of these organisms is predicated on both protection and use to meet society's needs and wants.

In keeping with the popular conception of the Poconos, as a mountain playground, the Delaware State Forest provides a wide variety of outdoor recreation opportunities. There are ten lakes and ponds within the State Forest, six of which are glacial and four are man-made. Many clear mountain streams originate on the State Forest and eventually tumble down to the Delaware River, creating spectacular waterfalls. The streams provide excellent trout fishing, while warm water fishing is good at many of the lakes and ponds. Wildlife is plentiful throughout the area. Pike County is noted for its large population of black bear. The Delaware State Forest is home to game species such as black bear, white-tailed deer, turkey, snowshoe hare, woodcock, fisher, bobcat, and coyote. Numerous species of songbirds such as golden-winged warbler and cerulean warbler thrive this state forest land; and, waterfowl such as black ducks, ring-necked ducks, and wood ducks abound. Numerous bald eagles and osprey can be seen hunting over the state forest's lakes and streams, and numerous osprey nests are located on the power poles of PPL's Susquehanna-Roseland powerline. Rattlesnakes are also present.

State Wildlife Action Plan

Management of the state forest system is guided by the State Forest Resource Management Plan, which includes wildlife management goals to provide habitats for a wide variety of wildlife. These wildlife include Species of Greatest Conservation Need (SGCN) identified in the Pennsylvania Wildlife Action Plan, which is administered by the Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission.

For planning purposes, the Pennsylvania Wildlife Action Plan has been used by the DCNR Bureau of Forestry to:

- inform an implementation document for each forest district containing:
    - High priority SGCN known to occur in each forest district.
    - High priority SGCN that could potentially be found in each forest district.
    - Specific habitat types and characteristics where each species might be found.
    - General habitats management recommendations to support each species.
- draft strategies for each forest district to protect, maintain, or enhance wildlife habitat features during forestry management activities.

Advancing from planning to implementation, these forest district documents are guiding management for SGCN. Thus, strategically associating the State Forest Resource Management Plan and Pennsylvania Wildlife Action Plan fosters coordinated resource management planning and implementation to benefit Pennsylvania's SGCN and state forest habitats.

Wildlife Habitat Improvement Projects

Stream Improvement Projects

Historically the district has been doing projects for about the last 40 years. We currently have Saw Creek enrolled in the Adopt-A-Stream Program. Projects are designed and administered by the Pennsylvania Fish and Boat Commission. The work on the projects have been completed with volunteer help from the Pike County Conservation Camp. Approximately 20 projects have been completed to date.

Grouse Improvement Projects

The Ruffed Grouse Society has assisted in two projects on the Delaware State Forest. In 1995 tree and shrub seedlings were planted at Cummings Hill and 16 Mile Run. We are currently working to maintain and enhance grouse habitat from White Deer Lake, south to Peck's Pond. The Golden-winged Warbler habitat project area has a secondary goal of improving nesting and foraging habitat for species such as the Ruffed Grouse.

Duck Habitat Improvement Projects

The Delaware State Forest contains the Peck's Pond Waterfowl Propagation Area, a 310-acre area that seasonally protects waterfowl nesting habitat. The propagation area was established in 1994 on the eastern edge of Peck's Pond. The area is closed to the public from April 1st through September 30th to reduce disturbance of nesting waterfowl, such as black ducks and wood ducks. The area is open to recreational use including hunting from October 1 to March 31. Peck's Pond has been identified in the North American Waterfowl Management Plan as a "Special Management Focus Area" due to its importance to black duck production.

In addition, approximately 150 Wood Duck boxes at 15 locations have been established and maintained over the last 25 years.

Turkey Habitat Improvement Projects

Since 1990, primarily with funds and assistance from the National Wild Turkey Federation (NWTF), 12 permanent herbaceous openings have been established and maintained. We plan to establish one plot annually through the next management period with continued assistance from the NWTF and local turkey federation chapters. The openings have been enhanced with supplemental plantings of shrubs and fruit trees.

Golden Winged Warbler Habitat Improvement Project

The Delaware State Forest has established a Special Management Area dedicated to habitat creation to benefit the golden-winged warbler. The Special Management Area is centered around Highline Road and hosts an array of overstory removals and other early successional habitat projects. An unusually high concentration of golden-winged warblers and associated species are breeding and nesting at these sites. The location is very popular with birding enthusiasts.

Species of Special Concern

The current plan recognizes native fauna diversity as an integral part of the forest ecosystem that are highly valuable and that should be sustained.

Table 10.1. Species of special concern on Delaware State Forest.

CARTEROCEPHALUS PALAEMON MANDAN	ARCTIC SKIPPER
CROTALUS HORRIDUS	TIMBER RATTLESNAKE
DOROCORDULIA LEPIDA	ELEGANT SKIMMER
ERYNNIS PERSIUS PERSIUS	PERSIUS DUSKYWING
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
HEMILEUCA MAIA	BARRENS BUCKMOTH
LONTRA CANADENSIS	NORTHERN RIVER OTTER

Hunting

Hunting is a recreational activity, but in many cases, it also plays a key role in sustainable forest management. Forests can only be sustainably managed if balanced populations of wildlife are maintained. This is particularly true for herbivores, such as deer. If left to multiply unchecked, deer will eat the entire next generation of understory plants in a given area. If generations of new seedlings are lost, the forest soon loses its ability to renew itself following disturbances.

Northeastern Pennsylvania continues to provide good hunting opportunities for a variety of wildlife. Regeneration cutting on public and private lands is expanding habitat diversification. This is evidenced by increased deer and grouse numbers. Many hunters from surrounding states concentrate on the

public lands of the Pocono Mountains for black bear season. A healthy, increasing population of bear exists in many of the swamps. Both the spring and fall turkey hunting seasons indicate an increase of hunters. Snowshoe hare inhabits the swamps thereby providing another unique hunting experience.

Fishing

The Delaware State Forest is awash with angling opportunities which are managed and supported with the cooperation of the Pennsylvania Fish and Boat Commission. Fishing is permitted on state forest land, unless otherwise posted, in accordance with the current State Forest Rules and (Regulations17. Pa. Code, Chapter 21) and the laws, rules, and regulations of the Pennsylvania Fish and Boat Commission. In addition to the many streams, particularly in the headwater regions, that offer wild brook trout fishing opportunities, the lower reaches within the basin's flood plain, may offer additional fishing opportunities for wild brown trout, an introduced species, as well.

Bureau of Forestry streamside buffering policies and road construction and maintenance policies outlined in the Bureau "Timber Management Manual" all contribute to healthy stream environments.

State forests have some of the most pristine waters in the Commonwealth and they support abundant fish life. The Department of Environmental Protection classifies 2,970 miles of waterways as high quality and 626 miles of waterways are classified as exceptional value. In addition the Fish and Boat Commission classifies 207 miles as wilderness trout streams.

Cold-water trout fishing on the Delaware State Forest is available in some streams, rivers, and ponds. Saw Creek, Bushkill Creek, Little Bushkill Creek are all stocked with brook trout. In addition to the stocked streams, Stony Run, Marshall Creek, Red Rock Run, Poplar (Laurel) Run, and many small streams contain native trout populations that can provide good fishing.

Fishing on lakes and warm-water streams appears to be increasing. Good populations of warm-water species are being maintained at several of the State Forest lakes.

Ice-fishing is increasing. Panfish, bass, and pickerel provide the winter fisherman with a unique sport.

Warm Water Streams - The Big Bushkill Creek and the Delaware River provide river/stream based warm water fishing opportunities in the District. Big Bushkill Creek runs through approximately six miles of State Forest land and contains bass, pickerel and pan fish. Anglers on the Delaware River may catch the following species including bass, walleye, American shad (springtime), catfish, carp, pan fish and muskellunge.

Warm Water Lakes – There are thirteen lakes and ponds in the forest district that provide a host of angling opportunities. Some are stocked with trout and all of them contain pickerel, panfish, and bass.

Trout Stocking (data based on annual requests that may change year-to-year depending on availability)

LAKES & PONDS

SNOW HILL DAM: Preseason and Inseason: Brook Trout

LAKE MINISINK & LITTLE MUD POND: Preseason: Brook Trout and Brown Trout

Inseason: Brown Trout and Rainbow Trout

LILY POND: Preason and Inseason: Rainbow Trout

STREAMS

Bush Kill – Section 02 – Outflow Pickerel Lake to downstream Border Delaware State Forest – 2.98 mi.

Preseason: Brook Trout and Brown Trout

Inseason: Brown Trout and Rainbow Trout

Saw Creek – Section 03 – Bushkill Falls Road (SR2003) Bridge to Whitaker Road (T-324) Bridge – 5.15 mi.

Preseason and Inseason: Brook Trout

Little Bush Kill – Section 06 – Lower Lake Lehman Club Boundary downstream to Bushkill Road & Gun Club Boundary – 1.74 mi.

Preseason and Inseason: Brook Trout

Polluted Waters - There are no polluted waters in the Delaware State Forest.

Birding/ Nature Observation

Bird watching and nature observation are uses that occur throughout the 2.2 million acres of state forest land. The best locations for these activities depend on the habitat requirements of the species involved. The Audubon Society has designated certain areas of state forest land with unique or unusual bird species as Important Bird Areas. These parts of the state forest have particularly large and unique habitats for some unusual bird species. Most state forest lands have diverse habitats and support great numbers of birds. More information on important bird areas can be found at www.audubon.org/bird/iba.

State forest land with its many roads and trails and generally quiet environment is ideal for nature observation. A public use map of the roads and trails is available from each district to aid nature observers. Natural Areas and Wild Areas are managed with this objective in mind, but the entire state forest system is maintained in a largely natural system. Nature photographers and artists also find an abundance of natural settings on state forest land.

White-tailed Deer and Deer Management Assistance Program (DMAP)

White tailed deer populations in the District have historically been high. During the 1920's, the Poconos had the highest deer population in the State because of the vast quantities of browse that developed following logging and uncontrolled burning. This high deer population caused severe damage to the newly forming forest, especially planted seedlings. During the late 1920's, a deer damage study plot was located near the Whittaker homestead. Inside the deer exclosure fence, seedling survival averaged ninety percent after fifteen years. Outside the fence, very little survived. Only Norway spruce and Scotch pine showed a survival rate of more than one percent. At fifteen years of age, the Scotch pine

were four feet tall with fifteen percent survival and the Norway spruce were three feet tall with sixty percent survival. As the hardwoods reached the pole-timber stage, the available browse declined and the deer population decreased. Deer still represent a formidable obstacle to regeneration of quality hardwood stands in the region.

The Delaware State Forest encompasses approximately 85,000 acres of the 2.2 million acre State Forest System. The Delaware accounts for almost four percent of the Bureau of Forestry's land base. The Delaware is located in Monroe and Pike Counties. State Game Lands 38, 116, 127, 129, 168, 180, 183, 186, 209, 221, 312, and 316 are also found within the boundaries of the Delaware. The Delaware is generally categorized as part of the Pocono Mountains area of Pennsylvania. The area is moderately populated with a mosaic of forested areas intertwined with large housing developments. All of the Delaware State Forest is included in the Pennsylvania Game Commission's 3D Wildlife Management Unit.

The Delaware State Forest is separated into nine DMAP Management Units. The DMAP Management units are divided by physical features, primarily roads. There have been continuous forest inventory plots and other forest growth data gathered from the forest since the 1950s. In addition to these plots, an additional 90 understory plots, ten per DMAP unit, have been added to the sampling base in recent years. All nine units are evaluated each year for potential inclusion into the DMAP program. The final decision on their inclusion is based on the management activities occurring within the unit, insect and disease issues, understory health indicators, and social trends.

The forests of the Delaware State Forest are predominately dry oak heath with some oak –hickory, northern hardwoods and conifer stands. The Delaware has experienced significant insect mortality events dating to the 1960s that have severely impacted a number of stands. Gypsy moth defoliation has been the major cause of mortality, however, forest tent caterpillar and maple leaftier have caused mortality in many of the northern hardwood stands. Currently emerald ash borer is expected to cause significant mortality of the ash component and conifer stands are being impacted by hemlock woolly adelgid. The forest has also experienced large scale mortality events from the 1998 tornado, other wind events, and frost damage. A large number of our stands have a heavy understory of competing vegetation and lack advanced regeneration of many desirable tree species. Our silvicultural and management practices rely heavily on having this advanced regeneration present in the understory.

The northeast region of Pennsylvania, especially Pike and Monroe counties, has long been plagued with an overabundant deer population due to a minimum number of antlerless tags being issued up until the year 2000. During the preceding three decades, deer populations were so high that they depleted their own habitat and the habitat of many other wildlife species. The lon- term effect of depleting the habitat was that it compromised the habitat's ability to reproduce itself. Due to an increased doe harvest from 2000 to present, deer numbers have been reduced in this forest district; however, habitat recovery is slow due to its compromised condition. To allow the Delaware State Forest's habitat to fully recover, we need to maintain reduced deer densities for an extended period of time.

An additional problem that Pike and Monroe Counties face, about managing their deer herds, is the mosaic of housing developments and other safe zones located throughout the forested areas. These "safe zones" provide a hiding place for the deer during hunting seasons making it difficult for hunters to harvest enough deer to control the growth of the herd. Many of the residents within these housing developments feed the deer, especially during the hunting season, which compounds the deer

availability problem. Additionally, the supplemental feed artificially increases the productivity of the deer causing the population to swell well above what the habitat can naturally support.

To combat this deer overabundance problem, the Bureau of Forestry has spent hundreds of thousands of dollars on fence installation and herbicide application in Pike and Monroe Counties. Even after spending this money, these strategies only affect a small percentage of the State Forest land.

Based on past vegetation sampling data and insight from past foresters, it is known that this unit has had deer densities that exceeded the habitat's ability to sustain itself since the early nineteen seventies, at the least. The historical mismanagement of deer in this area is evidenced by a resultant layer of fern, low-bush blueberry, and huckleberry dominating the understory over a major portion of this unit.

Because this problem has persisted for so long and the damage is so severe, even with reduced deer populations, the changes to the forest and wildlife habitat are persistent and difficult to reverse. A long period of time with low deer densities is required to restore the forest to a healthy, normal ecological system.

DMAP will help to reduce the deer densities over time to what the habitat should naturally support. After those densities are achieved, DMAP will help to maintain that balance so that the habitat does not return to the condition that it has been in over the last few decades. We are already beginning to see some small glimmers of hope. In many areas, hemlock and white pine seedlings are surviving and growing into saplings, especially around the wetlands, thus eliminating the browse line appearance and restoring cover for species such as snowshoe hare and grouse. In the more heavily hunted areas, oak seedlings are surviving and growing into the sapling stage outside the fences and species such as pink lady slipper can be seen.

Our district is collecting data using the Vegetation Impact Protocol (VIP) to support DMAP decisions. The VIP was developed after analyzing continuous forest inventory (CFI) data (forest wide data collected by the Bureau of Forestry's Inventory and Analysis section), which indicated that supplemental CFI plots would add enough data to detect important biological changes in vegetation. The VIP was designed so that recently-collected data could be integrated with previously-collected data from the existing CFI.

The VIP collects information on competing vegetation, site limitations, indicator species, and tree regeneration. The protocol focuses heavily on using indicator species to determine if the deer herd is in balance with the vegetation. Providing healthy vegetation across Pennsylvania is part of the Bureau of Forestry's mission and is important for us to monitor in regard to deer impacts. The data collected from the VIP, CFI, and other measurements are then entered into a decision model, which utilizes utility functions and a dynamic linear modeling process to determine a best recommendation for each DMAP unit. Our district collects VIP data on a five-year cycle of data collection; therefore, every year our foresters are collecting data on approximately 108 plots. Our district collects data on a total of 540 plots. These data are compiled with approximately 468 plots collected by the CFI on our district. Therefore, every five years we have statistically robust data on 1,008 plots to detect changes in vegetation, including indicator species.

Chronic Wasting Disease on State Forest Lands

Chronic wasting disease (CWD) is an always fatal disease that affects the brain and nervous system of infected deer and elk.

It has been detected in Pennsylvania in both captive and free-ranging deer. Following these detections, the Pennsylvania Game Commission established Disease Management Areas (DMAs) to reduce the risk of spreading CWD to other parts of the state.

Three DMAs currently (2019) exist in Pennsylvania; however, newly confirmed cases can alter the boundaries. The current DMAs include: DMA 1 on a captive deer farm in Adams County in 2012 (DMA 1 has since been eliminated); DMA 2 includes multiple free-ranging deer in Bedford, Blair, Cambria, and Fulton counties, as well as captive deer farms in Bedford, Franklin, and Fulton counties; DMA 3 includes two captive deer farms in Jefferson County and a free-ranging deer in Clearfield County; and DMA 4 contain a captive deer at a facility in Lancaster County.

All or portions of the Michaux, Buchanan, Gallitzin, Tuscarora and Rothrock State Forests as well as several State Parks fall within DMA 2. A portion of Clear Creek State Forest is located within DMA 3 and William Penn State Forest is located within DMA 4.

Hunters who harvest deer within in a DMA should be aware that special rules and regulations apply and should have their deer tested for the disease. Additional information on Chronic Wasting Disease, testing, and approved processors can be found on the Pennsylvania Game Commission website

11) Water

a) Major Watersheds

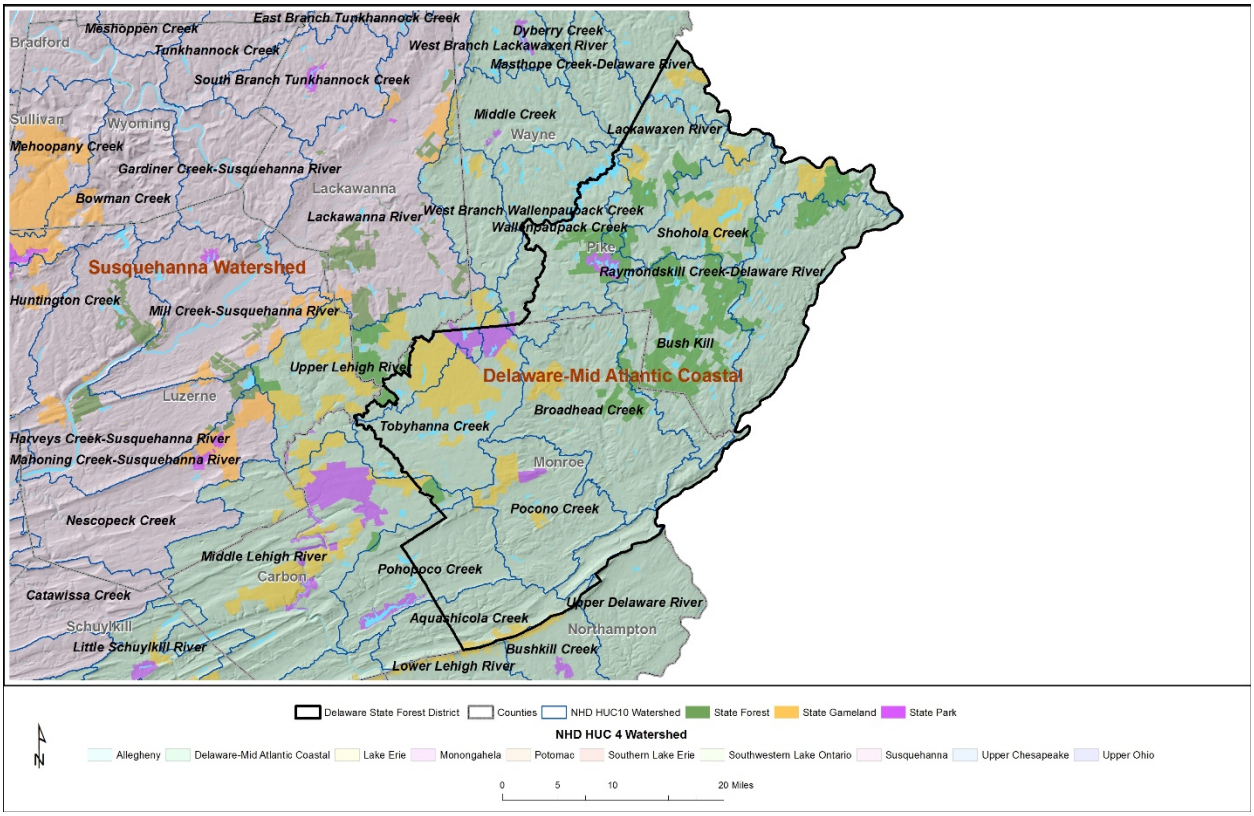


Figure 11-1. Map of major (Hydrologic Unit Code 4) and minor (Hydrologic Unit Code 8) watersheds within entire district. Delaware Forest district is within a region of exceptional water quality contributing to the Broadhead, Bush Kill and Raymondskill creeks and the Lackawaxen and Delaware rivers, to name a few. All waterways on Delaware State Forest carry the designation of Exceptional Value (EV) or High Quality (HQ), the two highest rankings for stream and water quality afforded by the Pennsylvania Department of Environmental Protection.

b) Major Municipal Supplies

Currently there are no major municipal watersheds on the Delaware State Forest. However, two municipalities obtain a portion of their water supply from major streams that have small tributaries originating on state forest land.

The Dingmans Ferry Water Company, in Delaware Township, Pike County, uses some water from Dingmans Creek. Of the total watershed of 10,000 acres, only 440 acres is state forest land.

The Stroudsburg Municipal Authority obtains some of its water from Brodhead Creek, at Stroudsburg, in Monroe County. Approximately 3,000 acres of state forest land in Price and Barrett Townships are at the headwaters of small streams that flow into Brodhead Creek. In both instances a great concern is being generated by the prolific land development that is occurring in the watersheds. The ultimate responsibility for the protection of these water supplies outside of state forest land will rest with the local governing bodies.

East Stroudsburg also obtains some of its water from 240 acres of state forest land. This acreage is only a small part of the total watershed and is about four miles above the reservoir with several wetlands in between.

c) Fish and Boat Commission Stream Habitat Prioritization

Wildlife and fish habitat work is most efficient if it is prioritized to get the most benefit for the effort. To help the Bureau of Forestry effectively manage for fish habitat, the Pennsylvania Fish and Boat Commission (PFBC) has shared their Stream Priorities for Habitat Improvement tool. Prioritization in this tool is based primarily on trout biomass, Class A designation, and high angler use. Priority 1 streams are highest priority for habitat projects. The PFBC prioritization tool includes spatial data for use in GIS along with a spreadsheet of priority streams within the districts. This tool assists the decision-making process when determining what streams to emphasize for improvement. The highest priority streams should be emphasized for habitat work within a district. Priority 1 streams should be addressed first, then priority 2 streams. This tool can also aid in prioritizing Dirt and Gravel Roads projects within districts to provide increased benefit to the aquatic resources.

Table 11-1. List of Priority 2 streams on state forest land in Delaware District, based on PFBC Stream Priorities for Habitat Improvement tool. There are no Priority 1 streams on state forest land in Delaware District.

Tarkill Creek	Pike
UNT to Saw Creek (rm 6.27)	Pike
High Swamp Run	Monroe
Spruce Run	Pike
Burchards Creek	Pike
Kleinhans Creek	Pike
UNT to Bush Kill (rm 12.11)	Pike
Mud Run	Monroe
Saw Creek	Pike
Unt To Bush Kill Rm 13.85 (camp girard)	Pike
Pinchot Brook	Pike
Unt To Pinchot Brook (rm 0.1 t-428 woodtown road)	Pike
Little Bush Kill	Pike
Dimmick Meadow Run	Pike
East Branch Wallenpaupack Creek	Pike
Bush Kill	Pike
UNT to Little Bush Kill (rm15.01)	Pike
Middle Branch Bush Kill	Pike
UNT to Peck Pond (rm 29.50)	Pike
Marshalls Creek	Monroe
Maple Creek	Pike

d) Acid Mine Drainage

There are no known or probable acid mine drainage occurrences within the Delaware State Forest.

e) River Islands

Delaware Forest district does not manage any river islands but does host a river camping area on the banks of the Delaware river. The site is operated through a partnership with the National Park Service, Upper Delaware Scenic and Recreational River, since much of the campers are recreating with liveries operating through permits issued by the NPS.

12) Oil, Gas, and Mineral Resources

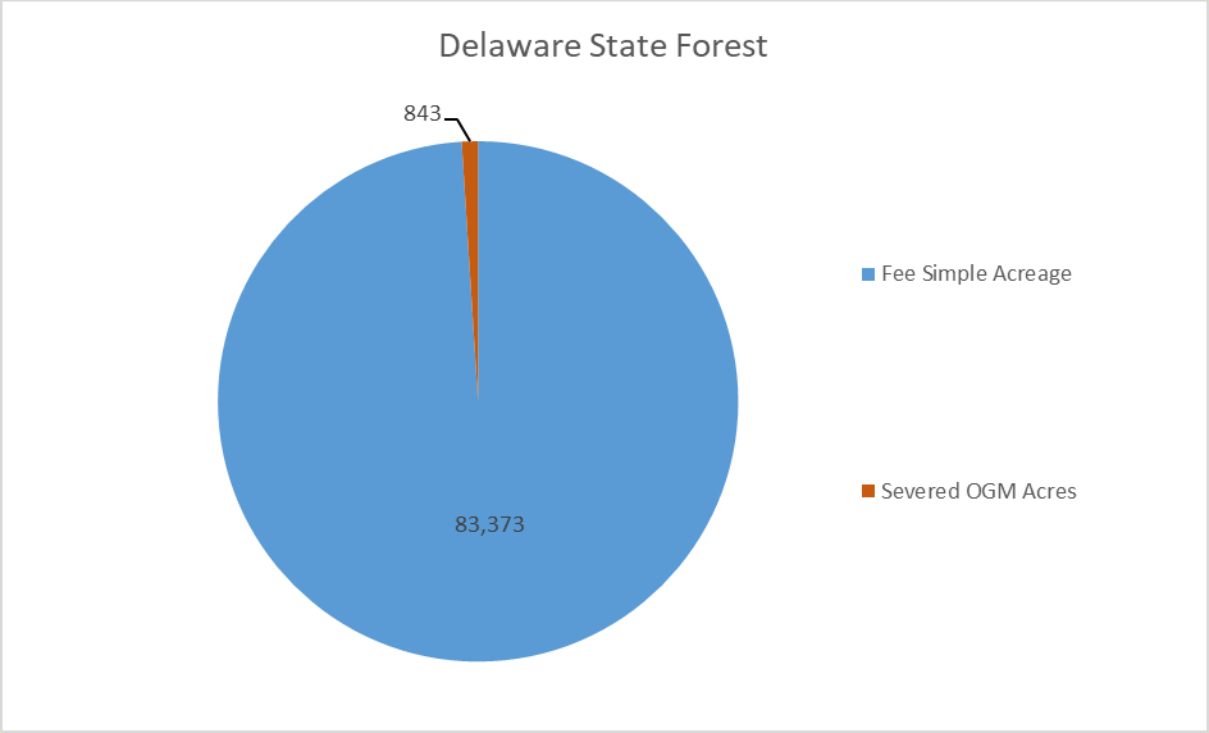


Figure 12-1. Acres of subsurface ownership/status on state forest land within the district. Acreage figures are derived from bureau GIS data, not acreages specified in lease or subsurface agreements. Severed Acres include only severed rights lands where the subsurface ownership has been verified. Partially severed areas that have been leased are counted as DCNR Issued Lease Acres, as opposed to Severed Gas Rights Acres.

The DCNR Bureau of Forestry's mission statement clearly identifies the environmentally sound utilization of mineral resources, which includes oil, gas, coal, and hard minerals as a key component of state forest management. Subsurface geological resources and unique geologic features on state forest lands are managed to provide long-term benefit to the citizens of the commonwealth while adhering to the principles of ecosystem management. Decisions regarding management of the subsurface estate must be based on the mission and both state-

wide and district-level management plans. Oil and natural gas development is one of the management activities that historically has occurred on state forest land. The activity contributes significantly to Pennsylvania's economy and provides a source of domestic energy. Natural gas development, however, especially at the scale seen in the modern shale-gas era, can affect a variety of forest resources, uses, and values, such as:

• recreational opportunities,

• the forest's wild character and scenic beauty, and

• plant and wildlife habitat.

Given the host of potential impacts of shale-gas development to the state forest resources, uses, and values, the Bureau has established a Shale-Gas Monitoring Program to track, detect, and report on the beneficial and adverse impacts of the activity. The program aims to provide objective and credible information to the public and inform and improve shale-gas management efforts. An essential function of the Shale-Gas Monitoring Program is to regularly compile and analyze its data and findings. The Program has produced two reports on its monitoring efforts. Information on the Shale-Gas Monitoring Program can be found here:

https://www.dcnr.pa.gov/Conservation/ForestsAndTrees/NaturalGasDrillingImpact/ShaleGasMonitoring/Pages/default.aspx

To assist the Bureau with managing oil and gas development in concert with other forest resources, uses, and values, the Bureau has created the Guidelines for Administering Oil and Gas Activity on State Forest Lands. The objective of this document is to communicate a set of "guidelines" and Best Management Practices (BMPs) that provide consistent, reasonable, and appropriate direction for managing oil and gas activity on state forest lands in accordance with the Bureau's mission. The Guidelines can be found here:

http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032134.pdf

There has been no economic oil or gas production from private or state lands within this Forest District. This is predominantly due to two reasons: mass-water withdrawal restrictions (required for deep gas exploration) that exist within the entire Delaware River watershed and the limited abundance of subsurface oil, gas or minerals. Of all the Delaware State Forest lands, only 7,542 acres in northern Pike County have been leased for oil and gas exploration and development. These lands were leased to Texaco, Inc. in 1971 (Tracts 163 and 164) and the oil and gas leases were surrendered in 1972 after the Texaco #1 Tract 163 dry hole was drilled to the Middle Ordovician Age Trenton limestone at a total depth of 13,910 feet. No other wells have been drilled for oil and gas on the Delaware State Forest lands.

All of the Delaware State Forest lands except for the small blocks of state land along the Appalachian Trail straddling the Monroe-Northampton County line, are located in the Pocono Mountains in the Appalachian Plateau Province in an area which is generally characterized as

having a gently dipping and fairly uniform layering of formations which have been deformed (folded and faulted) much less than in the steeply dipping and intensely folded and thrust faulted rocks of the Valley and Ridge Province to the south.

Oil and gas leasing and exploration in the Valley and Ridge Province part of the Forest District, where the state-owned lands along the Appalachian Trail are located, is part of the oil and gas industry's "Eastern Overthrust Exploration Play" where, due to new knowledge gained from seismic surveys, oil and gas producing formations are expected to exist below the enormous thrust sheets of the earth's crust which occur at or near the surface. These producing zones are expected at depths below 10,000 feet. Exploration and drilling costs to find these zones will be high; they will probably amount to many millions of dollars per well drilled.

13) Wildland Fire

a) Wildfire Suppression

The wildland fire program of the Delaware Forest District safely and effectively manages wildland fire to enhance and protect life, property, and natural resources for the public benefit within the Commonwealth of Pennsylvania. To accomplish this mission, we must have highly trained and qualified staff to execute suppression operations of wildfires both on public and private lands. Some employees also hold national wildland fire qualifications which expands the depth of experience within the district.

In addition to the Delaware Forest District staff, we rely on local Volunteer Fire Departments, Fire Wardens and Fire Warden Crews, the Division of Forest Fire Protection in Harrisburg, other adjacent Forest Districts and the Hazleton Tanker Base. We also partner with local, state, and federal agencies such as The PA Game Commission, The Nature Conservancy, The National Park Service and the US Forest Service for larger scale incidents and training opportunities.

The District Fire Warden, who is also the District Forester, is the lead person in charge of wildfire suppression in the district. Working directly under that person is the Fire Program Manager. This person creates the scheduling of staff, assists in coordinating and scheduling fire trainings, and manages the Forest Fire Specialist Supervisor (FFSS) and Fire Forester (FF) positions, who are also known as Fire Supervisors. The FFSS and FF are responsible for on the ground suppression efforts in their respective county, but they may work together on largescale incidents. They follow Incident Command System (ICS) to establish a structure for directing resources, completing logistics and executing operations on a fire. They also create and utilize our internal Wildfire Resource Plan which captures all or most of the information that could be needed for more complex or multi-day incidents such as personnel, heavy equipment, local vendors etc.

The FFSS and FF have anywhere between 20 and 30 staff to rely on for various positions such as the tower man, aerial recon, fire patrol and fire dispatch. The tower man and recon are primarily used to increase the chance of early wildfire detection. The faster we become aware

of a wildfire, the higher the odds are off containing it to a small fire with less destruction. Recon and towers are also used to gather information on larger project fires by watching the fire, looking for spotting, observing wind direction and change, detection of other aircraft and any other information that could be pertinent to the incident commander. Fire patrol are ground units generally consisting of 2 employees and a fire engine. Dispatch operates out of our district office and relays information as well as orders needs for fire personnel.

The district utilizes an abundance of tools and equipment to aid in fire suppression efforts. There are four fire towers spread across our landscape. Only two of the four are currently in service, the towers at High Knob and Big Pocono. Big Pocono was replaced with a new era tower as of Spring 2018. From these two vantage points, much of the district can be seen on clear days. There are also fire towers across the Delaware River that can see into our district and can call in fires they come across. If a wildfire requires aerial assistance, the district can contact the Hazelton Tanker Base to request those resources. There are 3 airtankers and 1 helicopter that cover the Eastern Area of PA. Depending on how many requests the tanker base has and what our fire is directly threatening will determine whether we get the aircraft or not. We have 7 type 6 engines to utilize currently, and 2 more new engines that should be up and running by 2020. We also have one type 4 engine and a fire ready UTV (type 7) that contains a slip-on unit complete with a pump and water storage tank. Heavy equipment includes one type 3 dozer with most other heavy equipment coming from outside vendors. Water pumps, large collapsible water storage containers, bladder bags, chainsaws, leaf blowers and many more hand tools also complement our fire suppression equipment.

The Delaware Forest District is known as a “fire” district throughout the Bureau of Forestry. This means that the occurrences of fires are frequent during the fire seasons and the potential for wildfires to grow and become more complex has become evident. There are two main seasons for the greatest risk of wildfire – one being Spring (mid-March through mid-May) and Fall (late October to late-November). There are also occasional fires during the summer but they are rare. There would need to be a drought and/or in a fuel type that would be conducive to summer burns such as Pine forest duff or scrub oak. By far, our most vicious fires come in the Spring Fire Season.

The two largest causes of wildfires in this area are debris burning and incendiary, which is arson or intentionally set fires. Occasionally a powerline, equipment use, children and some others are determined to be the cause. Wildfire risk has increased over the past decade with the loss of many mature oak trees across the district due to Gypsy Moth defoliations. The forest fuel bed in these areas become much more volatile as the dead oaks shed their branches and contribute fuel to the forest floor. These defoliations left many trees standing dead, which now can act as 40- or 60-foot roman candles, with the capability of spotting more than a ¼ mile when conditions are prime. This was the main reason that our most recent large wildfire, the 16-mile fire, was so hard to contain, eventually becoming a landscape wildfire charring nearly 8,000 acres. All the dead trees also become hazard trees, which increase the risk factor for a firefighter to become injured. Mechanized equipment and utilization of indirect tactics have helped to mitigate these risks.

The 16-mile fire and the Beartown fire both started on the same day and were in close proximity to each other. The cause was incendiary and the conditions were prime for wildfire with an RH dipping in to the single digits, high temperatures, and extremely dry fuels. Beartown took the priority due to immediate structures threatened, therefore that fire got all the aerial assistance. Since the 16-mile fire was in a remote location and no air resources were available, it grew at a fast pace, continually burning across fire lines and spotting across contingency lines. This incident quickly escalated to a type 3 incident and then to a type 2, which is very rare for the state of PA, in fact it was the first time in history there has been a type 2 team activated to take over a fire in PA. It took nearly two weeks and the effort of hundreds of firefighters to safely contain and extinguish. This fire proved that PA can experience large landscape fires and the need to be ready for these instances spread across the Bureau.

The Delaware Forest District has experienced a total of 303 reported spring fires and 27 reported fall fires over the past decade. Fires range in size from one tenth of an acre to nearly 8,000 acres and costs range from $0 to millions of dollars.

Table 13.1. Most notable and highest complexity fires over the past decade that occurred in the Delaware Forest District.

Date	Fire	Acreage	Cost
4/12/2008	Goose Pond	995	$102,604
4/26/2009	Hardytown	102	$28,617
4/8/2010	Kahkout Mountain	6	$5,103
7/6/2010	Twin Pines	10.2	$24,124
4/23/2013	Shaggy Bark	69	$751
4/23/2013	16 Mile Road	136	$2,252
4/25/2014	Dark Hollow	615	$60,670
4/13/2015	Old Indian Path	16	$32,472
5/10/2015	Hypsy Creek	122	$14,622
4/20/2016	Beartown Road	647	$237,056
4/20/2016	16 Mile	7949	$2,253,287
4/22/2016	Shohola Falls	64	$5,117
11/29/2017	Owego	125	$14,810

b) Prescribed Fire

From the state-wide 2016 SFRMP: Prescribed fire activities are governed by the Pennsylvania Prescribed Burning Practices Act, Act 17 of 2009, 32 P.S. § 425. The Pennsylvania prescribed fire standards were developed by the bureau in consultation with the Pennsylvania Prescribed Fire Council. These standards specify qualifications, training requirements, safety issues, and burn plan content required for all prescribed fires conducted in the commonwealth. The bureau also has developed an internal prescribed fire policy and a vegetation monitoring program to further promote and manage this activity on

state forest land. In late 2013, district prescribed fire coordinators were assigned to facilitate coordination and information sharing on prescribed fire in the bureau. The prescribed fire program continues to grow as more bureau staff become trained to carry out the activity and more information is learned on its applicability as a tool for state forest management.

The SFRMP of 2016 also says the number of acres burned through prescribed fire has increased in recent years on state forest land. In addition to increasing acreage, the average size of prescribed fires also has increased. Most prescribed burning on state forest land has been used as part of silviculture systems to promote oak regeneration and reduce undesirable tree species competition in combination with shelter wood or clear-cut harvests. Because of the success of these prescribed fires and research supporting their use in oak ecosystems, there is increasing interest in expanding the prescribed fire program on state forest land as a part of ecosystem management. Prescribed fire is an emergent tool that has potential for use in a variety of plant communities to promote desirable species compositions and structure. The bureau also has developed and implemented a vegetation monitoring protocol for prescribed fire on state forest land to help determine if objectives of prescribed fire are met and to adjust techniques from the information learned on resulting conditions. The protocol involves measuring vegetation composition and structure before and after a prescribed fire, as well as weather conditions and behavior during the fire. As more information is gathered about the use of prescribed fire, managers may be able to indicate conditions that were more successful in attaining management objectives or where other techniques may be more successful.

The Delaware State Forest has been conducting one or two prescribed fires each year for the past 5 years. The prescribed fires are used to promote desirable regeneration for timber management, reduce invasive species, remove interfering vegetation, staff training and wildlife habitat. The prescribed fires generally range in size from 30 to 50 acres and are conducted in the spring. The fires have proven to be very useful in the Delaware State Forest and have given great results. Prescribed fire is an important tool for forest management and will continue to be used in the future.

14) Infrastructure and Maintenance

Infrastructure refers to buildings, equipment, roads, and other capital assets, tools, and resources used to meet an organization's goals and objectives. Successful accomplishment of the bureau's mission cannot happen without proper inventory, planning, and administration of these assets. The bureau uses infrastructure to perform management activities and to provide for state forest use by others, including private industry and the general public. This requires accurate inventories, acquisitions, management, evaluation, maintenance, and retirement of infrastructure, as well as adequate funding to make all these tasks possible.

Bureau staff manage the following infrastructure on Delaware State Forest.

- Roads
    - There are approximately 38.5 miles of State Forest Roads that are typically ungated and open for travel year-round. Forestry classifies these roads as Z-1. These roads receive annual maintenance and funding and are surfaced with Driving Surface Aggregate, DSA, an aggregate formulated thru Penn State's Center for Dirt and Gravel Roads Studies. The DSA is placed with a paver and the material is rolled into the road to provide a smooth dirt road surface.
    - In addition to the Z-1 roads, Delaware Forest manages 90 miles of Z-3 roads. Z-3 roads are typically gated and locked for most of the year and receive very little funding. The roads are rough and typically are surfaced with native sand, gravel, cobble, or shale from State Forest borrow pits. The roads are gated to prevent illegal dumping on State Forest Land and due to their rough condition, which is not suitable to year-round use. Approximately 30 miles of Z-3 Roads are opened annually from September to January each year to allow better access to hunters with the goal of reducing deer numbers to enable a healthy, dynamic forest system to grow.
- Trails
    - There are 30.4 miles of ATV Trails available in Pike and Monroe Counties. These trails are located at Dixon Miller Recreation Area (Monroe), and Maple Run and Burnt Mills Trail (Pike).
    - There are 123 miles of snow mobile trails in the Delaware Forest. There are four trail systems located across the district. The Pike County Trails are comprised of the Edgemere-Pecks Pond Trail System, and the Delaware State Forest and Promised Land State Park Trail System. The Monroe County Trails are located at Snow Hill and the Dixon Miller Recreation Area.
    - There are 214 miles of Shared Use Trails in Delaware Forest District. These are open to hiking, biking, and horses. In addition, there are 66 miles of hiking only trails available to the public.
    - The Thunder Swamp State Hiking Trail is in Delaware Forest District and traverses 28 miles of terrain. Hiking only is permitted.
- Gates

  There are currently 133 gates located throughout the Forest District. They are maintained by the District staff and function primarily to curb the illegal dumping and to protect roads and trails that cannot support regular vehicular traffic. Some of these gates are locked open in the hunting season to give more access to the hunters to assist in lowering deer population numbers.

  There are additional gates that were installed on access roads to State Leased Campsites and are maintained by the cabin owner. These gates were installed to allow the cabin owner to protect their cabin from theft and vandalism.
- Bridges and culverts

  There are eleven bridges located within the Forest District. These bridges are regularly inspected by DCNR Bureau of Facility Design and Construction engineers who prepare a bridge inspection report. The report includes maintenance recommendations that are delivered to the Forestry Maintenance staff to complete.

The Bureau of Forestry conducts stream culvert assessments using the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocol. Assessed culverts yield data on the condition of stream crossings on state forest land in regard to AOP. The data is used to determine if the crossing is a barrier to organism passage, and if so, to what extent. This information assists the bureau prioritize culverts for replacement or repair. The end goal is for the road to not impact the stream. The following is a list of priorities to consider when replacing stream crossings, from highest to lowest priority.

Priorities for Culvert Replacement

1. Failing critical infrastructure

2. Assessed as no aquatic organism passage (AOP)

1. Class A brook trout streams

2. Exceptional Value (EV) streams

3. Wild brook trout streams

4. High Quality (HQ) streams

5. PA Fish and Boat Commission Stream Priority 1 for habitat improvement

6. NAACC priority tool (length of stream reconnected)

    - This District has approximately 69 culverts, which will be assessed over time using the NAACC protocol.

- Radio and communications leased towers/anntenas

  There are 20 communication towers located at High Knob and Dixon Miller Recreation Area. These towers range from cell phone towers, to ham radios. Each tower is authorized to operate on the respective mountains by securing and paying for a lease agreement. The responsibility for maintenance falls to the antenna lease holder and is administered by staff of Delaware Forest.

- Fire towers

  There are four Fire Towers in the Forest District. Two are in Pike County, High Knob Fire Tower and Buckhorn Fire Tower. High Knob is located on High Knob Road in Blooming Grove Township, and Buckhorn is located along Fire Tower Road in Westfall Township. Big Pocono and Pohopoco Fire Towers are in Monroe County. Pohopoco is located off Jacks Road, Tunkhannock Township within the Dixon Miller Recreation Area, and Big Pocono Fire tower is located within Big Pocono State Park, Pocono Township.
  Three of the four fire towers are considered historic and listed on the Historic Fire Tower Registry: Big Pocono, Pohopoco, and Buckhorn. Big Pocono Fire tower was recently replaced with a modern tower and cabin. The original cabin was removed, and ownership was transferred to the U.S. Forest Service facility at Grey Towers, Pinchot Institute, Milford, Pike County. The original fire tower cabin will function as an interpretive tool for the Forest Service to help tell the story of wildfire detection and suppression in the region.

- Buildings
    - The Forest District Headquarters is in Pocono Township, Monroe County along SR 611. The building also is the home of the DEP Pocono District Office. It is the headquarters for District Managers, Foresters, DCNR Rangers and the administrative staff. This is where all the administrative functions are located.
    - There are three maintenance facilities located in the Forest District. Two are in Pike County and one is in Monroe County. The Owego Maintenance Headquarters is in Blooming Grove Township, Pike County along U.S. Route 6. The Edgemere Maintenance Headquarters is in Porter Township, Pike County along Silver Lake Road. The Snow Hill Maintenance Headquarters is in Price Township, Monroe County along Snow Hill Road. These facilities function to house the staff and equipment needed to support the maintenance, fire, recreation, and emergency response to the Forest.
    - The Dixon Miller Recreation Area has a vacant fire towerman cabin and associated garage located on top of the mountain in Tunkhannock Township, Monroe County. The garage functions to support the maintenance and emergency response to the mountain trail network.
    - Little Summit Fire Station is in Tobyhanna Township, Monroe County. This facility houses staff and equipment and functions to support the Fire Suppression Program for Monroe County.
    - H.B. Rowland Heliport is in big Pocono State Park, Pocono Township, Monroe County. It serves to stage and launch helicopters for wildfire suppression and gypsy moth aerial spray operations when needed.
    - The Delaware Valley Raptor Center, a nonprofit organization with the purpose of rehabilitation of raptors, i.e. eagles, falcons, hawks, etc. leases a State-Owned building to conduct their work at Lily Pond, Milford Township, Pike County. There is also a State-Owned cabin located at Lily Pond that is used to house students conducting research on State Forest.
- Picnic Areas
    - There are two designated picnic areas in Delaware Forest. Pecks Pond Picnic Area is located at Pecks Pond, Porter Township, Pike County. There are picnic tables and BBQ grills and a public water well for the public's use.
    - The Ron Flad Memorial Picnic Area is located on Laurel Run Road below the Snow Hill Maintenance Headquarters. There is a picnic pavilion, picnic tables, BBQ grills, and a latrine available to the public.
    - In addition, there are two more picnic pavilions open for public picnicking at the Ambush property located just west of the Owego Maintenance Headquarters along U.S. Route 6 and the picnic pavilion at Lily Pond. The Lily Pond Picnic Pavilion has tables, BBQ grills, and a latrine. Reservations for groups are required at Lily Pond.

- Camping sites

    There are 30 designated motorized campsites in Delaware Forest. Camping at these sites require a camping permit and are available by contacting the Forest District Office

at 570-895-4000. There is a picnic table, BBQ grill (fire ring type) and stone for parking at each site.

In addition to the motorized campsites, there are campsites located along the Upper Delaware Scenic and Recreational River. Camping Permits are also required for these sites and available by contacting the U.S. Park Service, Upper Delaware River Scenic and Recreational River Headquarters.

Dispersed, primitive camping is permitted throughout most of the Delaware Forest with some exceptions. Contact the District Office for camping guidelines, maps, and permits.

- Boundary line

  There are approximately 350 linear miles of Delaware State Forest Boundary line to maintain. The annual goal is to complete 70 miles, 1/5 of the total distance each year. Boundary maintenance includes applying white paint and metal boundary tags to trees along the line.

- Rights-Of-Way

  There are two natural gas pipeline rights of way, ROW, located in Westfall, Milford, and Shohola Townships in Pike County. Kinder Morgan's Tennessee Gas Pipeline, (TGP), owns one and Columbia Gas owns the other. The TGP right of way is 75' wide and 2, 105' long. The Columbia Gas Pipeline is 50' wide and 7,531' long.

  Pennsylvania Power and Light, PPL, owns and operates four major transmission lines in Pike County in Delaware Forest. The Susquehanna-Roseland line traverses 14 miles and runs from U.S. Route 6 in the north and parallels SR 402 through State Forest to Bushkill in the south. The ROW ranges from 250' to 150 'wide. The Blooming Grove to Honesdale line shares part of the Susquehanna-Roseland ROW for a distance of 13,977' and is located west of SR 402 near White Deer Lake. The Blooming Grove to Hemlock line is located west of SR 402 and north of Pecks Pond and is part of the Maple Run ATV-Snowmobile Trail system. This ROW is 11,025' long and 100' wide. Blooming Grove to Palmyra line is located in the Promised Land Tract and originates in the west at Beaver Dam Road and traverses 33,420' to the Ranch Road in the east. The ROW width is 100'.

  PPL, MetEd, and Verizon own and operate distribution lines either on or adjacent to State Forest Land along all the major State Routes and Township Roads within the Forest District.

- Parking lots

  There are 29 designated parking areas on the Delaware State Forest. Please refer to the Delaware Forest Public Use Map for the locations. These parking areas are maintained seasonally to give the recreating public access all over the Forest District. In addition, there are many more undesignated "pull offs" along State Forest Road that afford additional opportunities for access.

  Popular parking lots have a 911 address installed on a 4x4 post to assist the visitor and response in case of emergencies.

- Boat launches

  There are boat launches located at White Deer Lake, Little Mud Pond, Lake Minisink, and two at Pecks Pond. The public is encouraged to clean their boats before and after launching to prevent the spread of invasive, non-native aquatic plants.

- Dams

  There are seven dams located at Pecks Pond, Egypt Meadow, Stairway Lake, Lake Minisink, and Lily Pond in Pike County, and Snow Hill Pond, and Camp William Penn in Monroe County. Each dam is regularly inspected by DCNR Bureau of Facility, Design, and Construction engineers who prepare a dam inspection report. The dam inspection reports include a section for maintenance recommendations. These recommendations are delivered to Forestry staff to complete.

- Leased camps

  There are 732 State Leased Campsites located in Delaware Forest. These cabins are privately owned, and the owner leases a portion of State Forest land from the state under it. Some cabin owners also own docks along the lakes, ponds and streams adjacent to their cabin. Docks are inspected annually, and cabins are inspected every third year by Forestry staff. Inspections ensure that the docks and cabins comply with guidelines.

- Deer exclosures

  Currently there are 30 deer fences erected on Delaware Forest with the purpose of preventing deer from browsing on the natural tree regeneration. That represents 27.25 miles of fence line and encompasses 932 acres. These numbers will change over time as fences are removed once the seedlings grow out of the reach of the deer and new fences associated with new timber sales are administered. The fences are maintained by the staff each month by visual observation around the fence and any repairs needed are completed. A fence report is generated each month to document the findings/repairs.

- Restrooms/latrines/etc.

  There are two permanent latrines in the Forest District. One is located at Lily Pond near the picnic pavilion in Pike County and the other is located at the Ron Flad Memorial Picnic Area near Snow Hill, Monroe County.

  In addition, there are 5 portable latrines that are put into service seasonally to support the ATV and Snow Mobile Riding Seasons. They are located at Burnt Mills, Maple Run, Pecks Pond, and Kleinhans Parking Areas in Pike County and Dixon Miller Recreation Area in Monroe County.

- Vistas

  There are four vistas in Delaware Forest District. Two are in Monroe County. One is located at Big Pocono Fire Tower in Big Pocono State Park. Another is located at Pohopoco Fire Tower in the Dixon Miller Recreation Area. There are two vistas in Pike County. One is on top of High Knob near the fire tower and the other is off Blue Stone Boulevard in Westfall Township. Periodically these vistas need to have the trees and vegetation trimmed to afford the scenic view.

- Kiosks

  There are informational Kiosks at all of the parking areas. They are posted with information relative to the area in which the parking lot is located. They also have the Parking Lot Name and GPS location posted to help facilitate emergency response.
- Monuments

  There are two cemetery's that are maintained by Forest District Staff on Delaware Forest. One is located along the Saw Creek Club Road, off of Whittaker Farm Road in Pike County and the other one is located at Camp William Penn, along Snow Hill Road in Monroe County.
- IT Resources

  The Forest District uses a wide variety of computers, tablets, data recorders, GPS's, and smart phones to support the Resource Management, Fire, Operations, Search and Rescue, Maintenance, and Recreation Programs.
- Vehicles

  Delaware Forest possesses pickup trucks, dump trucks, fire engines, water tenders, graders, loaders, tractors, snow groomers, ATV's, UTV's, snowmobiles, and a bull dozer. These vehicles and equipment are needed to support the Resource Management, Fire, Operations, Search and Rescue, Maintenance, and Recreation Programs.

15) Special State Forest Designations

a) Conservation Landscapes

The Delaware State Forest District is part of one of Pennsylvania's seven Conservation Landscapes - The Pocono Forests and Waters. The Pocono Forests and Waters Conservation Landscape covers two distinct areas in Pike, Monroe, Lackawanna, Luzerne, Wayne, and Carbon counties. Its rich and diverse past, ranging from early Colonial settlements along the rivers and valleys to industrial development and outdoor leisure and vacation activities in the forested uplands. This landscape houses abundant natural resources, including the greatest concentration of wetlands in the state and large tracts of public and private forest lands, such as state and national forests and parks and private hunting clubs that were established in the past and still exist today.

At the heart of the Pocono Forests and Waters region is:

- **Conserved land.** 54,536 acres of State Parks and 133,678 acres of State Forests
- **Trails.** Miles of recreational trails weave their way through the landscape, providing hours or days rewards.
- **Water.** There are 4,700 miles of streams and about 74 square miles of lakes and ponds in this region.

The natural lands in this landscape provide a sense of community, clean water, storm water retention, clean air, and an array of outdoor recreation activities.

Goals of the Pocono Forests and Waters:

- Identify and conserve important landscape areas for acquisition and easements to increase the public and private land base under conservation
- Facilitate local government decision making to conserve land and revitalize communities
- Engage the business sector to leverage financial resources and political will to enhance and conserve natural and recreational resources
- Improve community awareness of and engagement in conservation and restoration of local natural resources
- Increase cooperation among various state and local governmental agencies and private entities with an interest in conserving natural resources and sustainable development

Within this landscape are two somewhat distinct areas of focus. The first focus area includes Luzerne, Lackawanna, and western portions of Carbon counties that have distinct ecological and cultural characteristics associated with the Northern Anthracite field, including the Susquehanna and Lackawanna "Valley" communities of Scranton and Wilkes-Barre, and Lehigh communities of Hazleton, White Haven and Jim Thorpe. The second area focuses on the culture and ecology of Pike, Monroe, and portions of Wayne and eastern Carbon counties that have been influenced by the Delaware River, its river communities and its long-standing tourism industry. Gifford Pinchot's home, Grey Towers, is found in this region. Pinchot was the first chief of the US Forest Service and one of the fathers of the conservation movement in the United States.

b) Wild and Natural Areas

The objective of a **natural area** is to protect areas of scenic, historic, geologic or ecological significance, which will remain in an undisturbed state, with development and maintenance being limited to that required for health and safety. Natural areas are set aside to provide locations for scientific observation of natural systems, to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty. Natural areas are maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. Any unique or unusual biologic, geologic or historic areas can be considered for designation as natural areas. In addition to the 'unique' or 'unusual,' representative examples of all major forest types occurring in this Commonwealth were also included in the proposed natural area system. The size of these areas is generally small but may be as large as several thousand acres.

The objective of **wild areas** is to set aside certain areas of land where development or disturbance of permanent nature will be prohibited, thereby preserving the wild character of the area. In Pennsylvania's state forest system, certain areas that retain an undeveloped, wild character are designated as Wild Areas to assure that this primitive character is perpetuated. A wild area is defined as an extensive area which the general public will be permitted to see, use and enjoy for such activities as hiking, hunting, fishing, and the pursuit of peace and solitude. Development of a permanent nature will not be permitted so as to retain the undeveloped character of the area. Because of the restrictions imposed on wild areas, careful consideration must be given to alternative uses before additional areas are so designated. The size of the area should be no less than 3,000 acres and seldom more than 15,000 acres. They should be located where there are few public roads or other human-made developments

such as campsites, rights-of-way, etc. Only areas where the department owns sufficient subsurface rights to preclude development will be considered.

Table 15-1. Total acreage of Wild and Natural Areas on state forest land within Delaware State Forest.

Delaware	Name	Acreage
Natural Areas	Bruce Lake Natural Area	3,160.5
	Buckhorn Natural Area	545.5
	Little Mud Pond Swamp Natural Area	180.0
	Pennel Run Natural Area	949.3
	Pine Lake Natural Area	59.7
	Stillwater Natural Area	1,837.8
	Natural Area Total	**6,732.9**
Wild Areas	Stairway Wild Area	2,705.7
	Wild Area Total	**2,705.7**
Total		**9,438.6**

Bruce Lake Natural Area

This natural area covers 3,160 acres including two lakes, Bruce Lake and Egypt Meadow Lake. Bruce Lake is a glacial formed lake and is completely spring fed. Virgin stands of pine and hemlock were cut in the late 1800's leaving the area vulnerable to fires that destroyed the rich humus soil layer. Egypt Meadow Lake was constructed by the Civilian Conservation Corps in 1935.

Stillwater Natural Area

This natural area provided a sanctuary for Union Army deserters and young men evading conscription during the Civil War. Shacks were built on the islands of the swamp or in the dense growth. This 1,931-acre tract contains a mix of conifers and hardwoods. About one mile of the Little Bushkill Stream offers "stillwaters" for canoeing.

Pennel Run Natural Area

Scrub oak, gray birch, aspen, and mixed oaks dominate the landscape of the Pennel Run Natural Area. This elevated area is comprised of 936-acres. A portion of the Utts Swamp is located within this natural area. Reptiles and amphibians are protected by special regulations within Pennel Run Natural Area.

Buckhorn Natural Area

A high mountain swamp surrounded by mixed oaks is located within the 535-acre Buckhorn Natural Area. Reptiles and amphibians are also protected by special regulations within the Buckhorn Natural Area.

Pine Lake Natural Area

Located in this 67-acre site is a ten-acre glacial bog that exhibits plant zones ranging from open water to tree cover. Various flora and fauna inhabit this truly fascinating tract.

Little Mud Pond Swamp Natural Area

This 182-acre natural area features a boreal swamp. Various emergent plants grow within the glacial bog including species normally found at more northern latitudes such as black spruce, tamarack and picture plant.

Stairway Wild Area

This 2,882 acre wild area is truly unique for its historic significance as a blue stone quarry during the 1840's, for its wetlands, remoteness and wild natural beauty. Featuring Stairway Lake and the nearby vista overlooking the Delaware River makes this wild area a remote, quiet get away for shared use recreationists. Stairway Wild Area buffers Buckhorn Natural Area to the northeast.

c) High Conservation Value Forests

Pennsylvania state forests are certified under the Forest Stewardship Council (FSC) standards. FSC certification prioritizes the protection of particularly valuable forest characteristics by requiring certified landowners to identify high conservation value forests (HCVFs) on their land and plan for sustainable management and monitoring of these areas. FSC recognizes six types of HCVFs:

- HCV 1: HCV forest areas that contain globally, regionally, or nationally significant concentrations of biodiversity values (protected areas, rare or threatened species, endemic species, and seasonal concentrations of species)
- HCV 2: Globally, regionally, or nationally significant large landscape-level forests
- HCV 3: Forest areas that are in or contain rare, threatened, or endangered ecosystems
- HCV 4: Forest areas that provide basic services of nature in critical situations (protection of watersheds and protection against erosion and destructive fire)
- HCV 5: Forest areas fundamental to meeting basic needs of local communities
- HCV 6: Forest areas critical to local communities' traditional cultural identity

In 2011, the bureau followed FSC's HCVF guidance to identify, designate, and manage for areas of high conservation value. The areas which have been identified as HCVFs are managed in a manner that will maintain and/or enhance the values for which they have been designated and conversion of forest land to a "non-forested use" is prohibited.

Sub-categories of HCVFs occurring on state forest land are as follows:

- **1.1:** areas legally protected or managed primarily for concentrations of biodiversity values that are significant at the ecoregion or larger scale
- **1.2:** areas with significant concentrations of rare, threatened or endangered species or rare ecological communities, endemic
- **2.1:** significant large landscape-scale forest where viable populations of most if not all naturally

occurring species exist in natural patterns of distribution and abundance

- **2.2:** areas significant to biodiversity conservation at the ecoregion scale because it contains landscape-scale biodiversity values that are not present on other forests due to landscape-scale habitat modifications on surrounding lands
- **3.1:** old growth stands
- **3.2:** roadless area >500 acres in size or that has unique roadless area characteristics
- **3.3:** rare, threatened, or endangered ecosystem
- **4.1:** areas providing a source of community drinking water
- **4.2:** areas protecting community drinking water supplies
- **4.3:** extensive floodplain or wetland forests that are critical to mediating flooding or in controlling stream flow regulation and water quality
- **6.2:** areas with cultural features created intentionally by humans

More information about HCVFs can be found in the LMU descriptions of this plan and in the SFRMP, p. 64.

Table 15-2. Acres of High Conservation Value Forest (HCVF) by category. To comply with Principle 9 of the FSC U.S. Forest Management Standards, the bureau evaluated and assessed areas for inclusion as HCVFs. While the BOF believes that all state forest lands are of highest conservation value, areas not designated as such are still of equal importance and are protected through law and best management practices. The areas which have been identified as HCVFs are mapped and managed in a manner that will maintain and/or enhance the values for which they have been designated. More information about HCVFs can be found in the SFRMP, p. 64.

HCVF Category	Acres
1.1, areas legally protected or managed primarily for concentrations of biodiversity values that are significant at the ecoregion or larger scale	545
1.2, areas with significant concentrations of rare, threatened or endangered species or rare ecological communities, endemic	2,844
2.1, significant large landscape-scale forest where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance?	4,219
2.2, areas significant to biodiversity conservation at the ecoregion scale because it contains landscape-scale biodiversity values that are not present on other forests due to landscape-scale habitat modifications on surrounding lands	4,219
3.2, roadless area >500 acres in size or that has unique roadless area characteristics	1,606
3.3, rare, threatened, or endangered ecosystem	58
4.1, areas providing a source of community drinking water	33
6.2, areas with cultural features created intentionally by humans	6

d) Core Forest Index

As described in the state-wide 2016 SFRMP, the purpose of Core Forest Focus Areas (i.e. LMUs within the top 20% of core forest index scores) is to assist in the inventory, management, maintenance, and monitoring of the most significant core forest tracts in the state forest system and to conserve the ecological values associated with interior forest conditions and unfragmented landscapes.

While the Bureau of Forestry manages for these values across the entire state forest system, Core Forest Focus Areas will serve as a means to ensure the appropriate balancing of these values in landscape-level forest management decisions. As such, special management guidelines will apply to these Core Forest Focus Areas. The following preliminary guidelines will guide the development of expanded management guidelines during the planning cycle.

Preliminary Guidelines

1. No permanent conversion of forest land will occur in these areas, including roads, pipelines, recreational parking lots, natural gas infrastructure pads, and other activities that permanently convert forest to non-forest.
2. The most restrictive, underlying Management Zones still apply in Core Forest Focus Areas. Wild and Natural Area guidelines apply in designated areas. Timber harvesting and other active management that does not involve permanent conversation is allowed per Management Zoning.
3. The temporary disturbances associated with timber harvesting and other forms of habitat management are allowed per state forest Management Zoning. Special consideration should be given in Core Forest Focus Areas to reducing the amount of haul roads, ensuring appropriate restoration, and maintaining closed canopy conditions in haul road corridors.
4. Where the Bureau of Forestry does not own mineral rights beneath Core Forest Focus Areas, it will work cooperatively with operators to avoid forest conversion.
5. When possible, the Bureau of Forestry will strategically purchase and/or exchange real estate interests to protect Core Forest Focus Areas where mineral rights are currently severed.
6. The Bureau of Forestry will consider, when available, acquiring key tracts that ensure connectivity of and expand and protect existing Core Forest Focus Areas.
7. The Bureau of Forestry will continually monitor the status of Core Forest Focus Areas. Deviation from these guidelines requires a State Forest Environmental Review and state forester approval.
8. The Bureau of Forestry will identify regionally important core forest Landscape Management Units. In these identified landscapes, long-term management goals and conditions will emphasize the promotion core forest conditions. When balancing uses and values in these landscapes, management decisions and plans will favor the promotion of these values.

The core forest analysis was based on the density of fragmenting features within a given area, which includes roads, pipelines, well pads, certain large rivers (large enough to show up on NLCD), etc. Based

on fragmentation of an LMU, each LMU was given an index score between 0-100, representing the density of fragmenting features with a higher score representing a less fragmented area. As expected, all of state forest land across the state scored very high relative to more developed areas of the state. Because the scores were very similar, a rank/percentile was assigned to each LMU based on their Core Forest Index relative to all other LMUs.

Table 15-3. Core forest index value for state forest land in this forest district by LMU. The core forest index is a rating value out of 100 that expresses the proportion of the area within the LMU that is increasingly far away from dense areas of fragmenting features. The yellow highlighted LMUs are Core Forest Focus Areas (i.e. LMUs within the top 20% of core forest index scores state-wide).

LMU Name	Statewide Percentile	Core Forest Index Value
Ivan Swamp	87%	97.39
Twelvemile Pond	86%	97.39
Buckhorn	85%	97.28
White Deer	83%	97.09
Bruce Lake	46%	94.76
Edgemere	39%	94.40
Mill Brook	36%	94.02
Pohopoco	30%	93.54
Highline	26%	92.97

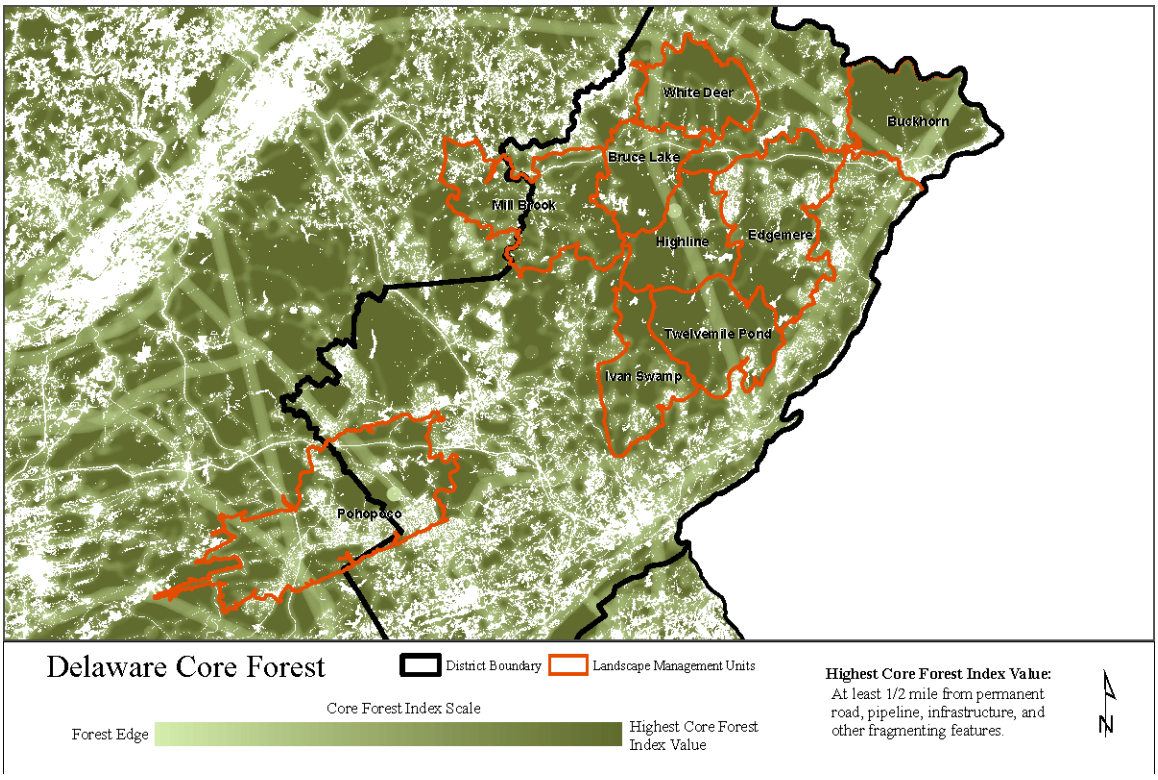


Figure 15-1. Map of core forest index in the region of Delaware Forest District.

In order to address Core Forest, Fragmentation, and Connectivity Objective 1.5 (pg. 38, SFRMP 2016), the top 20% of LMUs in terms of core forest index received the standard Core Forest Priority Goal as one of their LMU goals. Goals were kept intentionally broad so that they apply across SFL. Districts could further tailor the goal to address their specific plans for any Core Forest-related values in the LMU. For more discussion of Core Forest focus areas (LMUs) see the 2016 SFRMP, pgs. 34-38.

e) Supra Areas

Golden-winged Warbler Habitat Improvement Project

In cooperation with the Indiana University of Pennsylvania, a Golden-winged Warbler habitat improvement project is established in the area adjacent to Highline Road near Peck's Pond and hosts an array of overstory removals and other early successional habitat projects. A study was conducted on Delaware State Forest land in the 2014 and 2015 breeding seasons to collect data on Golden-winged Warbler fledgling's habitat, survival, and movement. This research is being done in response to declining populations and in hopes to better understand the habitat use and needs of the Golden-winged Warbler.

f) Other Designations

Wild Plant Sanctuary and Black Duck Propagation Area at Peck's Pond

The Delaware State Forest contains the Peck's Pond Waterfowl Propagation Area, a 310-acre area that seasonally protects waterfowl nesting habitat. The propagation area was established in 1994 on the eastern edge of Peck's Pond. The area is closed to the public from April 1st through September 30th to reduce disturbance of nesting waterfowl, such as black ducks and wood ducks. The area is open to recreational use including hunting through October 1st to March 31st. Peck's Pond has been identified in the North American Waterfowl Management Plan as a "Special Management Focus Area" due to its importance to black duck production. Within that same area, exists a Wild Plant Sanctuary. This area was created to protect a variety of plant species of concern that grow in an aquatic/bog habitat.

16) Ownership and Population Centers

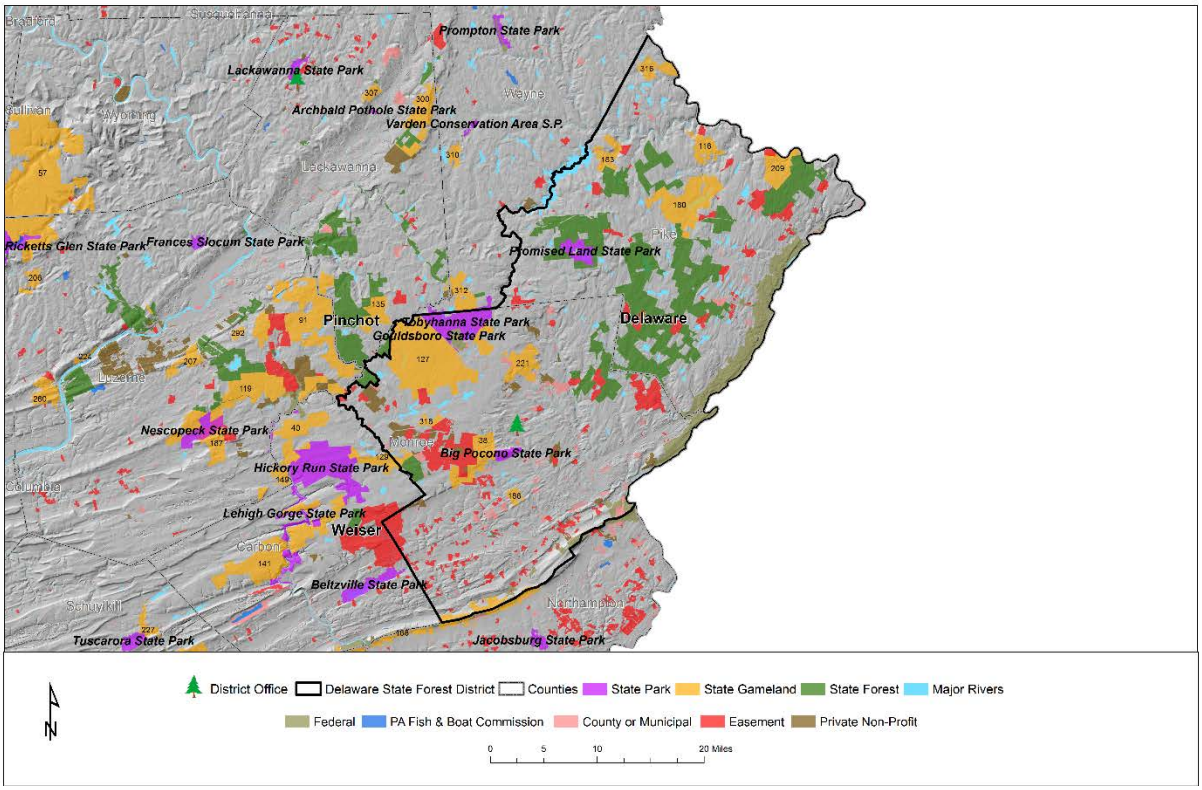


Figure 16-1. Public/conserved lands within entire district. Protection of high-quality watersheds and forest lands are a priority across the Pocono region. State Parks, State Game Lands, State Forest, federal lands and conservation easements held by land trusts, conservancies and water authorities evidence the long term commitment to the land protection ethic.

The northeastern portion of Pennsylvania is a dynamic region with a host of natural resource benefits and pressures. This region is located in between two high-density population areas, Scranton/Wilkes-Barre and Allentown-Bethlehem-Easton. In addition to that, the Delaware Forest District is within a two-hour drive or less of the greater Philadelphia, New York City, and northern New Jersey metropolitan areas. These large populations hubs provide a steady supply of forest visitors and users, all of which can have impacts on the large volume of protected natural resources in northeastern PA and the Delaware Forest District.

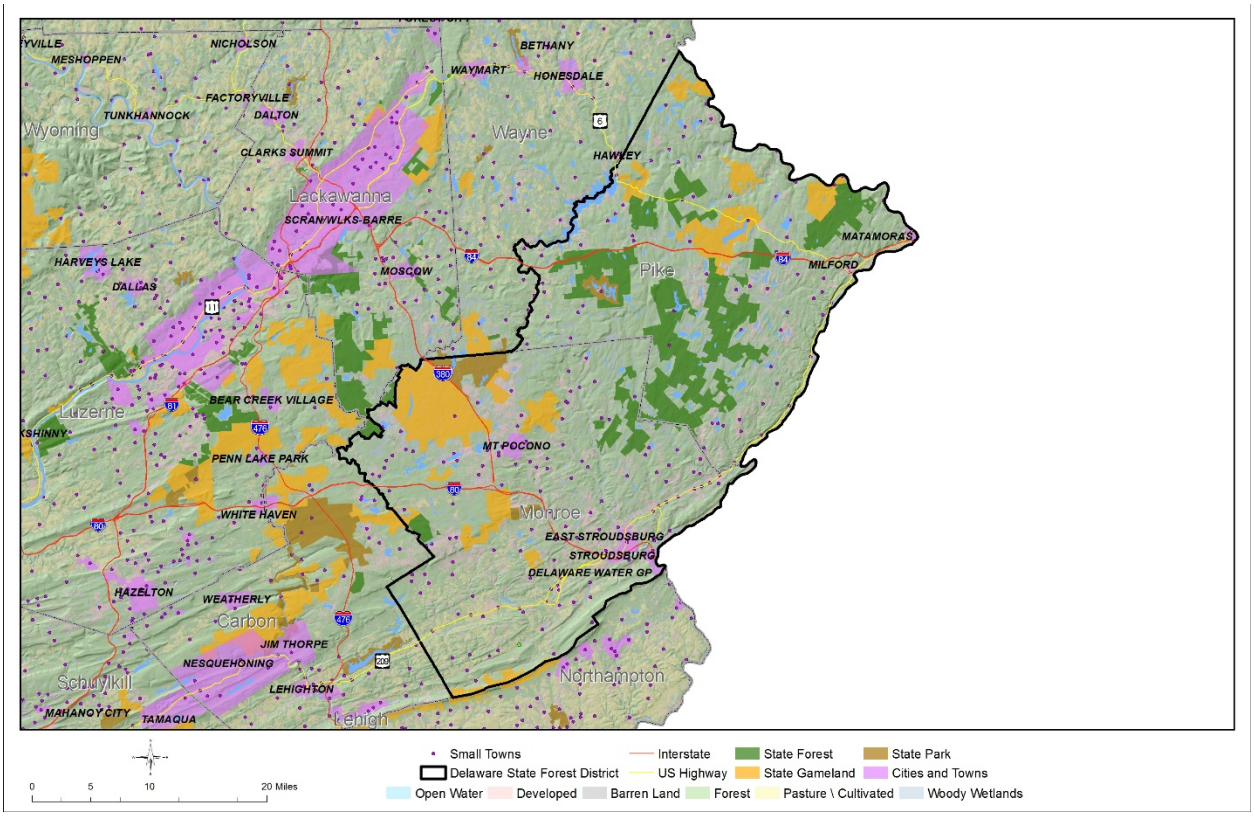


Figure 16-2. Map of public lands, population centers, and land use types (aggregated from National Land Cover Database).

Delaware Forest district lies within a two hour or less drive from the major population hubs of the Lehigh Valley, Wilkes-Barre/Scranton, Philadelphia, New York City and northern New Jersey. Within the district, the more densely populated areas include the Stroudsburg area Mount Pocono while much of the remainder of the district is rural or suburban. The combination of protected public lands of State Forest, State Parks, State Game Commission, National Park Service, and other local municipal and conservation easements makes this region a desirable destination for people looking to enjoy a variety of publicly accessible lands.

Table 16.1. Public and other conserved land acreages within Delaware District.

Delaware District	
Land Ownership Type	**Acres**
State Forest	84,216
State Parks	11,631
State Gamelands	65,251
Federal	27,694
Local/Municipal	12
Conservation Easements	42,087
Total Acres	230,892

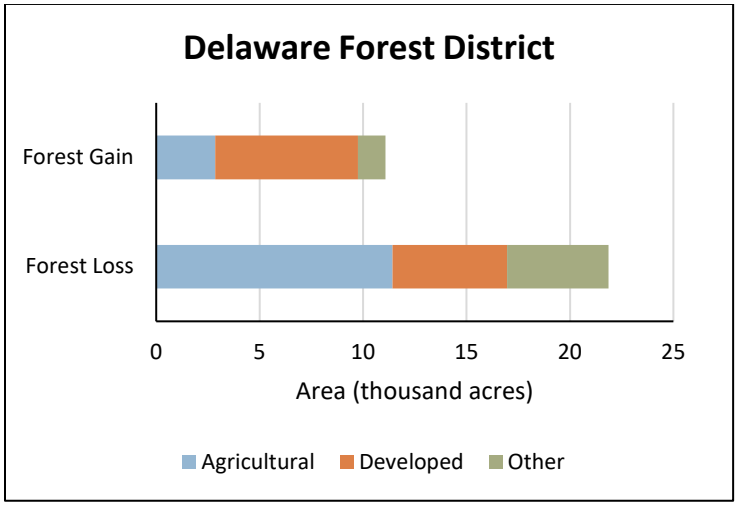


Figure 16-3. Gross forest loss and forest gain 2011-2016 (based on US Forest Service FIA plot data: https://www.fia.fs.fed.us/) by land-use categories within Delaware Forest District.

The US Forest Serice Forest Inventory and Analysis (FIA) program characterizes the areas of the State using several use categories which are generalized to the following broad classes: forest, agriculture (including pasture and cropland), developed land (including residential and commercial areas, and rights-of-way), water, and other non-forest land. Estimates for land use are produced from all measured plots in an inventory cycle (i.e. these estimates are based on plot expansions, not on a cell by cell analysis of landcover, as in the NLCD shown in various maps in this document). However, these data can be useful in understanding land-use changes dynamics, which allows land managers to make informed policy decisions. The categories in forest gain represent the type of land cover FROM WHICH the forestland came (e.g. agricultural could be an old farm field that gained enough tree cover in that period to now be classified as forest). Similarly, colors in forest loss represent the categories TO WHICH forestland was converted (e.g. agricultural could be a forest that was cut and converted to pasture). To read more about this nationwide forest inventory program, visit https://www.fia.fs.fed.us/

17) Economy and Forest Products

The Bureau's Policy states, "**State forest lands will be managed to provide a sustained yield of high quality timber and other wood products. The successful and timely regeneration of diverse forest communities will be promoted on state forest lands. The management of state forest lands will demonstrate and promote silvicultural practices that sustain ecological and economic forest values."**

Delaware State Forest continues to provide timber products in the form of sawtimber, pulpwood and fuelwood. These products are removed as part of state forest timber stumpage sales and permits. Large portions of the manageable forest acreage have received salvage operations of dead and dying trees due to massive gypsy moth outbreaks over the past decade. Logging operations have moved from

single chainsaw cutting to mechanized harvesting. This newer method involves multiple pieces of equipment that cuts, processes, and then forwards the product to a centralized landing. This method of harvesting is also much more efficient and can easily utilize lower grade products. Logs can then be hauled away for processing into lumber and dimensional squares for furniture making. Logs are cut into various lengths and grades of lumber at sawmills throughout northeastern PA and southern New York. Small diameter polewood is generally cut into twenty-foot lengths for pulp or firewood. Lower grade logs are cut into ten and twelve foot lengths and set aside for pallet wood.

Timber sales are awarded based upon the highest bid submitted. Single entity owners to large sawmill companies continue to win these bids. Prices for species are based upon board foot estimates which range from five cents to one dollar for sawtimber and a few dollars per hundred cubic feet for pulpwood. Red and white oak species make up the largest part of the volumes removed due to the relative amount available. Oak prices seem to dominate the largest portion of the bid submitted. Other hardwood species such as hickory, red maple, black cherry, and white ash augment these volumes and prices.

Prices for these logs and lumber over recent years have been dictated by overseas markets. Many of the nicer grade logs receive premium dollars from these clients. Recent trade wars between China and the U.S. have created an unstable market. One report stated that China has threatened a 25% tariff on imports of hardwoods from the U.S. This has led to a very unstable market in 2018. Timber sales in the Delaware State Forest continue to be sold despite fluctuating prices around the northeast. Many loggers and lumber mills adjust with these issues and continue to press on.

Foresters continue to work with loggers and contractors to harvest a sustained yield of timber while promoting regeneration and keeping a close eye on site conditions.

The Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, along with its partners, led an effort to gain information that reflects the current characteristics of the wood products industry in the state. In 2013, the Bureau of Forestry conducted a Timber Product Output (TPO) survey among Pennsylvania's primary wood processing facilities, collecting information from the 2012 production year and again in 2017, to gather information on the 2016 production year. The survey was reinstituted in order to gain insight into volumes, species, uses, products and origins of the wood harvested and processed in PA, as well as information about the facilities operating in PA (employment, age, functions, etc.). The survey process also provided an opportunity for BOF foresters to interact directly with the private facilities located in their districts and enhance vital professional relationships. The survey information can be used by land owners, wood-processing businesses, and other interested parties to plan and adapt to the needs and current condition of the market. In addition, the data collected from such surveys contributes to broader datasets that could be used in long-term trend analysis and assessments of regional dynamics.

More information on the wood products industry in PA, as well as reports from the Pennsylvania Timber Products Output Surveys can be found at:
https://www.dcnr.pa.gov/Business/ForestProducts/Pages/default.aspx

18) Recreation

Forest recreation is many things to many people. The variety in the forest itself is reflected by the variety of uses it provides. Trees, wildflowers, streams, fish, wildlife, insects, fungi, soil, rocks, beauty and serenity blended together in an infinite number of distinct forest communities provide recreational opportunities limited only by the imagination of the recreationist. The Delaware State Forest offers many approaches to access this great wealth of natural splendor in the form of hiking, camping, picnicking, biking, hunting, fishing, boating, motorized ATV and Snowmobile use, and other outdoor pastimes.

Camping

The Bureau of Forestry manages camping in three distinct categories. Primitive backpack camping, motorized camping and group camping. Primitive backpack campers are those who camp at undeveloped facilities. Campers who arrive at their site by boat may also be included in this classification. Permits are not required for primitive camping unless the camper plans to spend more than one night at a campsite or is camping with more than 10 people. The one exception to this would be camping at the River Campsites on the U.S. National Park Service, Upper Delaware Scenic & Recreational River. All camping at this location requires a camping permit, and can be obtained by calling the NPS. State Forest Rules and Regulations (17. Pa. Code, Chapter 21) list rules regarding campfires, sanitation, littering, closure, parking, and other regulations pertaining to camping. The August 18, 2011 document entitled " Camping Policy for State Forest Lands" further defines permissible camping areas and activities

Motorized camping requires a permit from the District Forester. As with primitive camping the rules can be found in the State Forest Rules and Regulations. Motorized camping will only be authorized at specific sites identified by the District Forester specifically for camping. These are termed designated sites. Guidelines for determining the location of campsites are listed in the 2011 paper entitled "Camping Policy for State Forest Lands".

The third type of camping, group camping, is defined by the Bureau of Forestry as more than 10 people at the same site. This requires a Letter of Authorization or in some cases a Special Activities Agreement issued through the District Forester.

Camping on the Delaware State Forest

1. Primitive Backpack Camping

   Most areas of the Delaware State Forest are open to primitive backpack camping.

2. Motorized Camping

   There are 28 sites designated for motorized camping. No other motorized camping locations will be authorized on the Delaware State Forest. Sites are broken down into four classifications based on camping type. Tent only (10), Large trailer/RV/tent (8), Small Trailer/RV/Tent (10), and Large group (3)

3. Group Camping

Group camping permits are issued on a case by case basis.

Leased Campsite Users

There are 729 State Forest Leased Campsites on the Delaware State Forest, 443 of which are located in colonies :

Lake Minisink 82 **Little Mud Pond** 36

Pine Flats 93 **Pecks Pond** 195

White Deer Lake 37

The balance of State Forest Leased Campsites are found along State Forest roads and township and State routes throughout the Forest District in Pike and Monroe Counties.

The campsite leasing program began in 1913. Demand for campsite leases during the early years of the program was slight due to limited leisure time, a lack of reliable transportation, and an inadequate road network. Most of the cabins were used by sportsmen's groups only during hunting and fishing seasons.

About the time of World War II, demand for campsites soared, spurred on by higher wages, increased leisure time, reliable transportation, better highways and a desire to get out of the city. By 1955, all the better sites were leased, but the demand continued even for less desirable sites with no facilities.

On May 6, 1969, Maurice K. Goddard, Secretary of the Department of Forest and Waters approved an addendum to the campsite zoning plan closing all the Delaware State Forest to further leasing of campsites. The addendum states in part: "When the Campsite Zoning Plan was written in 1959, the Delaware District had 941 active campsite leases. The plan provided for 70 additional sites before the District was closed to further leasing. Presently, the Delaware District has 729 active campsites. This is the highest concentration of campsites of any of the twenty forest districts in the state.

The development of private land for recreation and for second home sites has expanded greatly. This has considerably reduced the pressure for sites on state forest land, especially since the most desirable sites are already leased. There are four State Parks, 6 Natural Areas, one Wild Area and three State Forest Picnic areas within the Delaware District. Many of the leased campsites are near heavily-used recreation areas.

Leases being processed were completed and the last new campsite lease on the Forest was granted in July 1969.

On May 3, 1971, 227 campsite leases located within Promised Land State Park were transferred to the Bureau of State Park jurisdiction.

Picnicking

Picnicking is permitted anywhere on state forest land. In addition, the Bureau of Forestry maintains accessible picnic areas with pavilions, tables, parking areas, and restrooms. There are three such picnic

areas, The Ron Flad Memorial Picnic Area (formerly Snow Hill Picnic Area), Pecks Pond Picnic Area, and Lily Pond. State forest picnic areas should be regularly inspected and maintained. Special care must be exercised to prevent health or safety hazards. The District Forester is responsible to see that inspections and maintenance are completed.

An aesthetic buffer will be maintained around designated state forest picnic areas. This buffer will be managed in accordance with the guidelines established in the Silviculture section of this plan. Picnic areas and their associated facilities should be accessible to, and useable by individuals with a disability.

Hunting and Trapping

Hunting and trapping is permitted on state forest land, unless otherwise posted, in accordance with the current State Forest Rules and Regulations (17. Pa. Code, Chapter 21) and the laws, rules, and regulations of the Pennsylvania Game Commission. The fauna section of this plan details specific guidelines for maintaining and creating habitats for specific game species. The silviculture section likewise discusses habitat goals for wildlife.

Certain designated areas are managed in accordance with the 6/29/2012 document entitled " Guidance for Pennsylvania Department of Conservation and Natural Resources to Develop a Policy on Powered Mobility Devices on DCNR Property Pursuant to Federal Department of Justice Regulations, 28 CFR Part 35." An application must be completed and approval must be obtained from the District Forester prior to using these areas. A list of sites available is contained in the paper entitled, " Off-Road Areas on State Forest Land Designated by The Bureau of Forestry for Use of Powered Mobility Devices by Persons with Mobility Disabilities."(07/2012)

Hunting is a recreational activity, but in many cases, it also plays a key role in sustainable forest management. Forests can only be sustainably managed if balanced populations of wildlife are maintained. This is particularly true for herbivores, such as deer. If left to multiply unchecked, deer will eat the entire next generation of understory plants in any given area. If generations of new seedlings are lost, the forest soon loses its ability to renew itself following disturbances. Likewise trapping can help keep rodents and other wildlife in balance with their habitat; thus, hunters and trappers provide a valuable service to the public, while enjoying their sport.

Northeastern Pennsylvania continues to provide good hunting opportunities for a variety of wildlife. Timber Management activities on public and private lands is expanding habitat diversification, made evident by increased deer and grouse numbers. Many hunters from surrounding states congregate on the public lands of the Pocono Mountains for black bear season. A healthy and increasing population of bear exist in many of the swamps and woodlands in this region, enticing hunters to visit. Both the spring and fall turkey hunting seasons indicate an increase of hunters. Trappers have the option to pursue coyotes, bobcats and beaver to name a few. With all the steams, ponds and wetlands, beaver, muskrats and mink are often very plentiful.

An increase in hunting pressure on public lands in the Pocono Mountains can be expected in the future. Much of the private lands are being developed for housing and tourist resorts. Posting of the lands further stresses the demands on public lands. Management for habitat diversification and public access will be required to provide for hunting opportunities.

Fishing

Fishing is permitted on state forest land, unless otherwise posted, in accordance with the current State Forest Rules and (Regulations17. Pa. Code, Chapter 21) and the laws, rules, and regulations of the Pennsylvania Fish and Boat Commission. Bureau of Forestry streamside buffering policies and road construction and maintenance policies outlined in the Bureau "Timber Management Manual" all contribute to healthy stream environments.

State forest land has an abundance of streams, ponds and lakes that supply opportunities for fishing. State forests have some of the most pristine waters in the Commonwealth and they support abundant fish life.

The Delaware State Forest is awash with angling opportunities. Many clear mountain streams originate on the state forest and eventually tumble down to the Delaware River over stunning waterfalls. The streams provide excellent trout fishing while warm water fishing is good at many of the lakes and ponds. Many of these watercourses are stocked with the native species of trout and rise readily to a fly. Saw Creek, Bushkill Creek, and the Little Bushkill Creek are all stocked with brook trout. Poplar Run, Saventine Creek, East Spring Run and Red Rock Run to name a few all have native trout. The Delaware River fronts on one mile of State Forest land and is accessible by boat and hiking. Anglers on the Delaware River may catch species including: bass, walleye, American shad (springtime), catfish, carp, pan fish and muskellunge. There are thirteen lakes and ponds within the Delaware State Forest, seven of which are of glacial creation.

Hiking

Hiking trails have been developed in 19 State Forests. Hiking trails may be divided into at least five categories: National Scenic, National Recreation Trails, Keystone Hiking Trail system, local district trails and interpretive trails. There are many miles of existing trails in the Delaware State Forest. Many of these trails were constructed by the Civilian Conservation Corps (CCC) and are better described as fire access trails rather than recreation trails. Others were constructed to provide access for logging operations. Only those trails that are now being maintained for recreation are included in this inventory.

National Scenic and Recreation Trails

National Scenic and National Recreation Trails are designated by the National Park Service and often travel across state boundaries. The Appalachian Trail, a National Scenic Trail, runs along the Blue Mountain at the southern border of the Forest District, crossing and re-crossing to and from Forest District 17, before crossing into New Jersey at Delaware Water Gap, Monroe County. While sections of this trail may be in the Delaware Forest District, it does not cross any portion of Delaware State Forest land; thus, it is not under direct management by the District.

State Forest Hiking Trails

Another type of trail is the State Forest Hiking Trail. It is of regional importance and often travels through more than one State Forest. These trails are usually maintained by volunteer hiking groups with varying amounts of assistance from forest districts. Most of these trails were formerly part of the district trail network. Many sections are designated for hiking use only. There are 18 Keystone Hiking Trails. About 14% of all trails on state forest land or 713 miles are Keystone Hiking Trails. These trails each have their own maps and/or guidebooks. A list of the organizations maintaining these trail guides is listed on the back of a Bureau of Forestry map entitled Hiking Trails in Pennsylvania. It should be noted that this map

shows 16 additional trails of regional importance besides State Forest Hiking Trails. District public-use maps also show these trails.

Thunder Swamp Trail System - About 32 miles were developed by the Youth Conservation Corps in the 1970's. The trailhead starts along PA 402 one-half mile north of the Monroe and Pike Counties line. From this southern terminus, the trail meanders east and west then northerly to the Stillwater Natural Area.

Several small loops have been constructed to accommodate day-use hikers. Five (5) parking areas, appropriate signing and trail blazing assist the hiker. Trail maps are available.

Much of the natural ecology of the Pocono Mountains can be viewed. Rock outcrops, red and black spruce swamps, logging operations and a variety of wildlife make every turn interesting.

District Trails

District trails are marked and maintained per standards established by the districts. The marking of District trails is more fully described in the "Guidelines for Marking Recreational Trails " (07/2008). Local district trails are by far the largest category of hiking trail. 86% of state forest trails or 5,100 miles are local district trails. They are of great local importance for accessing state forest land. These trails are generally open to a wide variety of user groups, not just hikers. Therefore, they are sometimes referred to as shared-use or multi-use trails. Bureau of Forestry personnel maintain these trails with considerable volunteer help on some segments. Many district trails appear on public-use maps and separate maps have been developed for some shared-use trails. Overall, there are 72 miles of District Trails located in the Delaware State Forest.

One District Hiking Trail worthy of description on the Delaware State Forest is the Blooming Grove Trail System. As a youth project, the Blooming Grove Trail System was developed by the 4H Clubs of Pike County. The five mile system leads hikers through various oak stands, a grassy meadow, and swamps. Oak mortality due to the gypsy moth infestations and associated agents is prominent on the western boundary of the trail. This timber is being salvaged for forest products. Regeneration of oak, birch, maple and pine is replacing the dead trees. Access to the trail system is along PA 402 about 1 mile south of U.S. 6. A parking area is available at this location.

Interpretive Trails

Seven State Forest Districts maintain over 40 miles of interpretive trails designed to educate the public about the forest environment. Most sites have a trail-head parking lot and information signs maintained by Bureau of Forestry. Maps and/or guidebooks for each trail are available at district offices.

Interpretive trails are marked and maintained per standards established by the districts. They are intended to provide the public with natural resource, historical and forest management practice information. These have an interpretive trail brochure or interpretive signs on the trail.

The Tarkill Forest Demonstration Area was established in the Delaware State Forest in 1948. This "Outdoor Textbook Area" of 82-acres is located north of Peck's Pond along PA Route 402 in Pike County. Along marked trails, trees have been identified, examples of forest management practices can be viewed, and interesting facts about trees are provided. The area is a good example of multiple-use forestry as it supports a high population of wildlife, protects and maintains the Tarkill watershed, is a

source of recreation to hunter and hiker, contains a leased forest campsite, and supports a stand of quality timber. The interpretive trail is currently being re-established with updated signage and a corresponding trail map.

Cross-country Ski Trails

The Bureau of Forestry maintains 560 miles of cross-country ski trails in 15 districts. Trail maps are available from district offices. Potentially all 3,671 miles of state forest trails are open to this use. Each district has a public use map showing roads and trails. In the Delaware State Forest, there are 55 miles of trail suitable for Cross Country Skiing.

Bruce Lake Natural Area focuses on non-motorized, non-equine and non-bicycle travel. Bruce Lake is the district's cross country ski and snow shoe trail prospect. These trails are not groomed and offer skiers and snow shoe enthusiasts an opportunity to experience the forest's beauty on a marked trail system.

Horseback Trails

Horseback riding is a rapidly growing activity on state forest land. Twelve State Forests maintain over 616 miles of trails designated for Horseback riding with a total of 3,728 trail miles that are available for use. In addition, 1.9 million acres of state forest land is available for cross-country riding. Only Natural Areas, Keystone Hiking Trails and certain other areas posted closed are off limits to equestrians.

Some shared-use trails have been designed and developed by the forest districts for horse riding. These trails are maintained and promoted by the Bureau, equestrian clubs and other trail organizations. Horse riding is not restricted to designated equestrian trails. Most local State Forest trails are open to horse riding. Only Natural Areas, some portions of Keystone Hiking Trails and certain other areas posted closed are off limits

Several districts have developed equestrian trails specifically designed for horses. Although these trails were designed for horses, other trail users are welcome. These horse or equestrian trails have large trailhead parking areas and maps are available at district offices.

All though horses may be ridden on all state forest roads and trails within the Delaware State Forest except in natural areas or the Thunder Swamp Hiking Trail; motorized recreational trails offer an extensive trail system for equine users. The Promised Land tract of Delaware State Forest has more than 26 miles of trails for equine enthusiast to enjoy. This system links to Promised Land State Park by Hemlock trail.

Handicapped Trails

No trails have been specifically developed or improved for the handicapped. Some trails, or portions thereof, are suitable for use by persons with a handicap. DCNR permits persons with mobility disabilities to use powered mobility devices for purposes of accessing state forest land. In some instances, these areas are not otherwise open for motorized access by the general public. Visitors with mobility disabilities may request permission to use a powered mobility device on state forest property and where on the property they may be permitted to use the device. Permit application forms are available online and at the Forest District office.

Americans with Disabilities Act

The Bureau permits persons with mobility disabilities to use powered mobility devices for purposes of accessing state forest lands. In some instances, these areas are not otherwise open for motorized access by the general public. Permits can be obtained through District Offices by filling out a Mobility Device Permit Form. Once the form is completed the district can provide the Orange Placard for the vehicle that is to be utilized, or the blue Mobility Device Permit Sticker for the mobility device that is to be utilized. Each individual should make contact with the district where they wish to utilize their permit. It should be understood that the mobility device permit allows for only the individual to utilize the mobility device. However, someone may be with the permittee to assist in opening gates and collection of game. No other person should be hunting from the mobility device, unless it is a juvenile hunter(s), (up to three) that the permittee is mentoring. A list of areas where permits may be utilized and are not permitted can be found on the back of the Mobility Device Permit. Violations of the permit may result in the permit being terminated.

Mountain Biking

Mountain bikes and other non-motorized mechanized equipment are permitted on most local State Forest trails. These trails are maintained by the local forest district and forest conservation volunteers. Districts determine construction standards. Trails developed specifically for mountain biking will be marked with the white international mountain bike symbol on a brown diamond according to the 07/2008 "Guidelines for Marking Recreational Trails.

Most Delaware State Forest trails are open to mountain biking. Only Natural Areas, the Thunder Swamp Trail System and certain other areas posted closed are off limits.

Canoeing/Kayaking/Boating/Rafting

Pennsylvania is second only to Alaska in the number of miles of streams in one state. There is also an abundance of lakes and ponds. This means that there are many great opportunities for water activities in the Keystone State. These activities can be divided into at least three categories: Canoeing/kayaking, boating and rafting.

Canoeing on Pennsylvania's streams has a long history dating back to the Native Americans. European settlers used the streams for transportation and most of our first towns started on their banks. Today, many of Pennsylvania's stream banks have been cleared and developed. However, many miles of Pennsylvania's state forest streams are still relatively wild and remote. There are 5,132 miles of rivers and streams on state forest land. Potentially, many of these waters are navigable and open to canoeing and kayaking. Six Forest Districts have developed water trails on waters that transect state forest. The water trails are more fully described in the individual forest supplements. This link delivers real-time information on stream flow that can aid in determining whether a stream or river may be navigable for you type of vessel. http://waterdata.usgs.gov/pa/nwis/rt

Canoeing, kayaking, boating and rafting in Pennsylvania are permitted on state forest land, unless otherwise posted, in accordance with the current State Forest Rules and Regulations and the laws, rules, and regulations of the Pennsylvania Fish and Boat Commission. State Forest Rules and Regulations (17. Pa. Code, Chapter 21) subsections 21.11. Use, 21.12. Mooring and launching, and 21.13 Motorized boats

specifically regulate this activity on state forest land. In brief these regulations permit boating on all state forest waters unless posted closed. A DCNR Boat Launching permit is required for launching. Launching is also permissible with a Fish and Boat Commission registration. Motorized boats may only be powered by electric motors. Also, if camping overnight along a stream from a boat, please see the guidelines in the camping section above.

Boating typically occurs on the lakes and ponds, although some of the larger rivers on state forest land are good for boating too. The Bureau of Forestry has several lakes and ponds larger than 5 acres that can be used for boating along with many smaller ponds. The Bureau of Forestry has district public-use maps that show state forest lakes, access roads and parking areas. See boating guidelines for the permits required.

Birding/ Nature Observation

Bird watching and nature observation are uses that occur throughout the 2.1 million acres of state forest land. The best locations for these activities depend on the habitat requirements of the species involved. The Audubon Society has designated certain areas of state forest land with unique or unusual bird species as Important Bird Areas. These parts of the state forest have particularly large and unique habitats for some unusual bird species. Most state forest lands have diverse habitats and support great numbers of birds. More information on important bird areas can be found at www.audubon.org/bird/iba

State forest land with its many roads and trails and generally quiet environment is ideal for nature observation. A public use map of the roads and trails is available from each district to aid nature observers. Natural Areas and Wild Areas are managed with this objective in mind, but the entire state forest system is maintained in a largely natural system. Nature photographers and artists also find an abundance of natural settings on state forest land.

Snowmobiling

More than 1,358 miles of snowmobile roads and trails are maintained in 14 districts across the state. Snowmobile riding on state forest land is restricted to this system. Many miles of these roads and trails are groomed when snow conditions permit.

The Delaware State Forest maintains nearly one hundred and fifteen miles of snowmobile trails which are open to the public. This system provides trails for both long and short rides. Trail grooming is conducted on about seventy miles of this trail network. Groomed trail systems include the snowmobile trail system at the Promised Land Tract – which connects to Promised Land State Park. The Edgemere Snowmobile Trail System, predominately in Porter Township, Pike County, is also groomed. Dixon Miller Recreation Area and Snow Hill Snowmobile Trail system offer Snow Machine enthusiasts additional opportunities to recreate on their snowmobiles. Snowmobiles must be registered, covered by liability insurance, and riders must wear helmets. Trail maps and information may be obtained by contacting the district office in Swiftwater or from the DCNR web site.

All-Terrain Vehicle and Trail Bike Riding

ATV use is regulated on state forest land by State Forest Rules and Regulations subsections 21.23a All-terrain vehicles, 21.24 Spark Arresters, and 21.25 Parking. ATV use is further regulated by the Snowmobile and ATV Law (Chapter 77 of the Vehicle Code, Title 75).

Riding on state forest land is restricted to designated areas only. These trails are divided into summer and winter use trails to reduce the impact of vehicle use on soils, trails, and streams. Summer Trails are open from Memorial Day weekend to September 24. Four trail systems are also open in the winter from the day after antlerless deer season until April 1.

ATV trail marking has been standardized as a black ATV on a green diamond background. Trail construction standards are set locally the District Forester.

All-terrain vehicle ownership is at an all-time high in the Commonwealth and growing at an enormous rate. Over 101,985 ATV's are registered with the Pennsylvania Department of Conservation and Natural Resources. In one year, the number of ATV's has more than doubled making the growth in the last several years almost exponential. Beginning in the 1970's, the Bureau of Forestry opened limited trails to ATV use in Districts 12 & 15. Today, the ATV trail system has grown to over 214 miles of trails in 10 different State Forests. Subsequently the damage realized from ATV use has continued to increase, most of which is from illegal use. It is the policy of DCNR to not significantly increase the current ATV trail system on existing state forest land. DCNR is also targeting development of ATV activities to private, municipal, and county lands where the focus can be solely on motorized recreation. The development of trails on private, municipal, and county lands assisted by a DCNR grant program.
The Bureau of Forestry maintains maps of the current trail system and are available from the district office along with specific rules regarding the use of that trail. Additional information on ATV trails can be found at the Bureau of Forestry ATV website.

The Delaware State Forest maintains three ATV trails totaling more than twenty-eight miles. Class 1 and Class 2 ATV trails, summer and winter riding opportunities exist. Maple Run has been designated class 1 and 2 ATVs for summer use and is 8 miles. Two ATV trails are open for summer and winter riding. Located in Monroe County, Dixon R. Miller Recreation Area offers ATV enthusiasts thirteen miles of Class 1 and Class 2 winter and summer riding opportunities. Burnt Mills ATV trail located south of Interstate 84 on S.R. 402 in Pike County feature's a 7 mile, Class 1 and Class 2 winter and summer trail.

State Parks, State Forest Picnic Areas, and National Recreation Area

Four State Parks and two National Recreation Areas are within the District. The Pocono Environmental Education Center, a non-profit organization partnered with the National Park Service, is in the Delaware Water Gap National Recreation Area. Located north of Millrift is the Upper Delaware National Scenic & Recreation River, administered by the National Park Service In addition, there are three picnic areas on State Forest land.

State Parks

Promised Land State Park, located along PA 390 about two and one-half miles south of the intersection with Interstate 84, was named by a religious group known as the "Shakers", who originally settled in this region. Within the park are two lakes: the 422(look at GIS data) acre Promised Land Lake and the smaller 173(look at GIS data) acre Lower Lake. Ideally, cool summers help provide a healthful outdoor recreation experience to hundreds of thousands of park visitors annually.

Promised Land Lake provides swimming, fishing and boating. Several sand beaches and bathhouses are located within walking distance of the picnic area. One boat rental concession, four public boat

mooring, and launching facilities are also available. The 173-acre Lower Lake provides fishing, boating, a public boat mooring area, and boat launching ramp. Adjacent to the lake is a tent and trailer camping area. This complex has washhouses and a sewage treatment plant. Operational tent and trailer camping areas within the park contain 486 sites.

Fishing is very popular at both lakes. Largemouth and smallmouth bass, walleye, muskellunge, crappies, bullheads, yellow perch, pickerel, suckers, sunfish and bluegills provide a variety of sport.

Twelve rustic family cabins in the Bear Wallow Cabin Colony are rented to residents of Pennsylvania during the summer season. In the spring and fall, both residents and non- residents may rent the cabins weekly or weekends. The park administers 225 campsite leases.

A new museum has been added to the park. Included are histories of the Civilian Conservation Corps and Promised Land State Park. The museum is located at Deerfield Campground near Pickerel Point.

Increasing numbers of campers, snowshoers, cross-country skiers, fishermen, boaters, hikers, and snowmobilers have been using the park. Interpretive program attendance and park use by transients are also increasing. Participation in swimming, picnicking, ice skating, ice fishing, and hunting have remained constant. For more information, please contact Promised Land State Park at 570-676-3428.

Tobyhanna State Park, located northeast of Tobyhanna, Pennsylvania along PA 423, was formerly a U.S. Army Field Artillery Training Center. The amount of day use activity in the park has increased to 185,000 visitor days in recent years.

There are 140 tent and trailer sites available. Pit latrines and well water is only available. Four paved sites are available for people with disabilities. A swimming beach and boat launching area are located on the 170-acre lake. The lake is stocked and fishing is permitted. A boat rental service is available. A handicapped accessible fishing pier is located on the lake. Five miles of maintained trails provide for hiking, bicycling, and cross-country skiing. For more information, please contact Tobyhanna State Park at 570-894-8336.

Gouldsboro State Park is located west of Tobyhanna State Park, south of PA 507. A 250-acre lake site and 54 acres of land immediately adjacent to the lake were purchased by the Pennsylvania Fish Commission. An 850-foot swimming beach, a boat rental concession, and a food concession are available. Boating is permitted excepting gasoline motors. Practically every species of warm water fish found in Pennsylvania is found in Gouldsboro Lake. These include: muskellunge, walleye, pickerel, largemouth bass, catfish, crappies, sunfish, bluegills, yellow perch, suckers, and fall fish. Hiking and cross-country skiing are available on ten miles of trail. A longer trail connects Gouldsboro State Park with Tobyhanna State Park. Attendance was 134,000 visitor days in 2000. For more information, please contact Gouldsboro State Park at 570-894-8336.

Big Pocono State Park located in Monroe County, is six miles west of Tannersville, off U.S. 611. Within this 1,300-acre park are ten miles of foot and horseback riding trails, scenic views, and picnic areas. Big Pocono Fire Tower is located on top of the mountain at an elevation of 2,131 feet above sea level. The Catskill Mountains of New York, eighty-four miles northeast of the park, and High Point Monument in New Jersey, can be seen from the tower. The park office, and a large parking

area are near the fire tower. Camelback Ski Area, located on the north slope of Big Pocono State Park, is leased and operated by a private developer. About 185,000 people visited the park during 2000. The park is designated for day use only from 8:00 a.m. to sunset. The park is closed in the winter season. For more information, please contact Big Pocono State Park at 570-894-8336.

Picnic Areas

The Ron Flad (Snow Hill), Pecks Pond, and Lily Pond State Forest Picnic Areas are quite popular. The Ron Flad Picnic Area is located one-half mile south of the Snow Hill Ranger Station just off Laurel Run Road. A small lake provides limited fishing. A new pavilion was constructed in 2000. A handicap-accessible restroom is available at Snow Hill. Pecks Pond Picnic Area is located along the south shore of Pecks Pond. Fishing and boating are permitted on Pecks Pond. A portable latrine has been placed at this picnic area for public use. Lily Pond Picnic Area is located just off Schocopee Rd., by the Lily Pond Dam. A handicap-accessible restroom and a pavilion are on site, and a 12 acre lake provides an opportunity for fishing.

Delaware Water Gap National Recreation Area

The creation of the Delaware Water Gap National Recreation Area, created and administered by the National Park Service, attracts approximately 5 million visitors annually. The recreation area, which straddles both sides of the Delaware River and runs from the Delaware Water Gap to Milford, encompasses 70,000 acres.

Eleven picnic areas have been developed. Three swimming beaches with lifeguards are available. Boat launching to the Delaware River is permitted at eight access areas. A 30-mile bicycling and hiking trail is under construction between Milford Beach and south of the Smithfield Access area.

Childs Park provides a scenic day-use attraction north of Dingmans Ferry. Once belonging to the Delaware State Forest, it is now managed by the National Park Service. Waterfalls can be viewed at Childs Park or at Dingmans Falls in Dingmans Ferry. Long range recreation planning will improve and expand recreational opportunities. For more information about the Delaware Water Gap National Recreation Area, please contact the National Park Service at (570) 426-2452

Upper Delaware Scenic & Recreational River

The Upper Delaware Scenic and Recreational River is located near Lackawaxen, Pennsylvania, on the Delaware River. It includes parts of five counties along this section of the river: Delaware, Orange, and Sullivan in New York, and Pike and Wayne in Pennsylvania. The site includes and protects Roebling's Delaware Aqueduct and the Zane Grey Museum.

The Upper Delaware Scenic and Recreational River stretches along approximately 73.4 miles of the Delaware River from Hancock, New York, to Millrift, Pennsylvania. Most of the land in this unit of the National Park System is privately owned, the federal government owns only approximately 30 acres. Within the park are the remains of the Delaware and Hudson Canal. This canal operated from 1828 to 1898 carrying anthracite coal and other regional products to the Hudson River where the products were shipped to various markets including New York City. The Delaware and Hudson Canal Company is considered one of the first private million dollar companies in the United States. Some of the remains of the canal are a National Historic Landmark.

More than 14,000 acres within the watershed of the Upper Delaware Scenic and Recreational River are protected by conservation easements enacted by willing private property owners and held by the Delaware Highlands Conservancy land trust.

This scenic river has a variety of recreational activities with accesses at Skinners Falls, Narrowsburg, Mongaup, and Sparrowbush, with opportunities for solitude while hiking or canoeing various other stretches of the river. Sections of the river from Lordville to Callicoon, and Narrowsburg to Lackawaxen provide some of the most isolated and tranquil experiences along the Upper Delaware. There are 18 public access points stretching the Upper Delaware Scenic & Recreational River. These developed boat and canoe launches are on both sides of the river, and are available to the public approximately every 5 river miles. Privately owned and operated access points also exist along the river. These facilities are easily accessible by rural roads and include river information and amenities during the periods of heaviest visitor use. Four of the public access sites are staffed by NPS personnel during peak periods, making it easy for visitors to obtain information about recreation opportunities.

For more information about the Upper Delaware Scenic & Recreational River, please contact the National Park Service at (570) 685-4871.

Miscellaneous Recreational Activities

Many miscellaneous activities occur on state forest land. These include astronomy, dog sledding, geocaching, gold panning, jogging, ice-skating, orienteering, photography, rock climbing, rappelling, sleigh riding, sledding, snowboarding, snowshoeing, spelunking, swimming, snorkeling and tubing. These activities are permitted unless they conflict with State Forest Rules and Regulations (17. Pa. Code, Chapter 21).

Recreational Opportunity Spectrum

Figure 18-1. Graphical depiction of ROS zones and their characteristics.

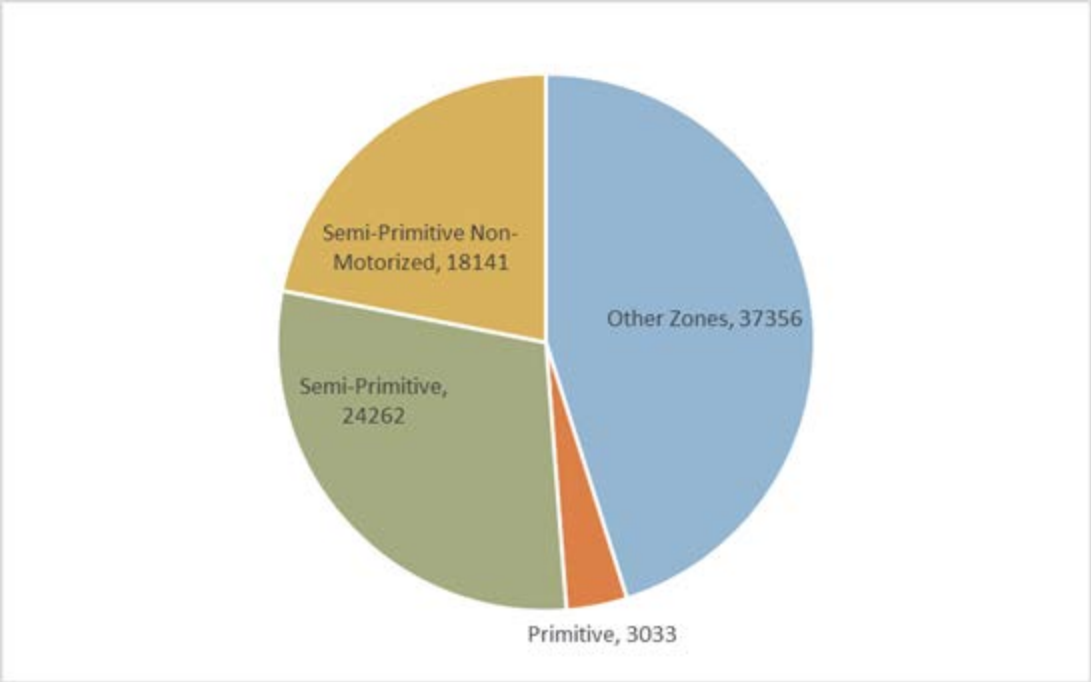


Figure 18-2. Acres of state forest land in this district by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

The Delaware State Forest varies greatly along the Recreational Opportunity Spectrum (ROS). The greatest amount of forest lands falls under the "Other Zones" category at 43%. These are semi-developed and developed areas within the forest. This components size of 37,356 acres is due to the large concentration of State Forest Lease Camps in the district and a highly-developed network of hard-top roads.

The second largest portion of State Forest is the "Semi-Primitive" classification at 28%. These areas are ¼ mile or more from a road. Remote State Lease Camps, Haul Roads, and Snowmobile/ATV trails result in 24,262 acres being classified in this category.

The next division, at 21% of the State Forest, is the "Semi-Primitive Non-Motorized" classification. These areas account for 18,141 acres with access limited to mostly hiking and other non-motorized trails. Areas more than ½ mile from a road are considered for this category.

The final, and smallest portion is the "Primitive" classification at 4% of the entire State Forest. Only 3,033 acres are considered to be "primitive" by the ROS standard, and are some of the remotest parts of the forest. Some portions of the district's Natural and Wild Areas could be considered on the criteria set forth by the ROS.

Visitor Use

Based on the information in the "Visitor Use Monitoring of Pennsylvania's State Forests: Year 2 Report-Delaware and Forbes State Forests" dated 8/13/2014, the Delaware State Forest sees about 89,000 recreational visits a year. Of those visitors, 87% are repeat visitors. Single day use makes up 65% of visitors and overnight users typically staying on average 2.6 nights. Only 17.5% of users made use of day use facilities such as picnic areas, parking lots, and trails. Family groups make up the largest percentage of visitors at 51%, with 21% of visitors coming alone.

In terms of Demographics that visit the State Forest, 95.6% are Caucasian and 72% male. The average age of visitors is 50 years old with people ages 36 to 50 represented 32.2% and 51 to 64 being 40.3% of the group sampled. Individuals ages 18 to 35 supplied 15.6% and 11.9% were 65 or older. Of those surveyed, only 7% reported having anyone in their household with disabilities.

The recreational activity that is the main reason for visiting the State Forest is fishing, with 19.7% of individuals surveyed choosing this as their primary activity. This is followed by hiking or walking at 17.8%. Hunting came in third, with 13.3%. Of those who took part in the survey, 55.4% said they participate in viewing natural features, such as scenery, wildlife, birds, flowers, fish etc., 53.5% will go hiking or take a walk, and 42.4% will use their time in the State Forest for relaxation. The individuals who were surveyed were only permitted to choose one primary activity, but could choose one or more activities that they will participate in while visiting. When asked as to their motivations for visiting, participants in the survey listed "To be outdoors" and to "experience natural surroundings". The visitors were also asked about what facilities/services in the state forest are most important to them. "Wildlife viewing areas or opportunities" received a mean score of 4.2 in terms of importance, with "Signs directing me to recreational facilities" in second with a score of 3.9. "ATV trails", and "Snowmobile Trails" ranked last with mean scores of 2.5 and 2.4 respectively.

Satisfaction was based on thirteen attributes and scored with a grade from 1 to 5, with 1 being "poor" and 5 being "very good". The State Forest was generally rated highly on each of the thirteen satisfaction attributes, with over 50% of the scores in the "very good" or "good" categories. The highest mean score was 4.6 in the categories of "Condition of the Natural Environment" and "Attractiveness of the Forest Landscape". The lowest mean score was 3.9 for "Condition of Forest Roads" and "Availability of information on recreation". The items that received the most not applicable (N/A) responses included helpfulness of employees and cleanliness of restrooms (over 50% N/A). Generally, these responses reflect the fact that the visitors did not encounter staff during their visits, and that restrooms are usually only present in developed areas in State Forests. Recreational users were also asked to rank how important each of these attributes were to them. "Attractiveness of the Forest Landscape" and Condition of the Natural Environment" ranked the highest, and "Parking lot condition" and "Availability of Parking" ranked the lowest. Overall satisfaction amongst those surveyed, 72.3% were "very satisfied", 22.5% were "somewhat satisfied", and only 1.1% "very dissatisfied". Crowding of State Forest was also analyzed. Visitors were asked to rank crowding on a scale from 1 to 10 with one being "hardly anyone" and 10 equating to overcrowded. The average score was 3.4, with 23.9% responding with "hardly anyone", and 1.1% replying with "overcrowded".

Based on ZIP code data collected from the surveys, the average distance traveled from home to the Delaware State Forest by recreational users was 50.4 miles. 23.8% of respondents' home ZIP codes were within 25 miles of the Delaware State Forest Headquarters; 93.1% were within 100 miles. Out of the six

states visitors were from, 87.4% were from Pennsylvania and from 32 different counties. The top counties were Pike (27.6%), Monroe (12.7%), Lehigh (7.9%), Northampton (7.0%), and Lackawanna (6.1%). The next two states with the highest number of users was New York with 6.1% and New Jersey with 5.4%.

19) Communication, Education, and Interpretation

The bureau disseminates and receives information to and from various destinations via various channels. Recipients of bureau content include researchers, government agencies, the public, and various stakeholders. The bureau contributes articles for publications; it reports to government agencies and shares data with interested parties; and it develops educational content for broad use by the public. The bureau is also a source of unbiased, credible information on Pennsylvania forests and native wild plants, and it shares its data regularly.

Communication - Effective communication is vital to conservation agencies, where efforts are tied to resource stewardship on the parts of individuals and communities. The bureau employs effective communication and public outreach to foster stewardship and convey a message of environmental sustainability. Central to the bureau's communication strategy is to inform visitors and stakeholders about the timing and siting of management activities, the availability of various recreation opportunities, and the importance of forest resources. Bureau staff remain available to engage in thoughtful dialogue with stakeholders, to answer questions, field concerns, and provide information.

Delaware Forest district staff use a host of media and printed materials to communicate with stakeholders and forest users. Printed materials may be sent via direct-mail for specific issues or updates; often related to the forest leased campsite program. Also, a host of printed materials are available at forest district office locations and posted, or available, at trailhead kiosks. District staff are engaged online via an active Facebook page (Delaware State Forest) and the DCNR-hosted website and forest district webpage.

Education - Public education and outreach is an essential component of the bureau's mission. DCNR's enabling legislation mandates it to "promote forestry and the knowledge of forestry" throughout the commonwealth. The bureau's mission further states that it will accomplish this by "advising and assisting other government agencies, communities, landowners, forest industry, and the public in the wise stewardship and utilization of forest resources." This is especially important with youth. The bureau serves as the state sponsor for Project Learning Tree, an international forest education program. Most forest districts participate in numerous educational opportunities with stakeholders from Envirothon, to fire prevention and Smokey programs, to forest resource programming with schools.

Interpretation – Interpretation is as a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource. The bureau of forestry provides interpretive wayside panels located at various locations including trailhead parking areas, along trails, at district offices, and other areas of the high use by the public.

District Interpretive Goals

1. Encourage exploration and participation in low impact recreation within the Delaware State Forest.
2. Promote awareness and encourage sustainable use of resources by communicating, promoting and modeling good stewardship and best management practices.
3. Support effective partnerships with local communities that benefit the community, the resource and the visitor.
4. Develop engaging experiences that promote intellectual and emotional connections between the resource and visitors.
5. Communicate the ongoing challenges of balancing natural resource use with society's needs, wants and desires.
6. To foster an appreciation and understanding of the history of Pennsylvania's forests and their role in our lives.

Main Interpretive Initiatives

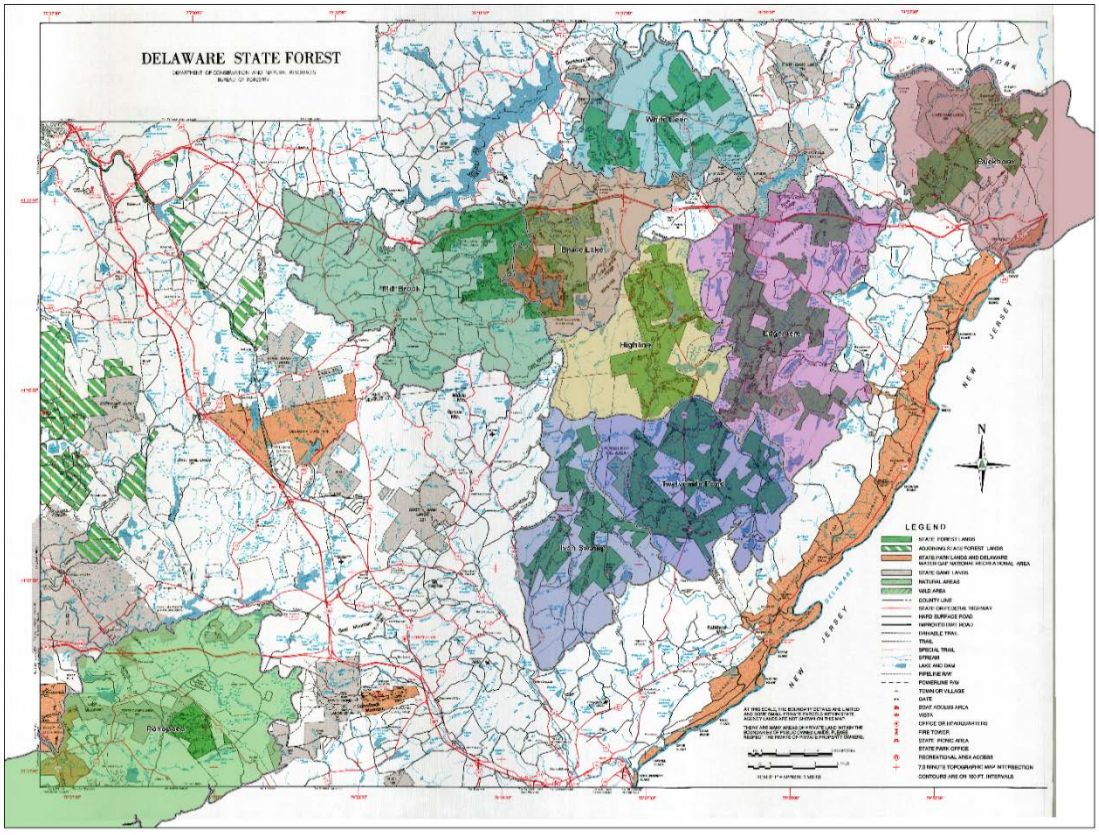
1. Interpret and communicate to the visitor our resource management efforts while maintaining the wild character of the state forest.
2. Interpret the dam repair and ecology at Peck's Pond.
3. Provide and maintain historic, cultural and natural history waysides.
4. Increase the variety or recreational program offerings.
5. Increase the visibility of the state forest by attending one community event where the state forest is promoted.
6. Work cooperatively with school and conservation districts to serve as outdoor educators.
7. Develop at least one additional volunteer opportunity.
8. Seek public volunteer help for district clean-up days.
9. Block roads that are too risky to pass due to winter conditions.
10. Promote a clean land ethic with "pack in, pack out" signage at all tracts.
11. Continue to provide a public contact at local festivals and public events.
12. Create recreational special use maps and specific area maps.

Landscape Management Unit Plans

With the 2016 revision of the state-wide SFRMP, the bureau introduced the LMU concept to facilitate consistent, structured, and integrated resource management and planning across large landscape units on state forest and adjoining lands. LMUs were delineated for all state forest land in 2016-2017. The LMU, which complements other ecological delineations, now serves as the primary unit for landscape-level planning and management on state forest lands. LMUs help the bureau facilitate planning on a landscape scale that has ecological context, incorporate multiple forest uses and values, and promote ecological analysis. The units also serve as a tool to facilitate cooperative management with adjoining forest districts, landowners, and agencies. An explanation of how LMUs were delineated is found in the 2016 SFRMP on page 62.

The bureau has developed LMU Plans for every LMU containing state forest land. The LMU Plans for LMUs within The Delaware State Forest are found below. Each LMU Plan contains three elements:

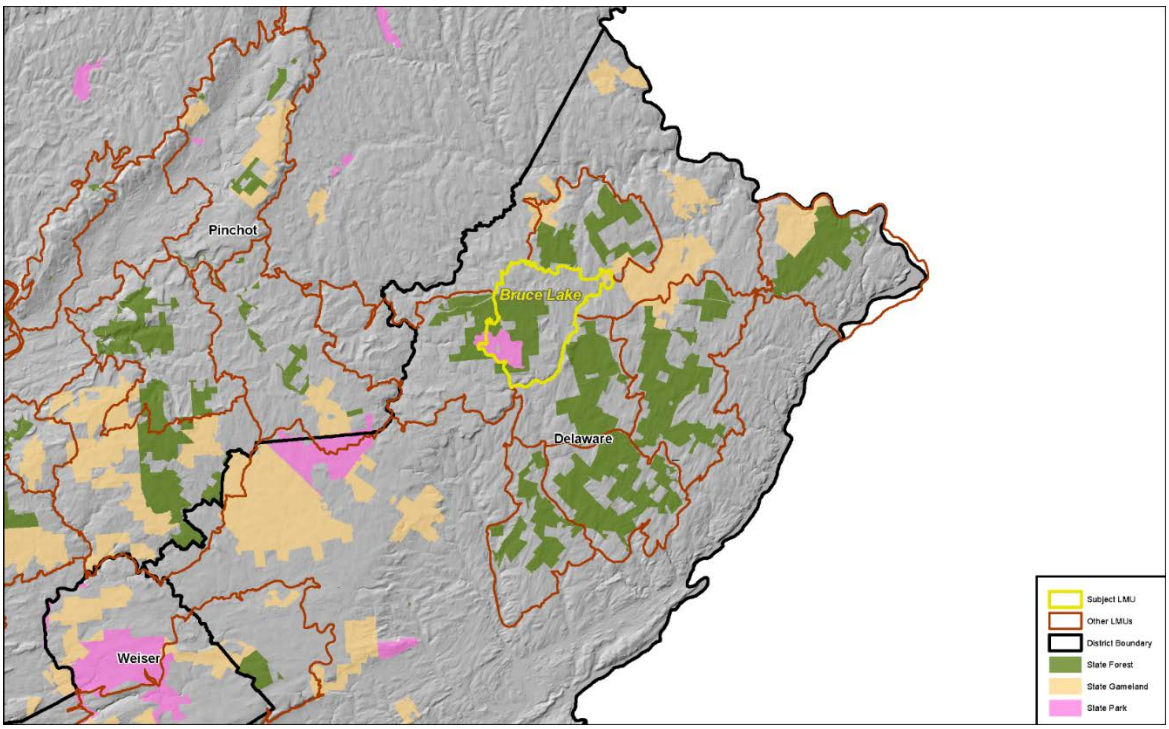
- Overview – a 1-2 page narrative describing the LMU and its important features;
- LMU Priority Goals – a list of points of emphasis for state forest land management within the LMU, similar to the District Priority Goals, but at the LMU level; and
- Profile – tables, charts, and accompanying text that more fully describe the LMU's characteristics.



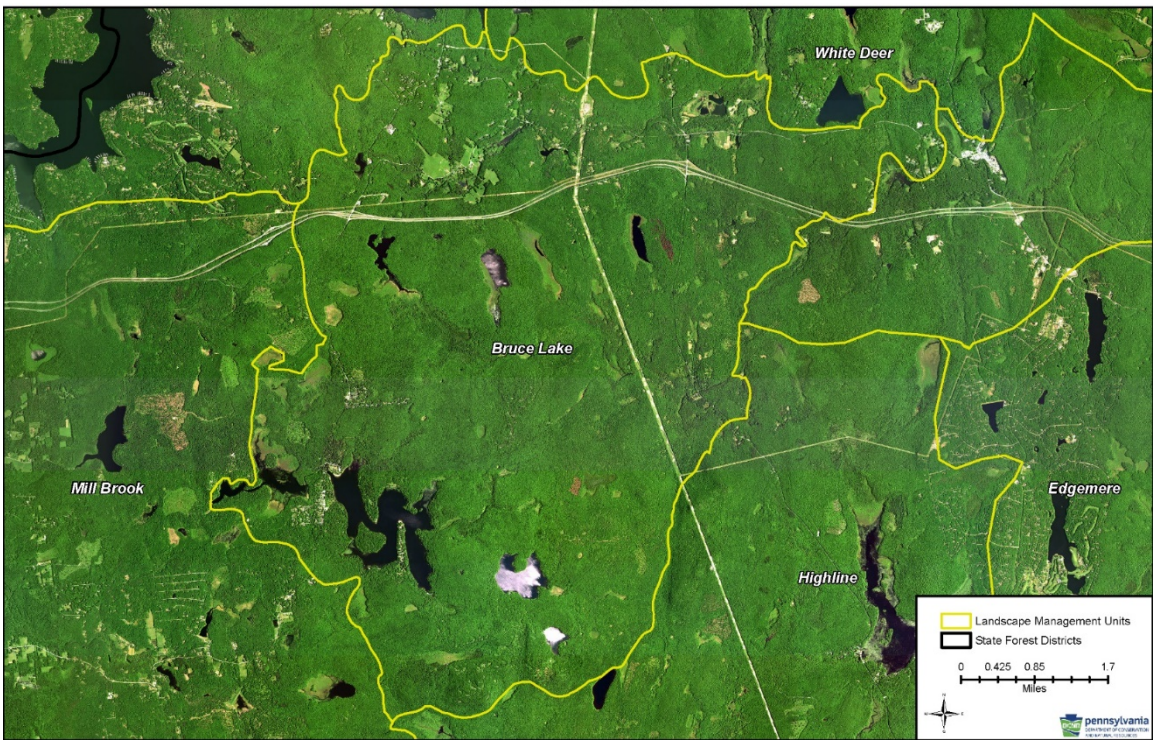
Delaware State Forest Landscape Management Units

Bruce Lake

Landscape Management Unit



Bruce Lake LMU



Overview

The Bruce Lake LMU is a unique landscape in the western portion of Delaware State Forest District. The Bruce Lake Landscape Management Unit (LMU) encompasses 23,765 acres including 6,304 acres of the Delaware State Forest in Pike County. The LMU is located in the Glaciated Pocono Plateau and Glaciated Low Plateau ecoregions. Situated on a plateau, the Bruce Lake LMU features large and numerous boreal swamps connected by high quality streams surrounded by remote forests. This LMU is located just southeast of Lake Wallenpaupack.

The central portion of this LMU is largely unbroken wilderness harboring abundant game species such as black bear, white-tailed deer, turkey, snowshoe hare, fisher, bobcat, and coyote. Numerous species of songbirds such as scarlet tanager and northern waterthrush and waterfowl such as black ducks and wood ducks are also present. Rattlesnakes are also present in this LMU. Elevations range from 1320' to 2012.' Interstate 84 transects the northern quarter of this LMU in an east/west direction. The western half of this LMU is mainly state forest land and state park land, except for the portion north of I-84, which is semi-rural housing. The eastern half is mainly larger tracts of hunting club property, most of which is owned by the Blooming Grove Hunting and Fishing Club. Except for a small sliver of northern hardwood forest on the LMU's extreme western tip, this LMU is comprised primarily of mixed oak with a heath understory. The Bruce Lake LMU is severed in both cardinal directions by very large electric transmission lines owned by PPL Corporation. In general, Bruce Lake LMU soils are very stony in the uplands and mucky peat in the wetlands. Water drains from the LMU to the Delaware River via the Lackawaxen River, the Shohola Creek, and the Bushkill.

Prior to European settlers, this LMU was the hunting grounds for the Minsi Tribe of the Wolf Clan of the Lenni Lenape American Indians (Delaware). A religious group called the Shakers then purchased the land. The Shakers and other early settlers of the area logged the large conifers and hardwoods and erected sawmills to process the wood. The original composition of American chestnut, mixed oak, white pine, hemlock, sugar maple and beech was first harvested in the 1800's for ship masts, charcoal, homes, mines, and farmland. By 1900, following repeated clearcutting, the entire area was virtually treeless.

Between 1902-1904, the Commonwealth of Pennsylvania purchased the land for less than $2 per acre. In 1905, Promised Land State Park was established as the fourth Pennsylvania state park. Campgrounds were formed and over a million trees were planted at the park. In 1911, the original Promised Land Lake earthen dam which had been built in 1890 was replaced for $1,000. In 1933, the Civilian Conservation Corps (CCC) began building roads, trails, and recreational facilities, fighting fires, planting trees, and performing many other conservation activities. Promised Land's Civilian Conservation Corps Camp S-139 opened in May 1933 and closed in July 1941.

On Sunday evening, May 31, 1998, an F-2 tornado with winds of 113 -157 mph dissected this LMU with a direct hit at Promised Land State Park. In less than 10 minutes, the tornado flattened more than 1,000 acres of woodlands.

Gypsy moth defoliations since the 1970s have ranged from extremely severe to no defoliation at all. Frequency of severe defoliations has decreased substantially since the 1970's. The emerald ash borer has not yet become established in this LMU, but the hemlock woolly adelgid has been impacting mature

hemlock trees in the region. The Bruce Lake LMU contains many invasive species including Japanese barberry, Japanese stiltgrass, *Phragmites*, tree-of-heaven, Japanese angelica tree, Tatarian honeysuckle, multi-flora rose, and autumn olive. In addition, a highly aggressive, native aquatic species, Variable-leaf milfoil, has been found in Promised Land lake. Monitoring of all state-forest waterbodies within this LMU for this species has taken places periodically since 2014.

Recreational activities in this LMU attract visitors from nearby towns and major cities including New York City,
Allentown, and Philadelphia. Many visitors also come from New Jersey. The Bruce Lake Natural Area and Promised Land State Park are the key attractions for conservation-minded recreationists. Promised Land State Park is one of the most visited parks in Pennsylvania and offers camping, cabins, hiking, horseback riding, snowmobiling, fishing, boating, hunting, biking, and birdwatching. The Delaware State Forest that surrounds Promised Land State Park offers similar recreational opportunities with the exception of camping but with the addition of trapping and dog training. The Bruce Lake Natural Area on the Delaware State Forest excludes motorized recreation, biking, and horseback riding. One State Forest Wild Plant Sanctuary is located within this LMU.

Priority Goals

a) Manage the commercial portion of the state forest using sustainable timber management to provide wood products for the economy, habitat for wildlife, and desirable trees for future generations.

b) Manage the state forest to provide abundant recreational opportunities to all citizens, including the visitors to Promised Land State Park.

c) Protect the water quality of the Delaware River watershed.

d) Protect the serenity, wild plant production, and recreational opportunities that are provided in the Bruce Lake Natural Area. Prioritize the maintenance of wild character and promote opportunities for primitive recreation experiences.

Profile

Table 1. LMU acreage: total and state forest land only.

	Acres
State Forest Land	6,304
LMU Total	23,765

Ecoregion: Glaciated Pocono Plateau and Glaciated Low Plateau

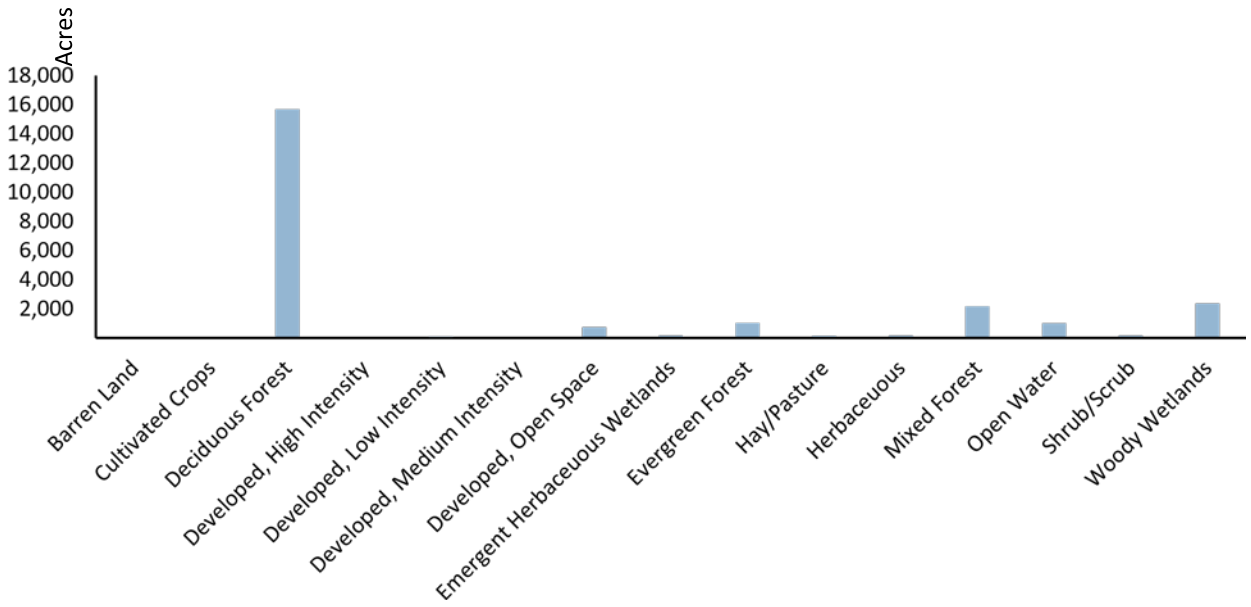


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. The central portion of this LMU is largely unbroken wilderness. The western half of this LMU is mainly state forest land and state park land except for the portion north of I84 which is semi-rural housing. The eastern half is mainly larger hunting club property, most of which is owned by the Blooming Grove Hunting and Fishing Club.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP.

Road Category	Total Miles
Z1 - Public Use Road	7
Z3 - Administrative Road (gated)	5
Total	**13**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing.

Trail Category	Total Miles
Hiking	25
Biking	4
Equestrian	4
X-Skiing	16
ATV I	0
ATV II	0
Snowmobile/ Joint Use Road	4

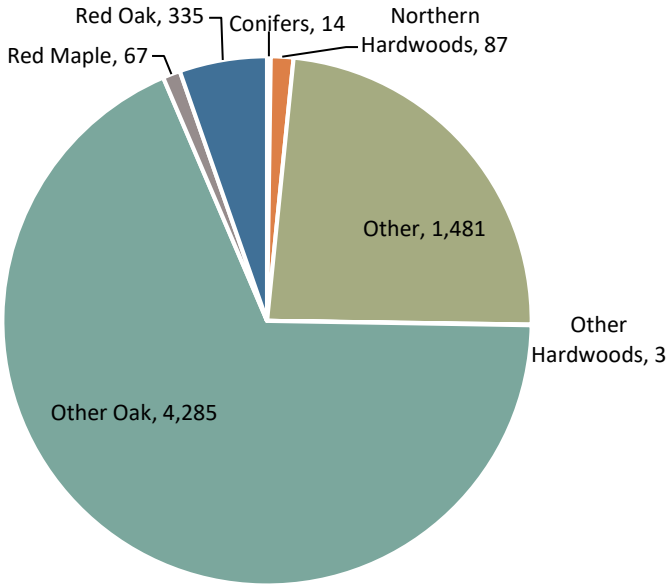


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. Except for a small sliver of northern hardwood forest on the LMU's extreme western tip, this LMU is comprised primarily of mixed oak with a heath understory.

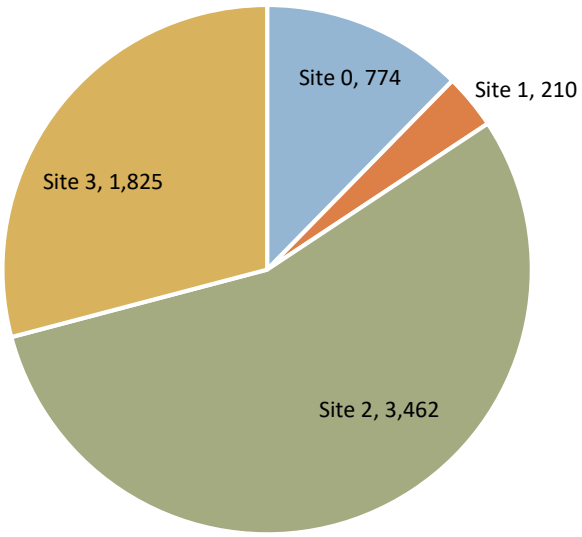


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

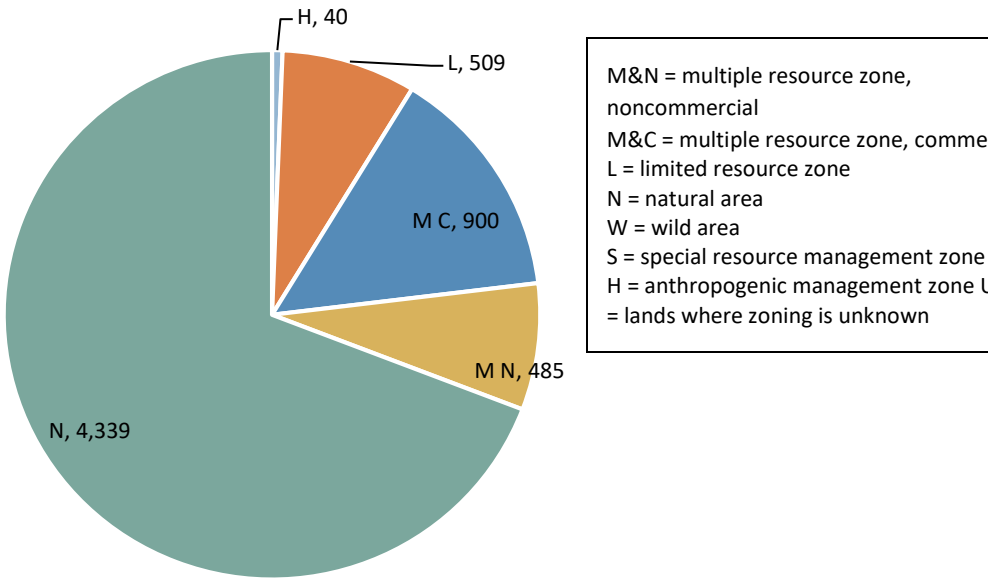


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP. The Bruce Lake Natural Area on the Delaware State Forest excludes motorized recreation, biking, and horseback riding.

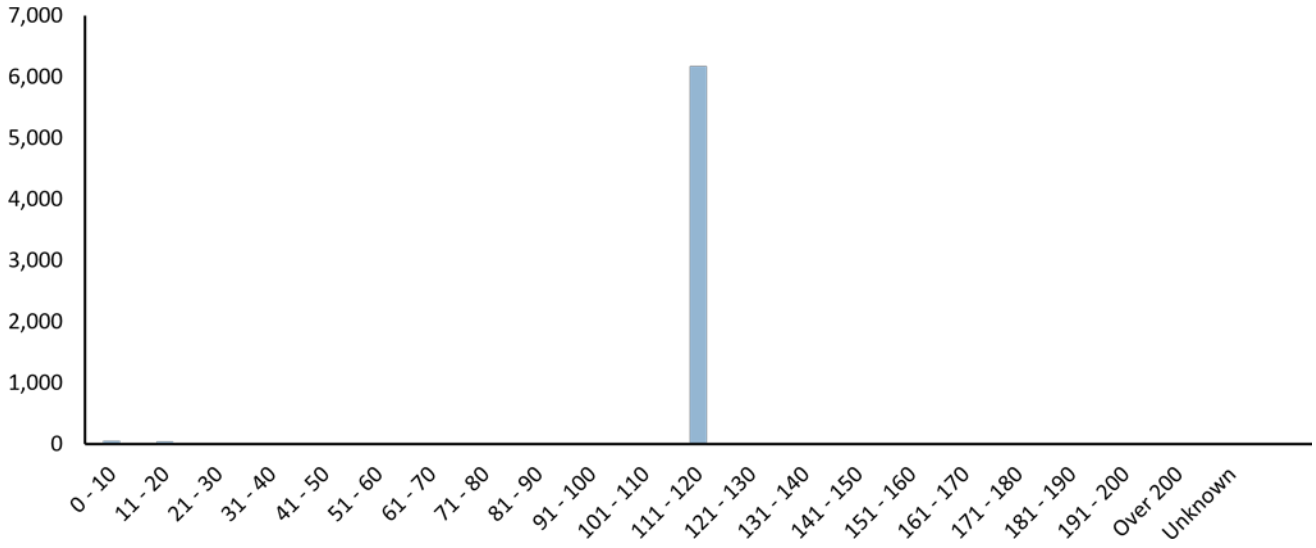


Figure 5. Acres of state forest land in this LMU by forest age classes. The Shakers and other early settlers of the area logged the large conifers and hardwoods and erected sawmills to process the wood. The original composition of American chestnut, mixed oak, white pine, hemlock, sugar maple and beech was first harvested in the 1800's for ship masts, charcoal, homes, mines, and farmland. By 1900, following repeated clearcutting, the entire area was virtually treeless. Since that time, the forests have returned, generally as a single cohort, illustrated by the uniform age of state forest acreage.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code. Water drains from the LMU to the Delaware River via the Lackawaxen River, the Shohola Creek, and the Bushkill.

Class	Total (miles)
Undesignated	1
High Quality Waters	44
Exceptional Value Waters	15
Total	**61**

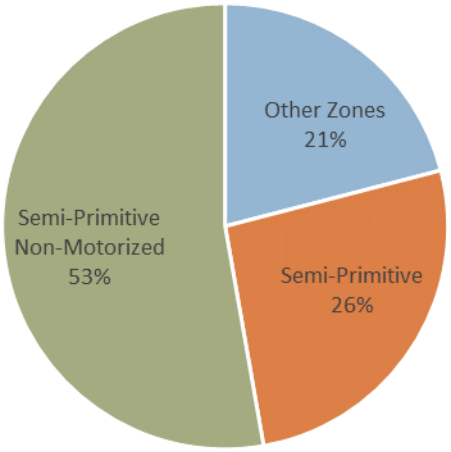
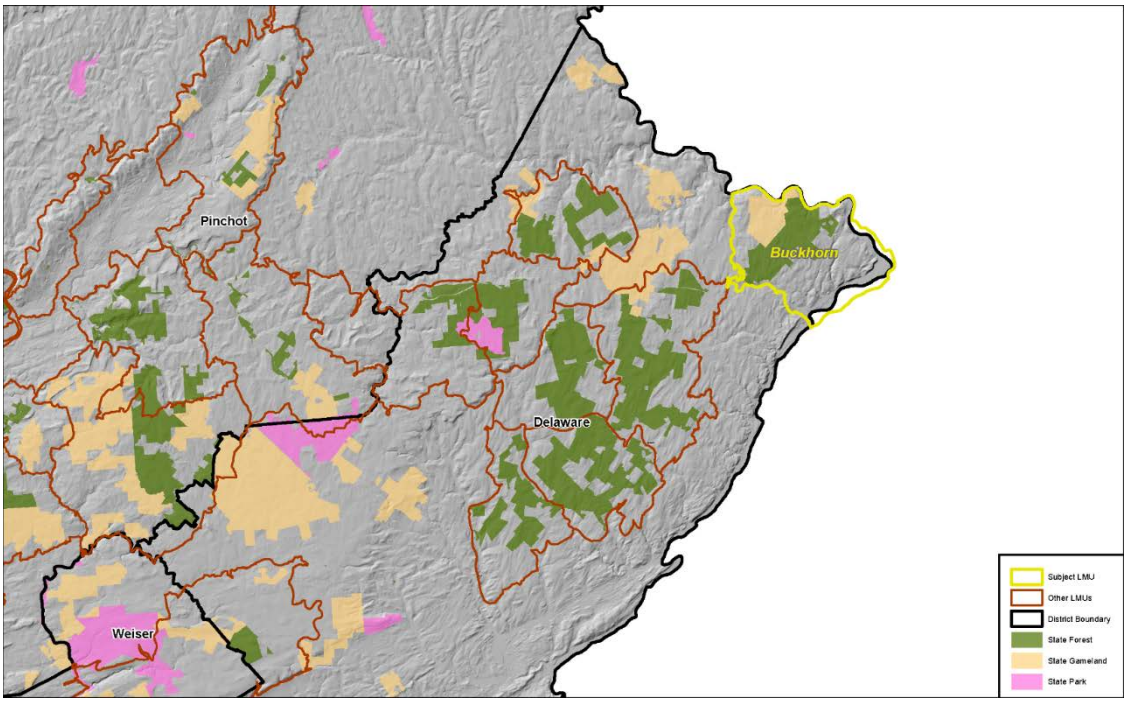


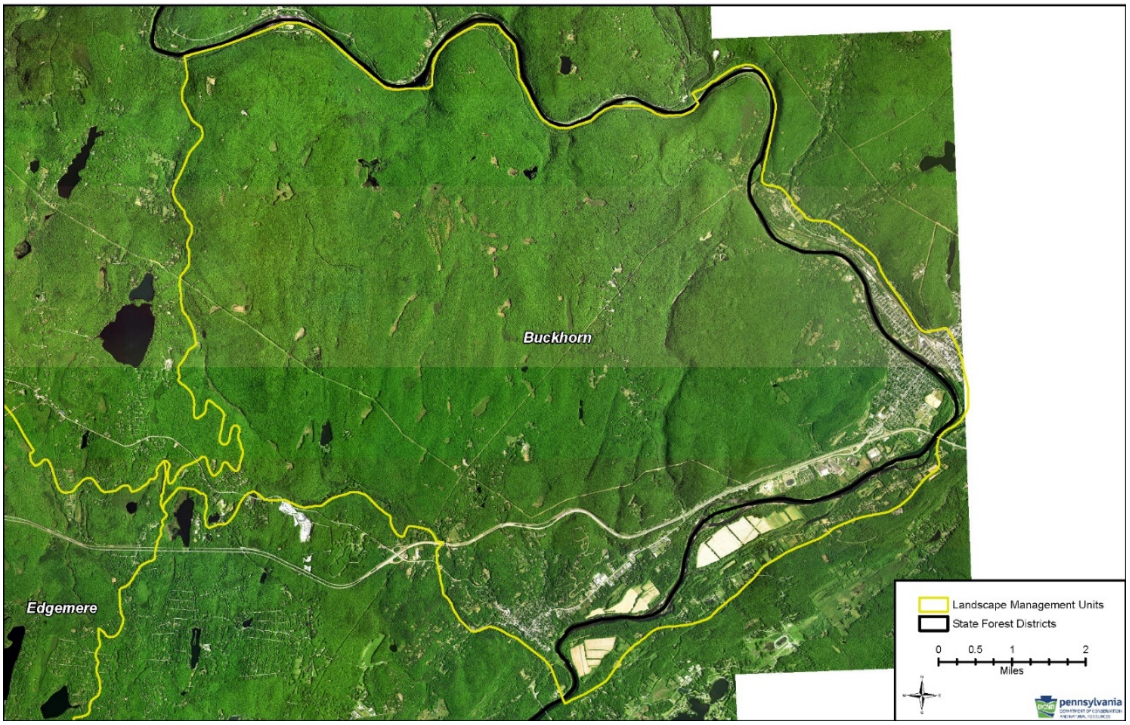
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

Buckhorn

Landscape Management Unit



Buckhorn LMU



Overview

The Buckhorn LMU is located in the northern part of Pike County and borders the Delaware River. It encompasses 40,397 acres of mountainous land in the Glaciated Pocono Plateau ecoregion. The Bureau of Forestry manages 9,201 acres within this landscape. State Game Lands #209 and the Upper Delaware National Scenic and Recreational River is found within it as well. The Stairway Wild Area, a 3,100-acre piece, sits atop some of the most rugged mountainous areas within the Delaware state forest district. Buckhorn Natural Area encompasses 536 acres abutting the wild area. Combined they make up approximately 3,636 acres. Two larger towns are found here as well: historic Milford, where Grey Towers is located, and Matamoras. The rest of this LMU is privately owned.
Timber management within this landscape is lacking due to the poor-quality sites and reduced basal area of the forests. Gypsy moth defoliation, past firewood cutting, and rocky, glaciated rubble keeps the basal area of these forests rather low. These forests are dominated by a heavy black huckleberry understory, black birch mid-canopy, and poor-quality oaks. Although oak is the predominant tree species, red maple, hickory, pitch pine and white pine dot the landscape. These oak forests provide an abundant mast crop for wildlife in the area. Their timber quality is lacking with one to oneand-a-half log heights being the norm during timber cruising and appraisal. Timber harvesting is non-existent within the LMU due to restricted access in the form of restricted-weight bridges, pipelines, and wetlands that inhibit being able to cross into more productive areas to harvest the timber.

There are many high value, cold water fishery streams which feed into the Delaware River: Pond Eddy, Bush Kill, Pinchot Brook, and Sawkill Brook to name a few. Recreation in the form of hunting, fishing, hiking and biking seems to dominate the major forest usage. Some browse cuttings for wildlife have been conducted with local hunting clubs. Old bluestone quarries can be found throughout the area. This stone was often chiseled out of the exposed rock, hauled by wagons down the mountainside, and taken by rail to New York City to line residents walkways. A large quarry is found along Bluestone Boulevard just east of Millrift.

There are numerous trails dissecting the landscape. One trail, Stairway Lake, takes hikers to a small five-acre lake which sits atop a mountain providing for spectacular views of the Delaware River and New York state. One old farmstead is located at the end of Craft Farm Road. Here, you can find fields going through early secession and a small pond. Lilly Pond, at the end of Schocopee Road, hosts annual fishing derbies and has a rather large pavilion for renting.

Priority Goals

a) This LMU lends itself to future recreation in the form of hiking, fishing, and mountain biking. Provide better maps for hiking and biking explaining loops and cross-connectors, establish signage documenting the rare bluestone quarries and unique areas. Providing for scenic recreation. Prioritize the maintenance of wild character and promote opportunities for primitive recreation experiences.

b) More in the way of wildlife enhancement projects can be done. Create better wildlife habitat, potentially through timber harvesting. More wildlife habitat openings creating by small-scale projects or large-scale timber sales.

c) Increased risk of large, catastrophic wildfires and repeated defoliation of oak trees by gypsy moth.

d) Prioritize the maintenance and promotion of core forest conditions and values.

Profile

Table 1. LMU acreage: total and state forest land only.

	Acres
State Forest Land	9,201
LMU Total	40,397

Ecoregion: Glaciated Low Plateau

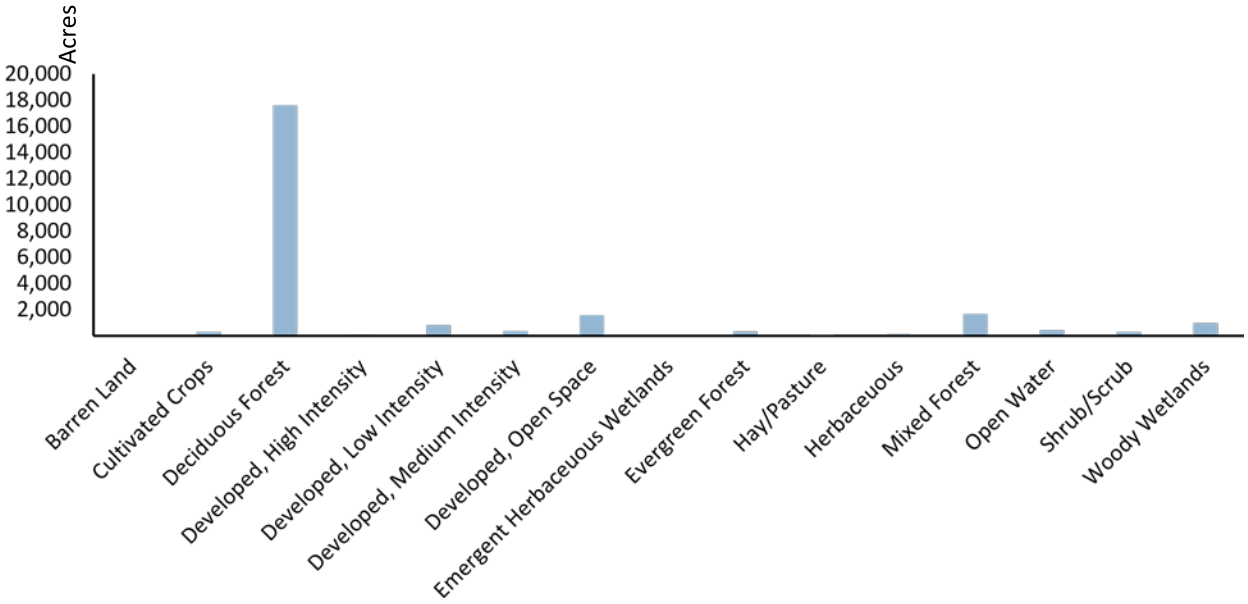


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. The LMU is dominated by deciduous forest. Developed, open space and woody wetlands pose unique management issues.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP. A total of five miles of Z1 roads exists within the LMU. Three miles make up Z3 roads. Schocopee, Firetower, Cummings Hill, and Bluestone Boulevard make up the Z1 roads.

Road Category	Total Miles
Z1 - Public Use Road	5
Z3 - Administrative Road (gated)	3
Total	**8**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing. Huckleberry, Foundation, Yellow Pine, Lost Camp, Boundary, and Stairway Lake Trails provide for future hiking enjoyment.

Trail Category	Total Miles
Hiking	11
Biking	4
Equestrian	4
X-Skiing	11
ATV I	0
ATV II	0
Snowmobile/ Joint Use Road	0

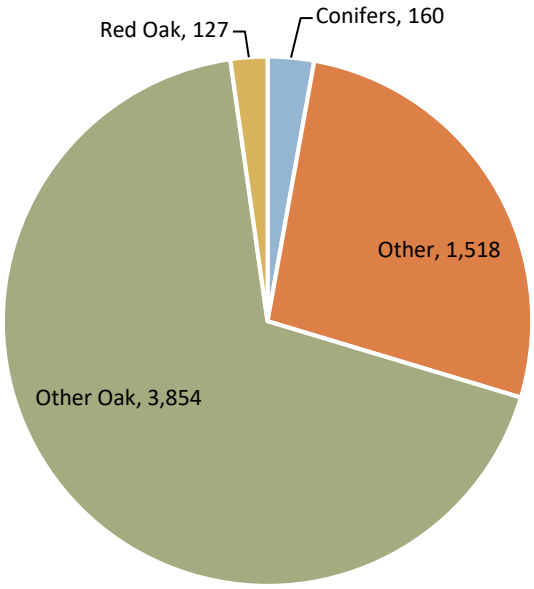


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. The vast majority of this LMU is oak forest. Enhancing the coniferous component would be beneficial.

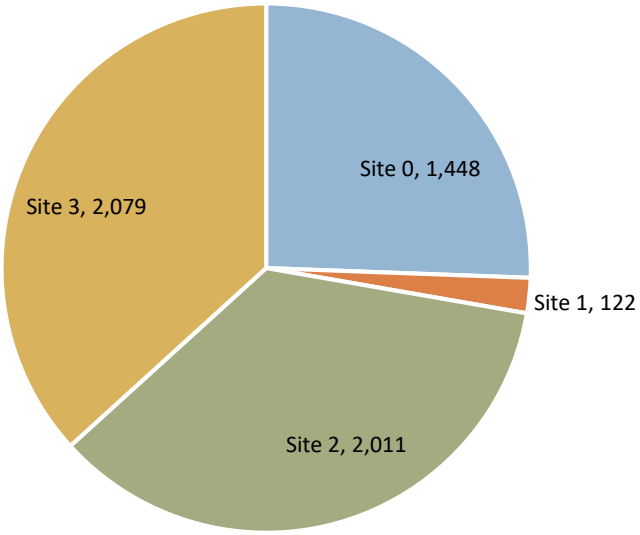


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP. Site Class 2 and 3 make up over half the LMU. Unrepresented here, is the inability to access some of these sites.

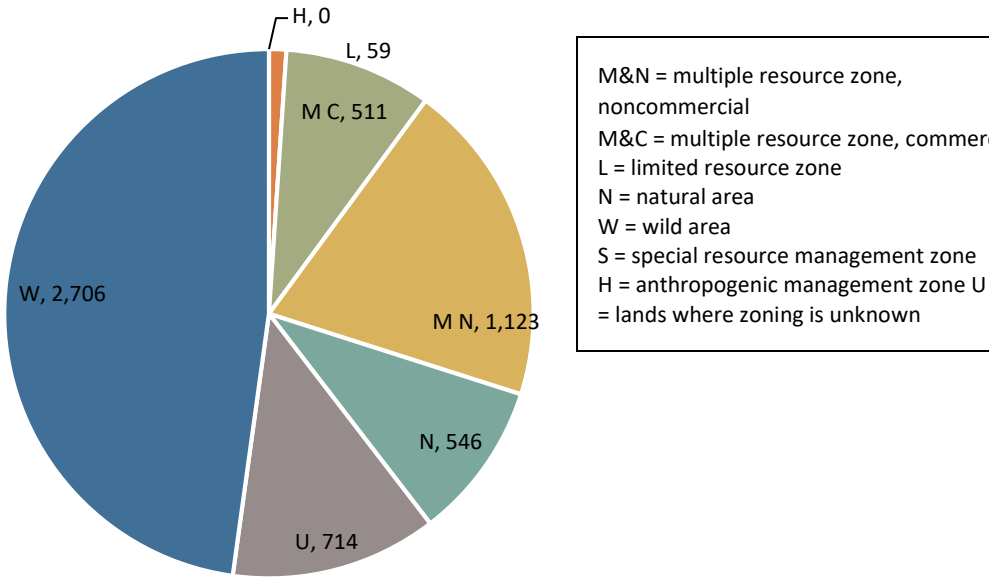


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP. Wild and Natural Areas make up a large portion of the LMU.

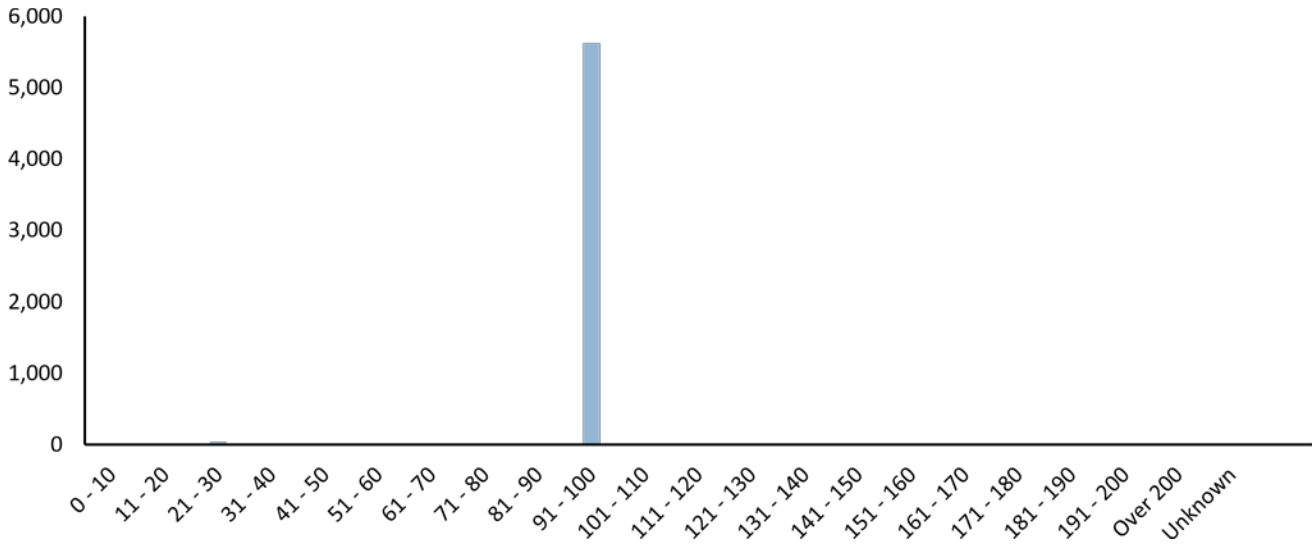


Figure 5. Acres of state forest land in this LMU by forest age classes. This LMU is representative of "old age." Executing more timber harvests would be favorable to balance out the age classes.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code. Bushkill Creek, Dimmick Meadow Branch, Pinchot Brook, Craft Brook, and Sanvantine Creeks make up these streams.

Class	Total (miles)
Undesignated	14
High Quality Waters	47
Exceptional Value Waters	13
Scenic Rivers	10
Total	**84**

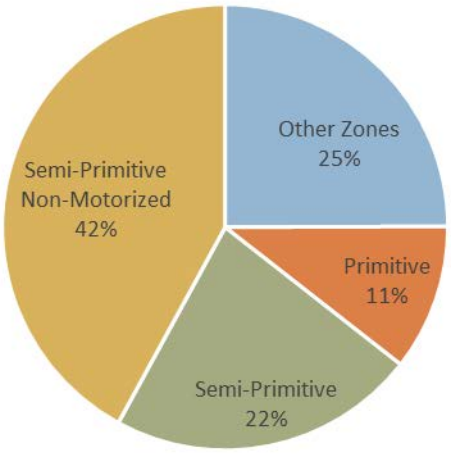
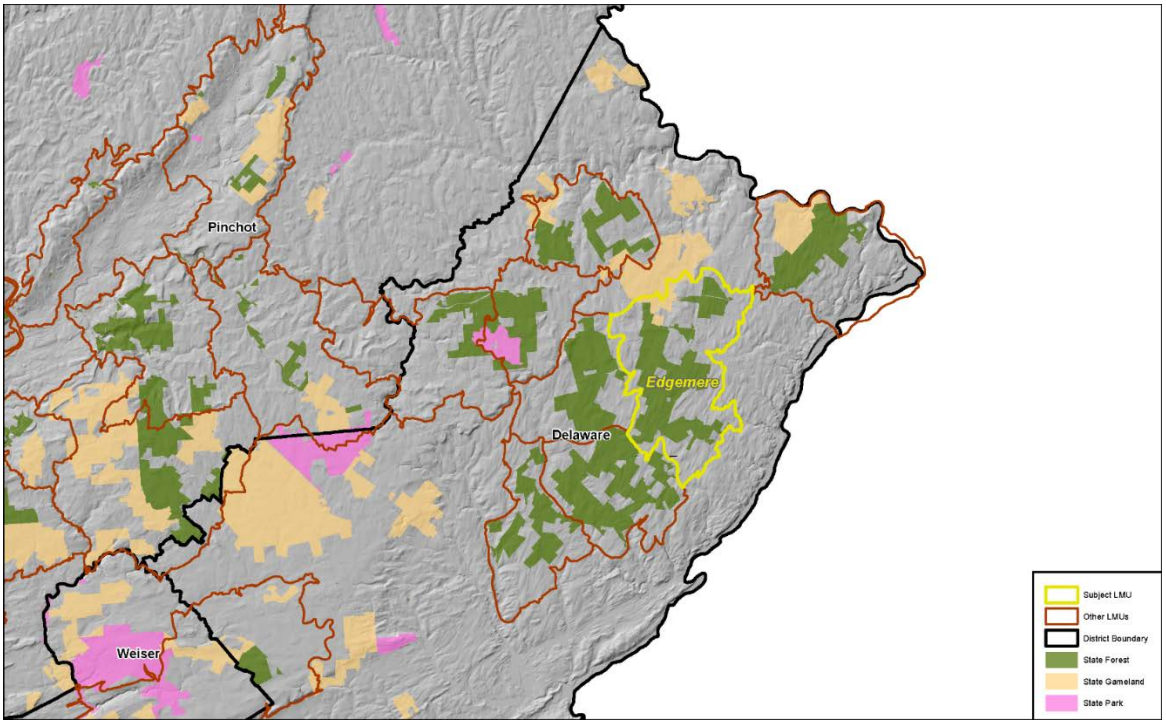


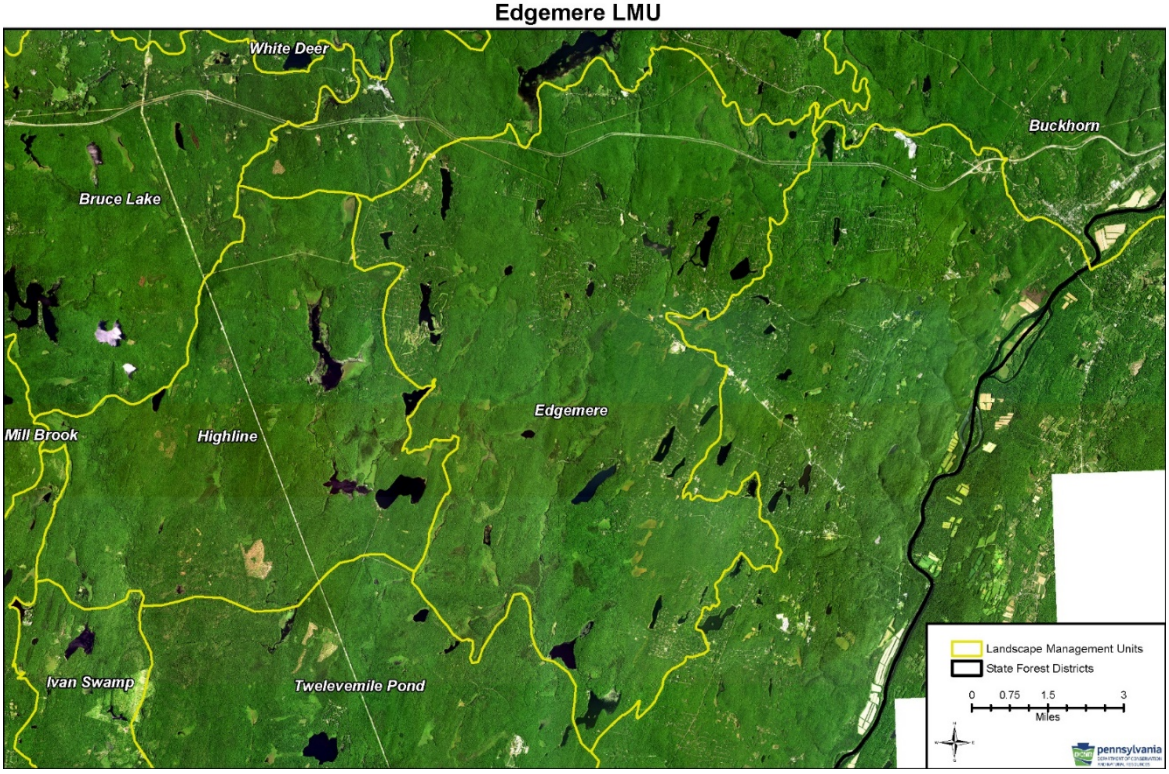
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones. Semi-Primitive and Non-Motorized/Semi-Primitive recreation make up a large portion of this LMU providing for undisturbed recreating opportunities.

Edgemere

Landscape Management Unit



Edgemere LMU



Overview

The Edgemere LMU is in the eastern part of Pike County not far from the Delaware River. It encompasses 46,955 acres of glaciated Pocono mountainous land. The Bureau of Forestry manages 17,408 acres within this landscape. A small portion of State Game Lands #180 is found within it. The Stillwater Natural Area, a 1,931-acre piece, contains a mix of conifers and hardwoods. The area provided refuge for Union Army deserters during the Civil War. Three large housing developments provide user pressure on this LMU. Hemlock Farms, Conoshaugh Lakes, and Gold Key Lake Estates are very large housing establishments bringing in residents who were traditionally from larger urban areas in New York and New Jersey. Only one small village provides for shopping which is found in Lords Valley at the northern end of Hemlock Farms. A few hunting clubs and associations own land within the LMU. The rest of this LMU is privately owned.

As with other nearby LMU's, gypsy moth defoliation, past firewood cutting, and rocky, glaciated rubble keeps the basal area of these forests rather low. Several large blueberry/red & black spruce swamps are found here. The forests are dominated by a heavy black huckleberry understory, black birch mid-canopy, and poor-quality oaks. Although oak is the predominant tree species, red maple, hickory, pitch pine and white pine dot the landscape. These oak forests provide an abundant mast crop for wildlife in the area. Their timber quality is lacking with one to one-and-a-half log heights being the norm during timber cruising and appraisal. Timber management within the southern portion of this landscape is fair. Mechanized logging affords foresters the opportunity to complete timber sales on mediocre quality sites. Most of these sales are largely due to the amount of volume needed to make it profitable.

There are many high value, cold water fishery streams which eventually flow into the Delaware River: Raymondskill Creek, Bush Kill, and Little Bushkill to name a few.

Recreation in the form of private cabin Leases, hunting, fishing, hiking, and biking seem to dominate the major forest usage. Other forms of recreation include ATV and snowmobile riding along trails within the Delaware State Forest. Also, a sizable portion of the Thunder Swamp hiking trail, a "state designated hiking trail," traverses the southern end of the LMU. Old bluestone quarries can be found throughout the area as well. This stone was often chiseled out of the exposed rock, hauled by wagons down the mountainside, and taken by rail to New York City to line residents walkways. A State Forest Wild Plant Sanctuary is located within this LMU.

There are a few miles of state forest roads dissecting the landscape. Several of these are considered joint-use and provide a valuable source of recreation to snowmobile users in times of heavy snow. These roads connect with trail systems that offer the rider hours of scenic enjoyment. One major issue with this LMU is the lack of access into a substantial portion of state forest land known as the Tarburner Tract. Also, a smaller tract, known as the Route 739 Tract, provides no access. With proper access achieved, timber management, recreational opportunities, and trail development could occur.

Priority Goals

a) Providing access to state forest land to allow the public to enjoy the scenic wonders of PA. Provide access. This LMU lends itself to increased access. Large portions of state forest are under-utilized due to no access points being available to the public. Decades of non-existent

work on these portions have basically left these lands as islands of forest surrounded by large housing developments.

b) Timber harvesting has been active in this LMU. More could possibly be accomplished in the Route 739 & Tarburner Tracts.

c) Create better wildlife habitat, provide access, not better access, just access into the Route 739 & Tarburner Tracts.

d) More in the way of wildlife enhancement projects can be done in this LMU specifically targeting bird species such as ruffed grouse, woodcock, and endangered and threatened bird species such as the golden-winged warbler. More wildlife habitat openings creating by small-scale projects or large-scale timber sales.

e) Increased risk of large, catastrophic wildfires and repeated defoliation of oak trees by gypsy moth, inability to accomplish professional timber management.

Profile

Table 1. LMU acreage: total and state forest land only.

	Acres
State Forest Land	17,408
LMU Total	46,955

Ecoregion: Glaciated Low Plateau

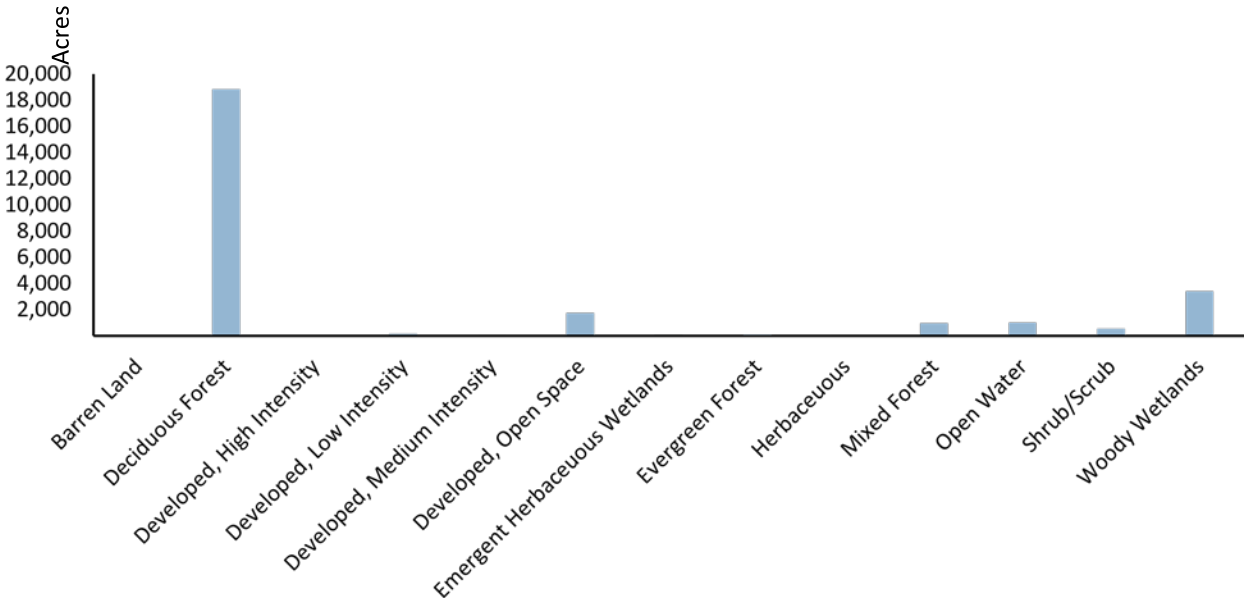


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. The LMU is dominated by deciduous forest. Developed, open space and woody wetlands pose unique management issues.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP. A total of thirteen miles of Z1 roads exists within the LMU. Seventeen miles make up Z3 roads. Flat Ridge, Fivemile Meadow, and Bald Hill Roads make up the Z1 roads.

Road Category	Total Miles
Z1 - Public Use Road	13
Z3 - Administrative Road (gated)	17
Total	**30**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing. Bald Barren ATV Trail provides for 6.5 miles of ATV riding pleasure. Thunder Swamp Trail, a state hiking trail, is found in the southern portion of the LMU. Cross-connectors for this trail include Painter Swamp West, Coon Swamp, and Bear Swamp. Marcel Lake, Tarburner Ridge, and Tarburner North trails are under-utilized except for illegal ATV activity. Two no-name trails connect portions of Satnding stone Road with Saw Creek Road.

Trail Category	Total Miles
Hiking	37
Biking	19
Equestrian	19
X-Skiing	19
ATV I	6
ATV II	6
Snowmobile/ Joint Use Road	17

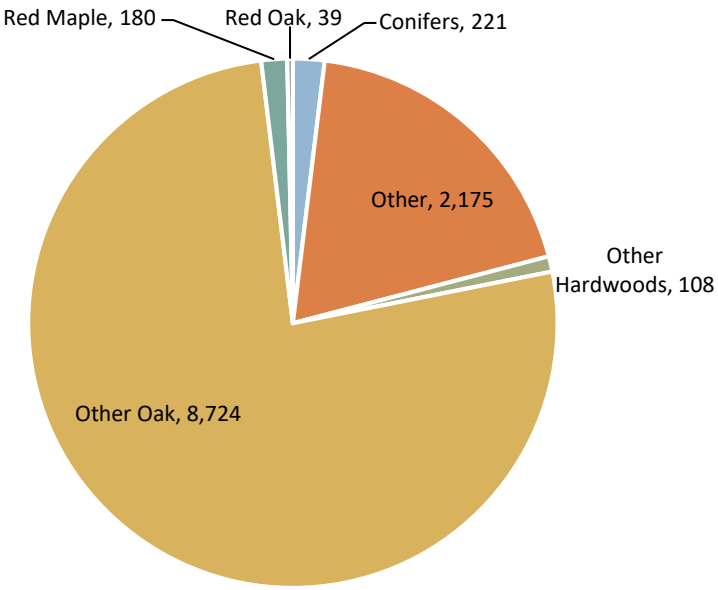


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. The vast majority of this LMU is oak forest. Enhancing the coniferous component would be beneficial.

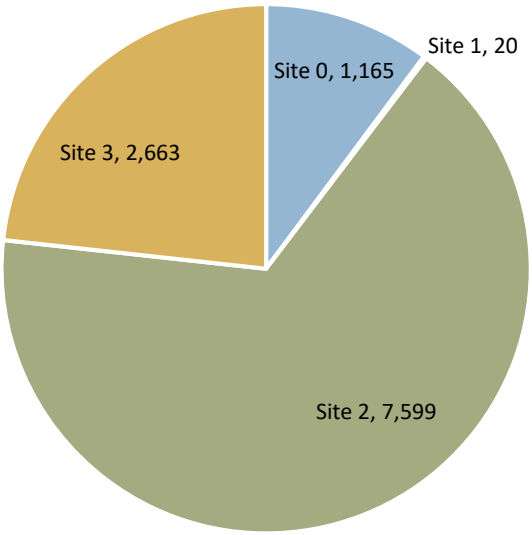


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP. Site Class 2 and 3 make up over half the LMU. Unrepresented here, is the inability to access some of these sites.

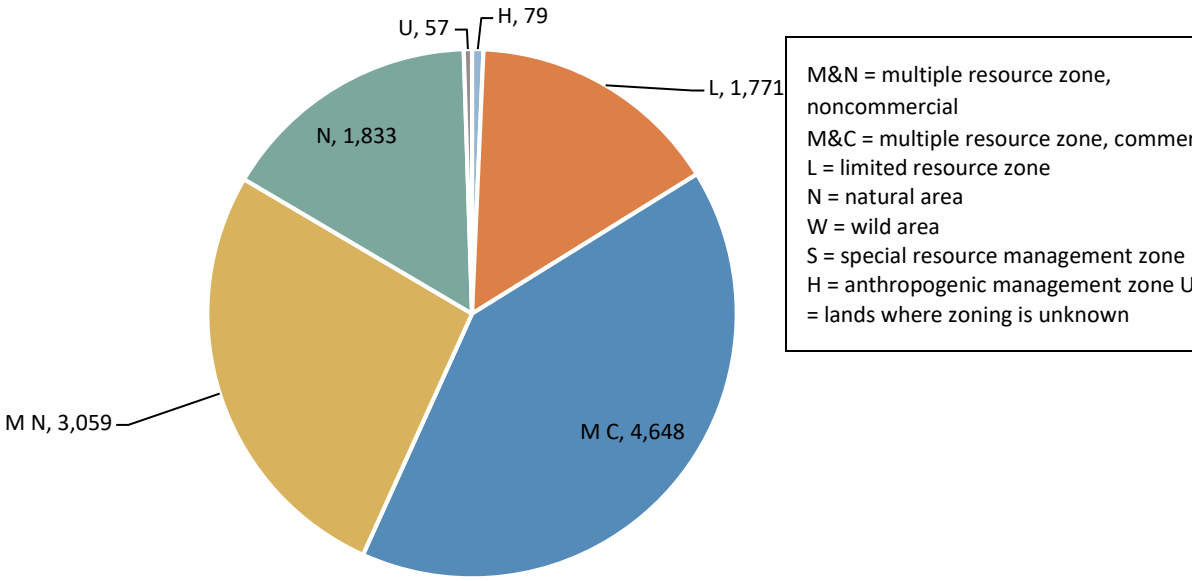


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP. Wild and Natural Areas make up a large portion of the LMU.

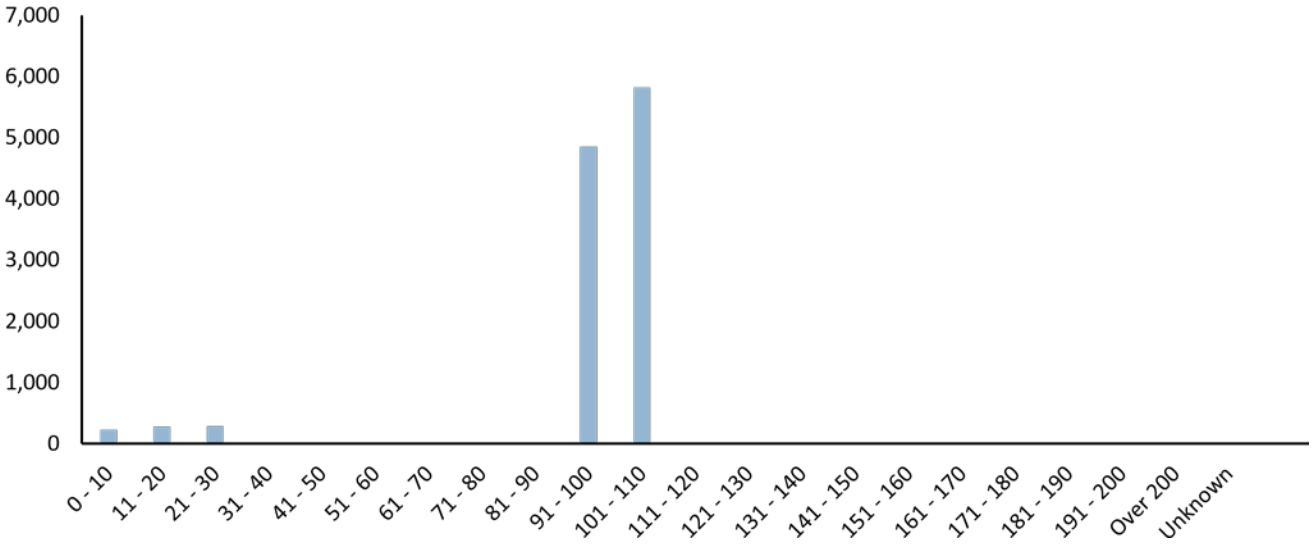


Figure 5. Acres of state forest land in this LMU by forest age classes. This LMU is representative of "old age." Executing more timber harvests would be favorable to balance out the age classes.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code. The Little Bushkill Creek makes up the major stream flow in this LMU.

Class	Total (miles)
Undesignated	2
High Quality Waters	55
Natural Lake/ Pond	1
Total	**58**

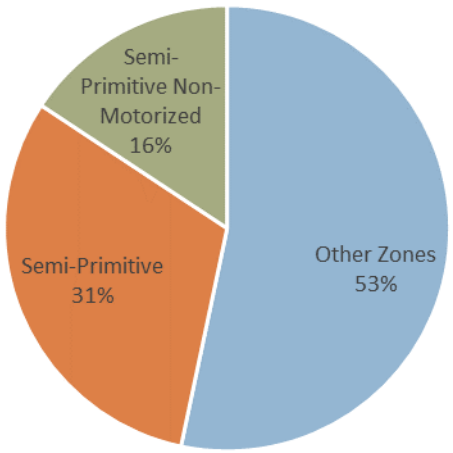
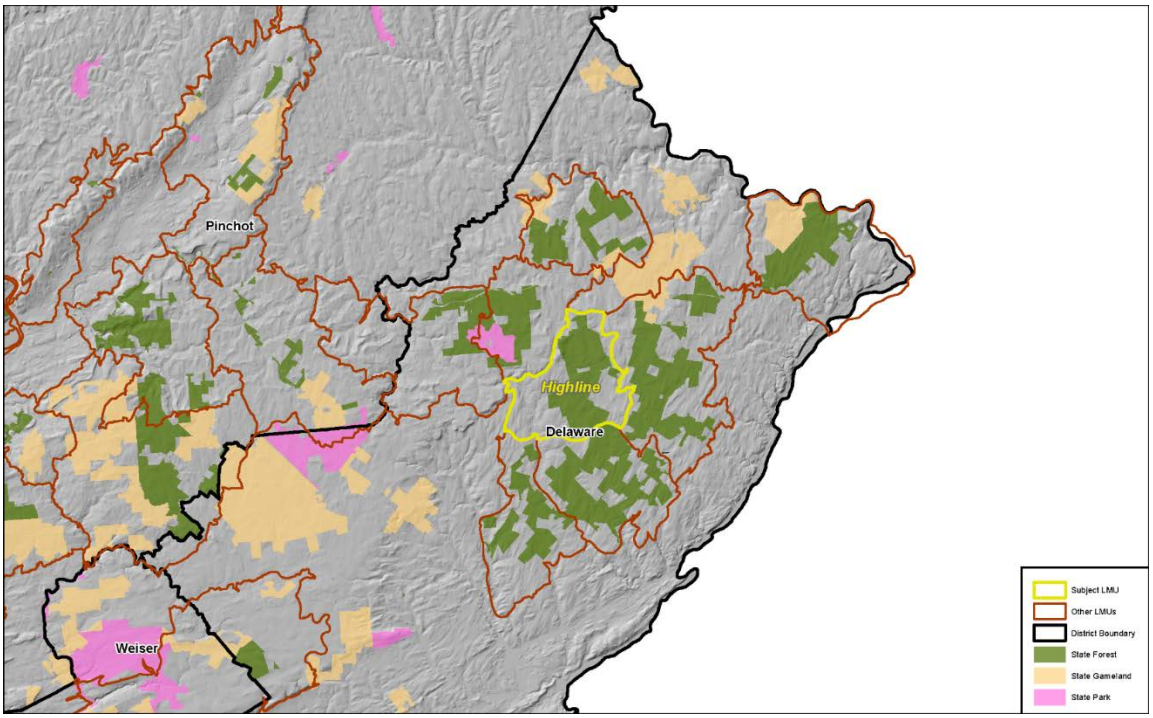


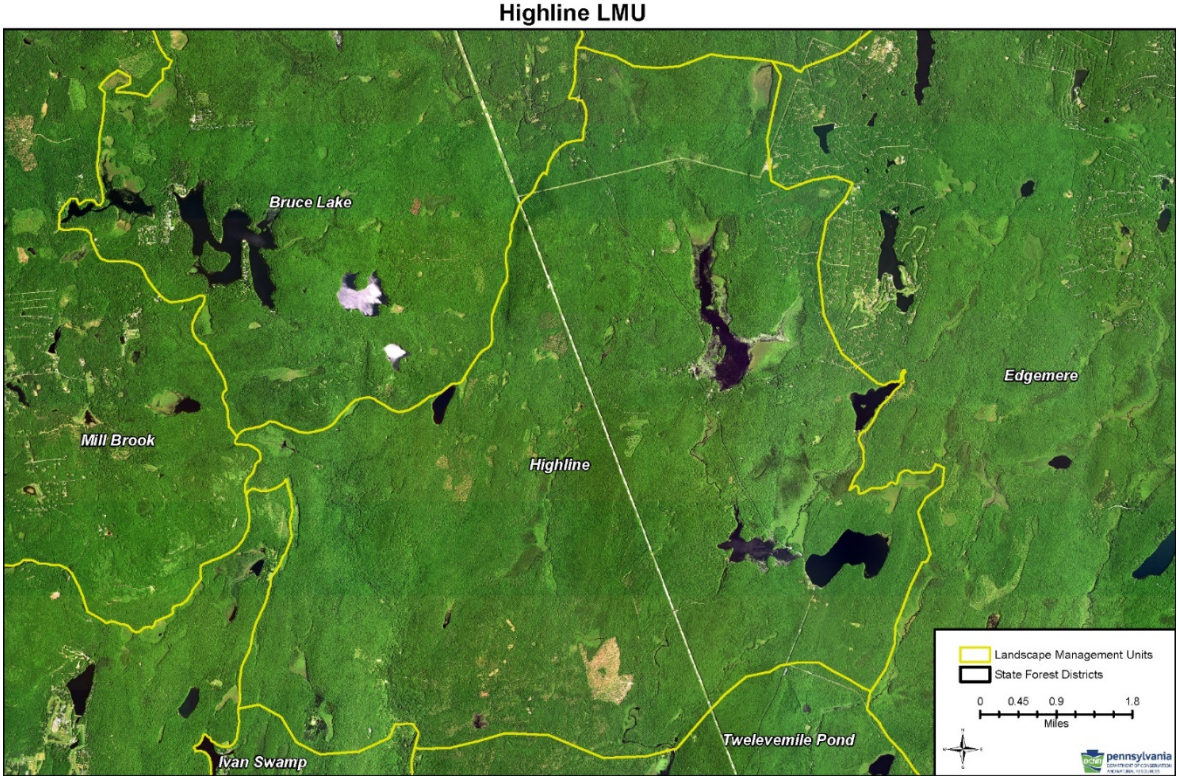
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones. Semi-Primitive and Non-Motorized/Semi-Primitive recreation make up a large portion of this LMU providing for undisturbed recreating opportunities.

Highline

Landscape Management Unit



Highline LMU



Overview

The Highline Landscape Management Unit (LMU) is an abundantly rich landscape in the central portion of the Delaware Forest District. The Highline LMU encompasses 27,004 acres including 10,904 acres of the
Delaware State Forest in Pike County. The LMU is located mainly in the Glaciated Low Plateau ecoregion. A small section around High Knob is located in the Glaciated Pocono Plateau ecoregion. Situated on a plateau, the Highline LMU features several lakes, numerous boreal swamps, high quality streams, and remote mixed oak forests.

The Highline LMU is best characterized as a vast tract of wilderness dotted lightly by human structures. The LMU is home to game species such as black bear, white-tailed deer, turkey, snowshoe hare, woodcock, fisher, bobcat, and coyote. Numerous species of songbirds such as golden-winged warbler and cerulean warbler thrive in this LMU and waterfowl such as black ducks, ring-necked ducks, and wood ducks abound. Numerous bald eagles and osprey can be seen hunting in this LMU, and numerous osprey nests are located on the power poles of PPL's Susquehanna-Roseland powerline. Rattlesnakes are also present in this LMU. Elevations range from 1100' to 2050.' State Route 402 bisects this LMU in a north/south direction. The LMU is equally divided between state forest land and exceptionally large hunting and fishing clubs. Generally, permanent residences are few and seasonal cabins are distributed throughout the landscape.

This LMU is comprised primarily of mixed oak with a heath understory. Stands of large white pine with hemlock are well represented in the northern portion of the LMU. The Highline LMU is bisected north to south by a very large electric transmission line owned by PPL Corporation. The LMU's northern tip is severed east to west by a very large PPL
Corporation electric transmission line. In general, Highline LMU soils are very stony in the uplands and mucky peat in the wetlands. Water drains from the LMU to the Delaware River via the Shohola Creek, the Big Bushkill, and the Brodhead Creek.

Prior to European settlers, this LMU was the hunting grounds for the Minsi Tribe of the Wolf Clan of the Lenni Lenape American Indians (Delaware). Early settlers of the area logged the large conifers and hardwoods and erected sawmills to process the wood. The original composition of American chestnut, mixed oak, white pine, hemlock, sugar maple and beech was first harvested in the 1800's for ship masts, charcoal, homes, mines, and farmland. By 1900, following repeated clearcutting, the entire area was virtually treeless. Low brush and scrub oak was all that appeared to remain. Uncontrollable fires raged through the denuded landscape.

In 1897, the Pennsylvania Department of Agriculture Division of Forestry received legislative authorization to acquire land to be set aside as state forest reservations. Over the next five years, 50,000 acres of land was acquired in Pike and Monroe Counties. The property was called the Minisink Forest until 1921, when it was named the Delaware State Forest. Today, the Delaware State Forest is comprised of over 84,500 acres. In 1933, the Civilian Conservation Corps (CCC) began building roads, trails, and recreational facilities, fighting fires, planting trees, and performing many other conservation activities. Since the initial acquisitions, the forests have matured, permanent forest management infrastructure has been developed, and forest management plans have been created and implemented on the forest.

On May 31, 1998, an F-2 tornado with winds of 113 -157 mph dissected this LMU with a direct hit at Peck's Pond. In less than 10 minutes, the tornado flattened more than 1,000 acres of woodlands.

Gypsy moth defoliations since the 1970's have ranged from extremely severe to no defoliation at all. Frequency of severe defoliations has decreased substantially since the 1970's. The emerald ash borer has not yet become established in this LMU, but the hemlock woolly adelgid has been impacting mature hemlock trees in the region. The Highline LMU contains many invasive species including Japanese barberry, Japanese stiltgrass, Japanese knotweed, *Phragmites*, treeof-heaven, Tatarian honeysuckle, multi-flora rose, and autumn olive. In addition, a highly aggressive, native aquatic species, Variable-leaf milfoil, has been found in Pecks Pond. Management for this species has taken place since 2013 and will continue after completion of the Pecks Pond Dam rehabilitation project. Monitoring of all other state-forest waterbodies within Delaware State Forest for this milfoil species has taken place periodically since 2014.

The Highline LMU contains the Peck's Pond Waterfowl Propagation Area, a 310-acre area that seasonally protects waterfowl nesting habitat. The area is closed to the public from April 1st through September 30th to reduce disturbance of nesting waterfowl, such as black ducks and wood ducks. Peck's Pond has been identified in the North American Waterfowl Management Plan as a "Special Management Focus Area" due to its importance to black duck production. This LMU also contains a State Forest Wild Plant Sanctuary.

Recreational activities in this LMU attract visitors from nearby towns and major cities including New York City, Allentown, and Philadelphia. Many visitors also come from New Jersey. Peck's Pond and the surrounding state forest land are the key attractions for conservation-minded recreationists. Many LMU visitors are drawn to the leased cabin colonies at Peck's Pond and Pine Flats. The first leased camp-site, was made available to the public by the Department of Forestry in 1913. A large percentage of all the leased-cabins statewide are housed in this LMU. Leased camps easily outnumber permanent year-round residences in this LMU. In this LMU, the Delaware State Forest offers camping, leased cabins, hiking, horseback riding, snowmobiling, ATV-riding, fishing, boating, hunting, trapping, biking, and birdwatching.

Priority Goals

a) Manage the commercial portion of the state forest using sustainable timber management to provide wood products for the economy, habitat for wildlife, and desirable trees for future generations.

b) Manage the state forest to provide abundant recreational opportunities to all citizens, including the numerous campsite lessees.

c) Protect the water quality of the Delaware River watershed.

d) Protect Peck's Pond's natural beauty and wild plant production, while providing for its historical recreational opportunities. This includes continued management of variable-leaf water-milfoil growing in Pecks Pond, as well as monitoring for invasive species such as hydrilla, Phragmites, purple loosestrife and Japanese knotweed.

Profile

Table 1. LMU acreage: total and state forest land only.

	Acres
State Forest Land	10,904
LMU Total	27,004

Ecoregion: Glaciated Pocono Plateau

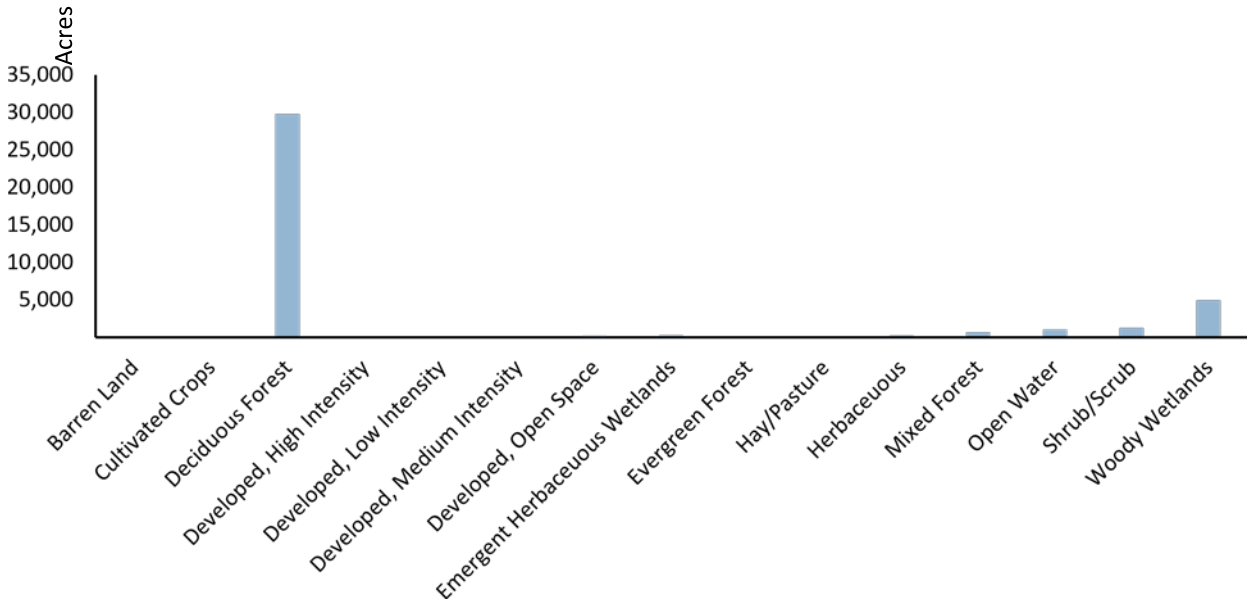


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

The Highline LMU is best characterized as a vast tract of wilderness dotted lightly by human structures. Generally, permanent residences are few and seasonal cabins are distributed throughout the landscape.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP.

Road Category	Total Miles
Z1 - Public Use Road	20
Z3 - Administrative Road (gated)	13
Total	**33**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing.

Trail Category	Total Miles
Hiking	41
Biking	27
Equestrian	27
X-Skiing	27
ATV I	1
ATV II	1
Snowmobile/ Joint Use Road	21

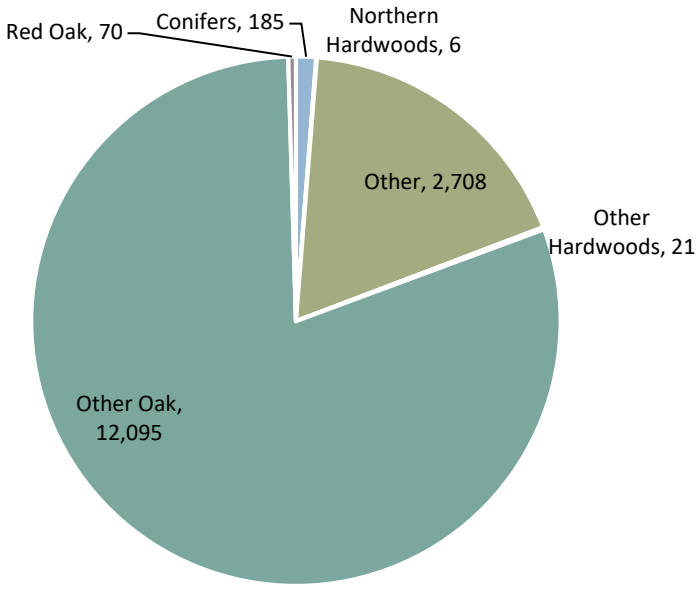


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

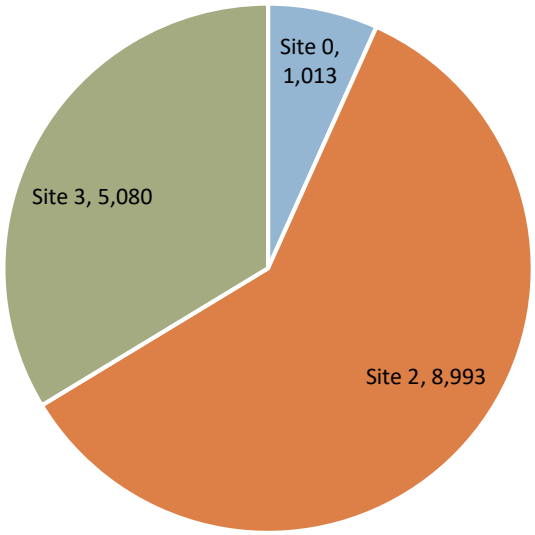


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

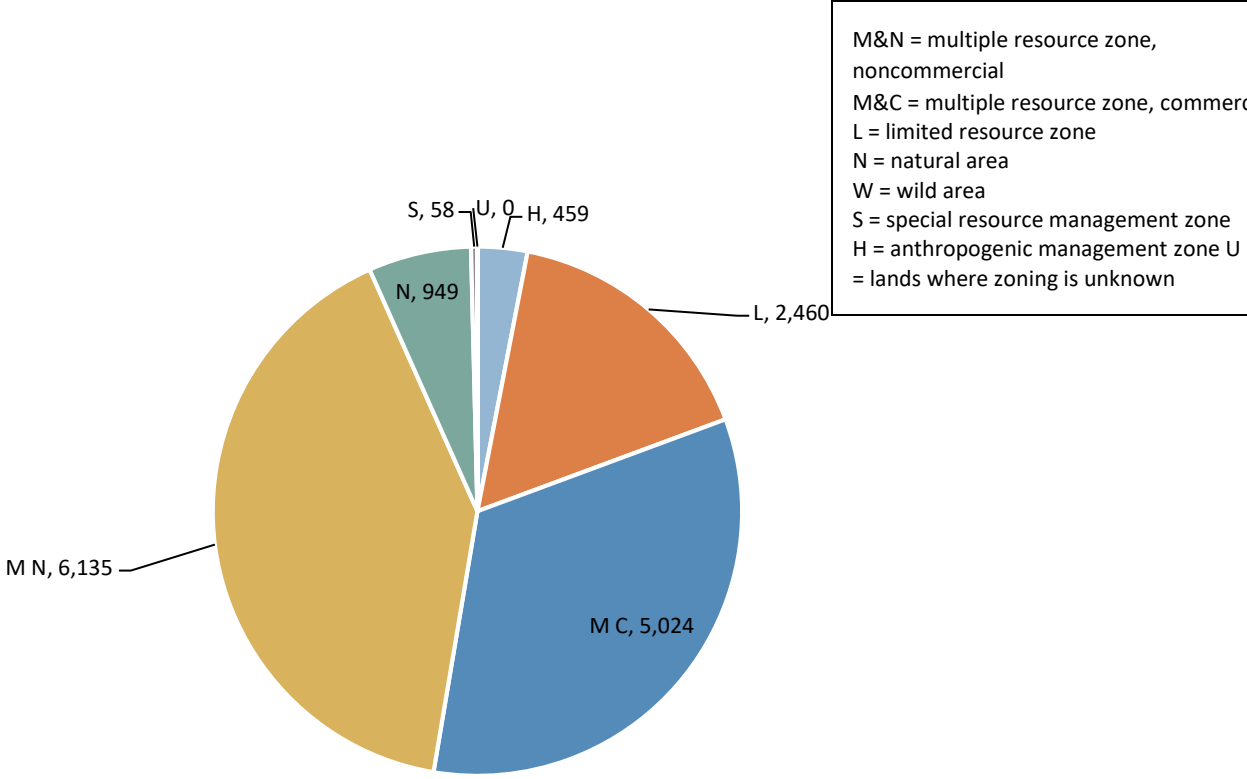


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

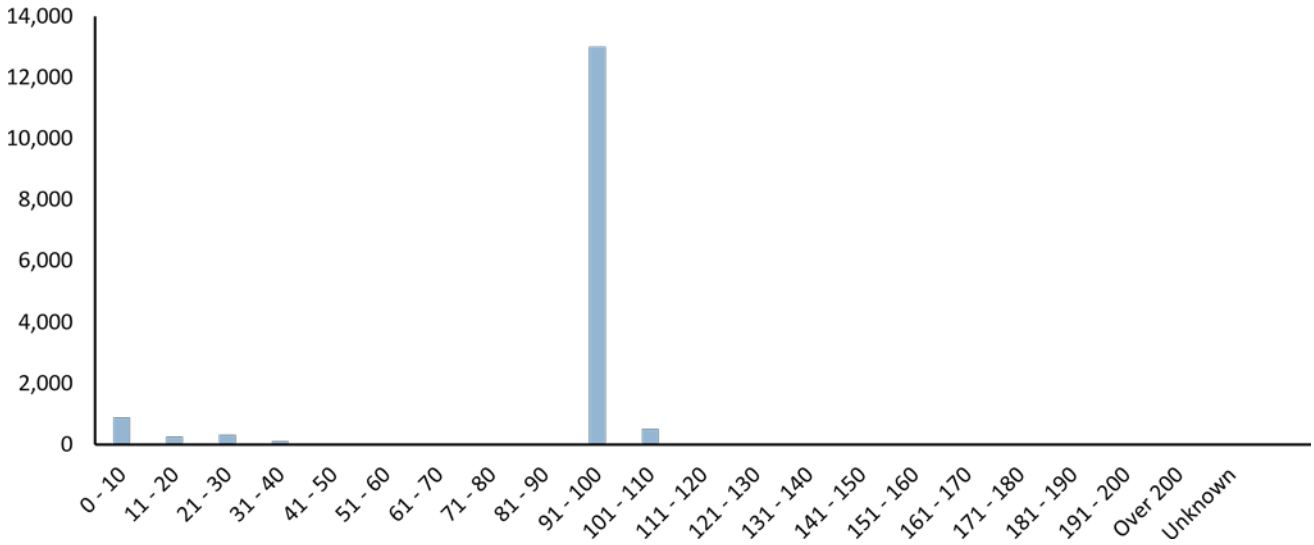


Figure 5. Acres of state forest land in this LMU by forest age classes.

The original composition of American chestnut, mixed oak, white pine, hemlock, sugar maple and beech was first harvested in the 1800's for ship masts, charcoal, homes, mines, and farmland. By 1900, following repeated clearcutting, the entire area was virtually treeless.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code. Water drains from the LMU to the Delaware River via the Shohola Creek, the Big Bushkill, and the Brodhead Creek.

Class	Total (miles)
Undesignated	0
High Quality Waters	101
Exceptional Value Waters	4
Natural Lake/ Pond	0
Total	**106**

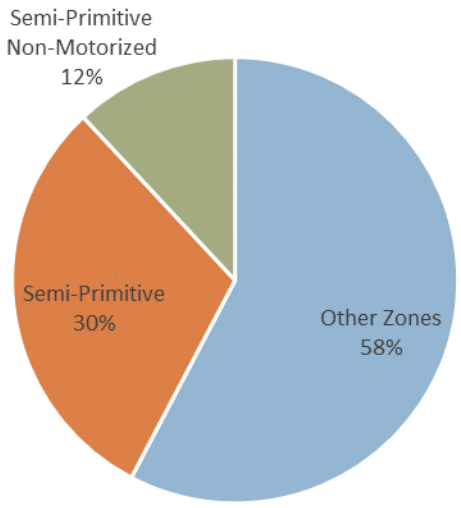
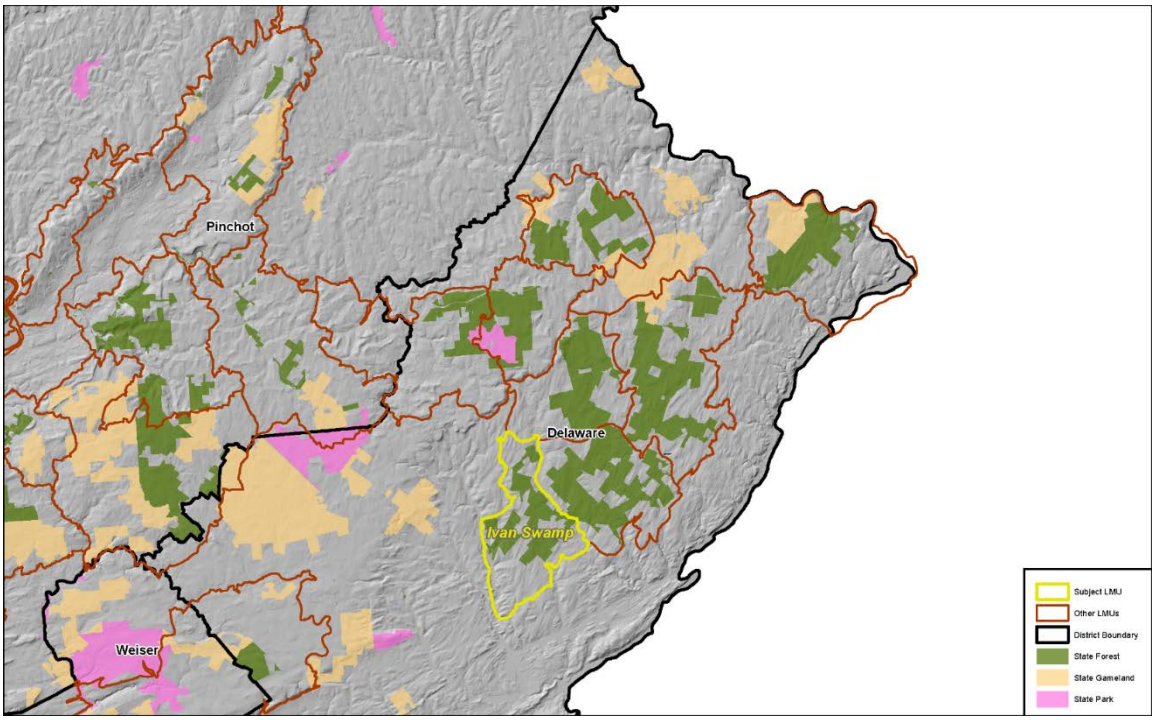


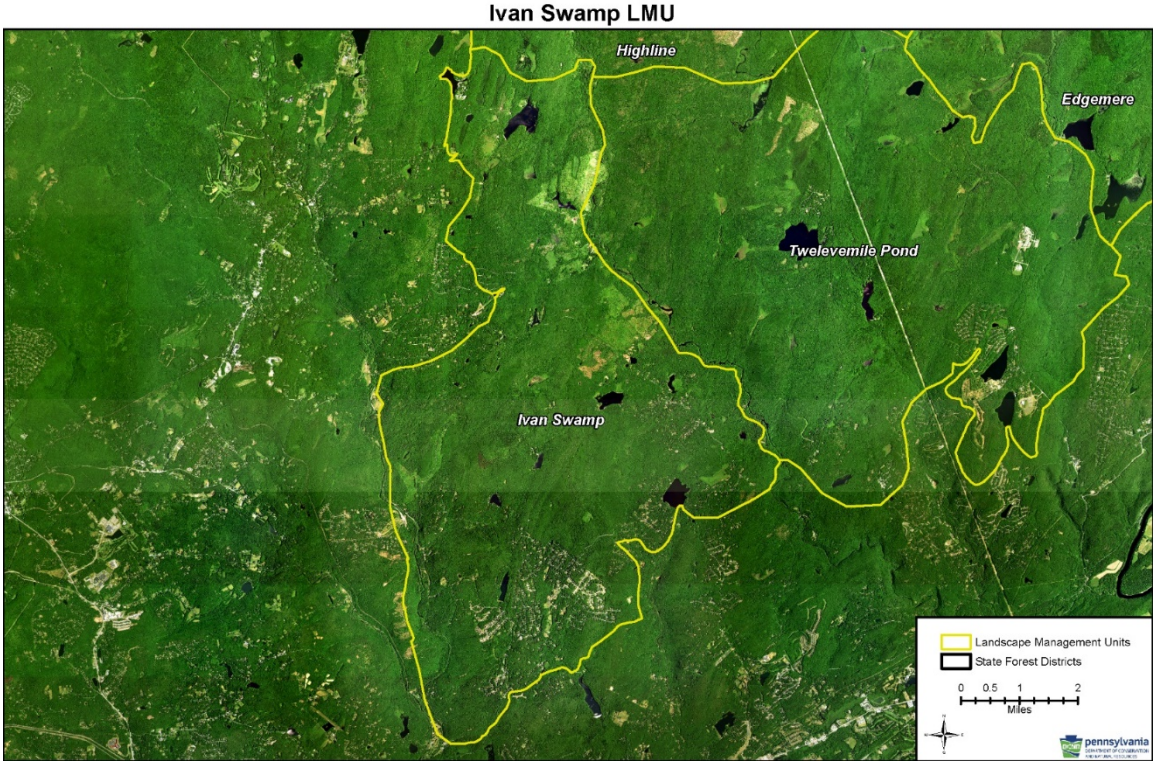
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

Ivan Swamp

Landscape Management Unit



Ivan Swamp LMU



Overview

The Ivan Swamp Landscape Management Unit (LMU) is located in northern Monroe County and a small portion of southwest Pike County. It lies in Barrett, Price, Middle Smithfield, and Porter townships. The LMU is 26,242 acres in size and has 8,141 acres of State Forest Land in it. The Ivan Swamp LMU lies in the Glaciated Low Plateau Ecoregion.

The Ivan Swamp LMU is 77% forested, with deciduous forest being the most common 73%. The LMU has numerous small
developments surrounding the lower two thirds of it and hunting clubs around the upper third. The developed areas make up 6% of the LMU. Most of the LMU is composed of small to medium size sawtimber trees in the 90 to 100 year old range. The northern part of the LMU was part of the large 16 Mile Run fire that burned close to 8,000 acres. In the northern part of the LMU along Browns Lake Road there have been numerous arson fires over the last decade along with the 16 Mile Run Fire.

The Snow Hill and Ivan Swamp areas of the Delaware State Forest were purchased in the early 1900's and the shape of the original purchases has remained the same. There has been no change to the boundary of the original purchases from over 100 years ago. One acquisition was added this year just to the east of Snow Hill. A CCC camp was located in the Snow Hill tract along the bottom of Laurel Run Road. The camp planted many Norway Spruce along Laurel Run Road and other places in the LMU. The CCC camp also created the Snow Hill Pond and other improvements in the area. Some remnants of the CCC Camp can still be found deep in the woods of the area. There are also many old bluestone quarries scattered throughout the LMU.

The LMU was devastated by Gypsy Moths in 2006, 2007, 2008, and somewhat in 2009. Large amounts of oak mortality occurred as a result. Many harvests were done since then to salvage the Gypsy Moth killed trees. Some of the harvests had over 90% oak mortality. Approximately 1200 acres of overstory removal and a couple hundred acres of shelterwood cuts were completed. There were timber harvests done in the late 90's along Ivan Swamp road that have regenerated into a mix of Birch and Red Maple. All of the recent salvage harvests are regenerating into mixed oak and are a great success.

The tract has 18.1 miles of snowmobile trails which are used little in the winter. Hunting and hiking are other popular recreational activities in the LMU. There are many roads and trails bisecting the LMU. There are many parking areas which allow access to the trails and State Forest Land.

Priority Goals

a) To conserve, manage, and enhance the wildlife habitats in the landscape and ecosystem.
b) To identify and implement strategies of forest acquisition to add valuable resources to the State Forest.
c) To identify, conserve, and enhance a diversity of habitats for plant species and their communities.
d) To research and gain information on the soils in the landscape.
e) Prioritize the maintenance and promotion of core forest conditions and values.

Profile

Table 1. LMU acreage: total and state forest land only.

SFL Acres: 8,141 Total LMU Acres: 26,242 Ecoregion: Glaciated Low Plateau

State forest land makes up approximately 30 percent of the land within this unit.

Land Cover (entire LMU)

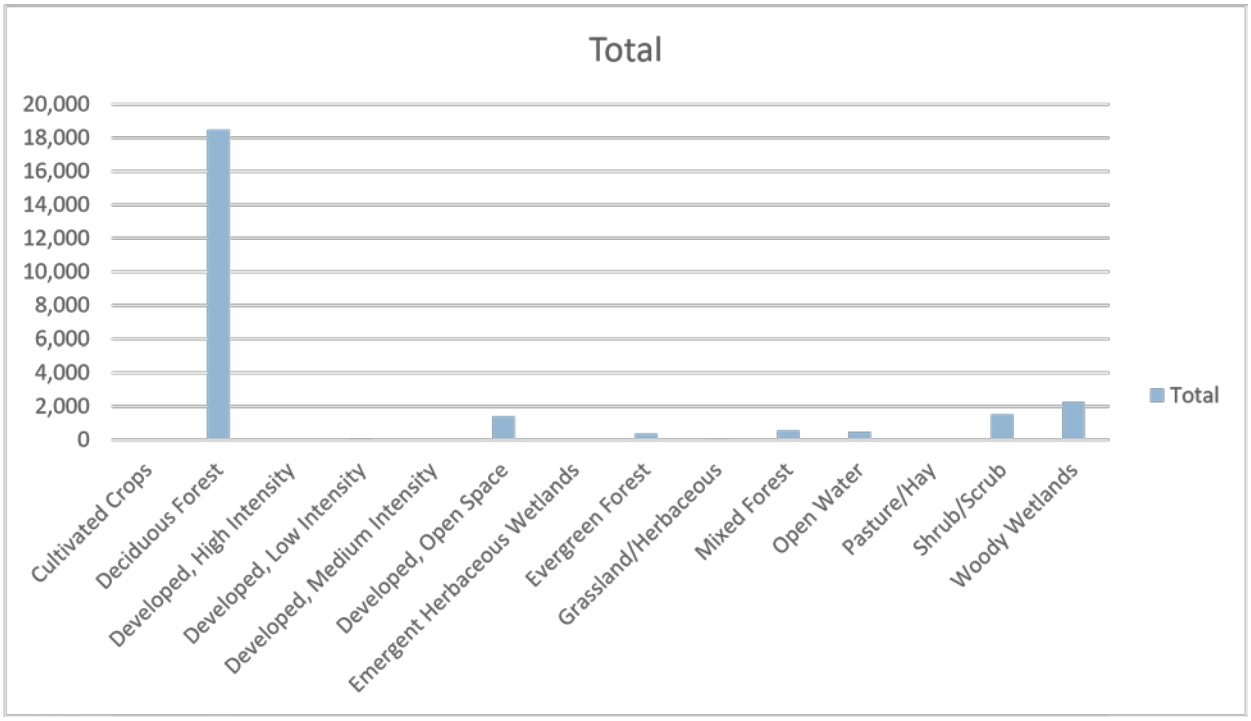


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. The Ivan Swamp LMU land cover is comprised predominantly of undeveloped open forest lands with a limited amount of dispersed residential developments. Across this unit there are often pockets of wetlands including both open and forested swamps.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP.

Roads and Trails

Road Category	Total Miles
Z1 - Public Use Road	11
Z3 - Administrative Road (gated)	9
Total	**20**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing.

Trail Category	Total Miles
Hiking	24
Biking	22
Equestrian	22
X-Skiing	22
ATV I	0
ATV II	0
Snowmobile	18
Joint Use	3
Total	**111**

Recreational trails are available and established at a moderate level throughout this unit. This is a typical amount of dispersed recreational trails for the region and the Delaware Forest district.

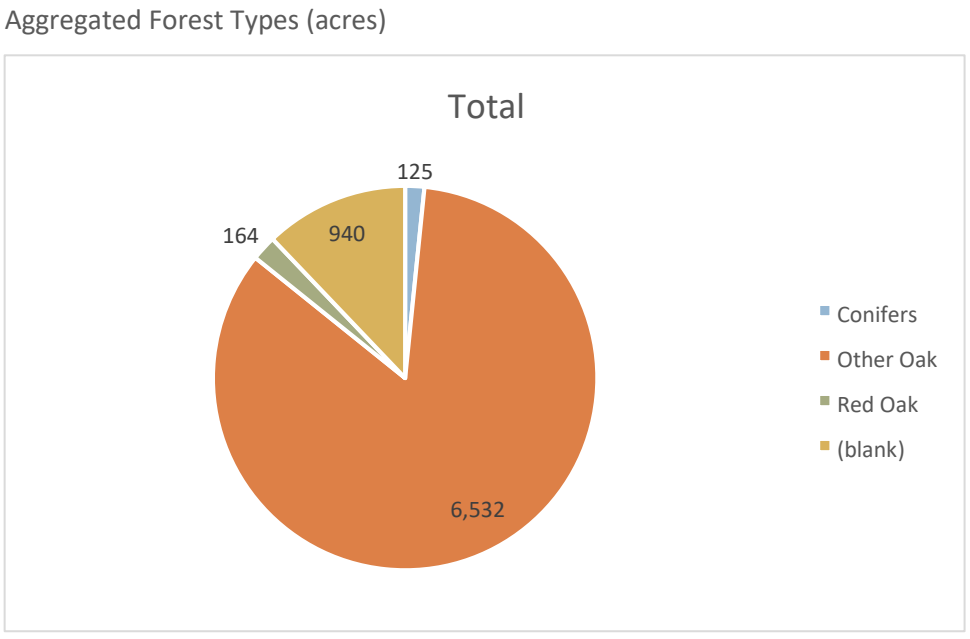


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

This unit is mostly composed of a mixed-oak forest type with lesser amounts of wetlands, red oak, and coniferous forest types. This distribution of forest types is typical for the region and forest district.

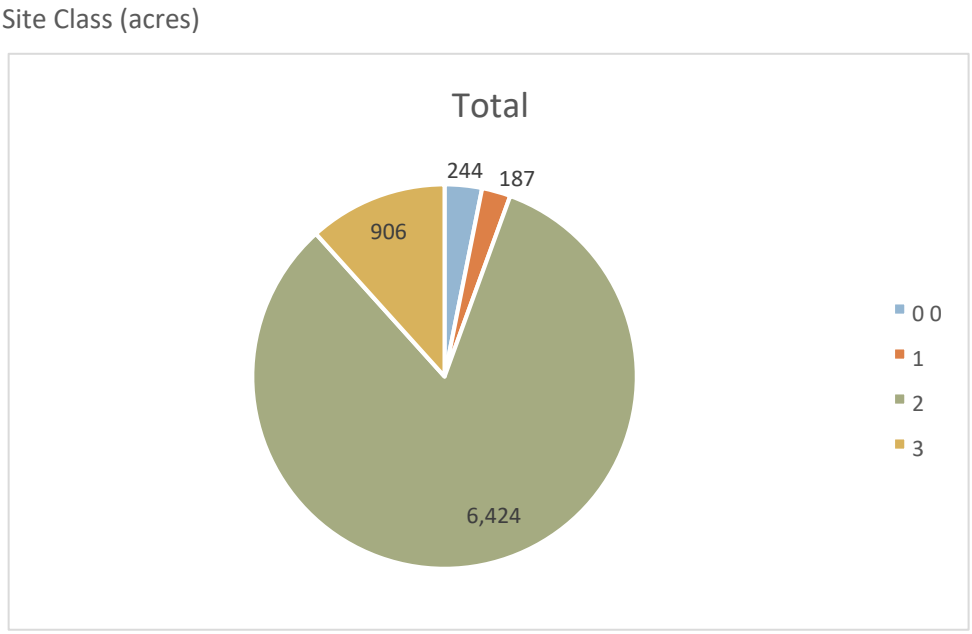


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

The majority of this unit classified as a Site 2 with lesser amounts of Site 3, Site 1, and Site 0. A Site Class of 2 depicts a forest type that can produce average timber quality with limited restrictions. This distribution is typical for the region and the forest district, however, other LMU's may have a lesser abundance of Site 2's and a greater abundance of Site 1's.

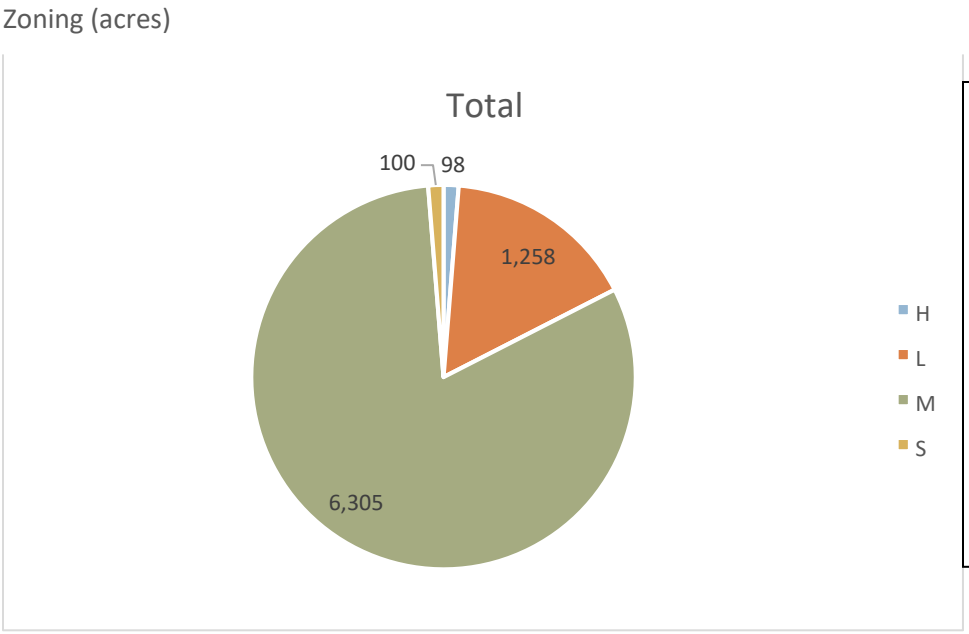


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

The majority of this unit is zoned as a multiple resource zone where most management and forest-use activities may be permitted.

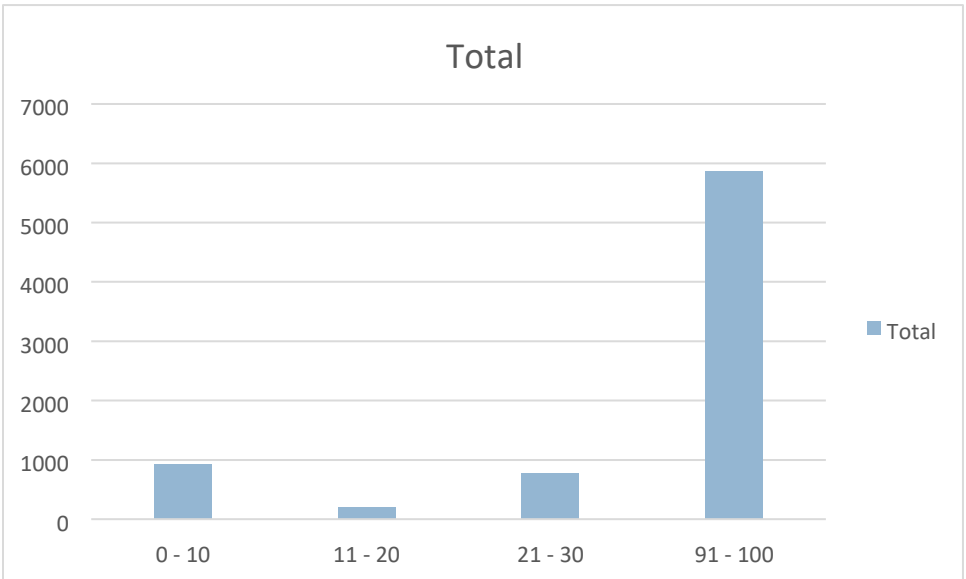


Figure 5. Acres of state forest land in this LMU by forest age classes.

Typical of this region and much of Pennsylvania's forest lands, the majority of this unit has a forest age-class in the 91-100 year range.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code.

Streams by Class

Class	Total Miles
Exceptional Value	9.2
High Quality	38.3
Warm Water Stream	1.6
Total	**49.1**

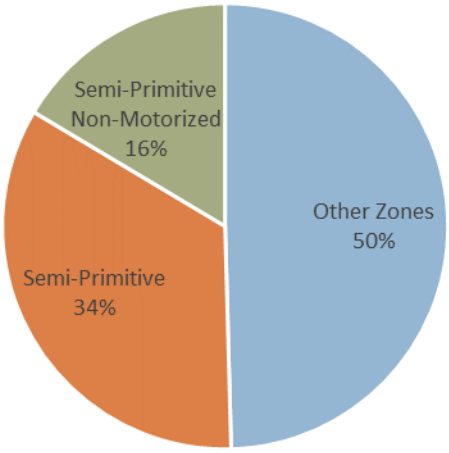
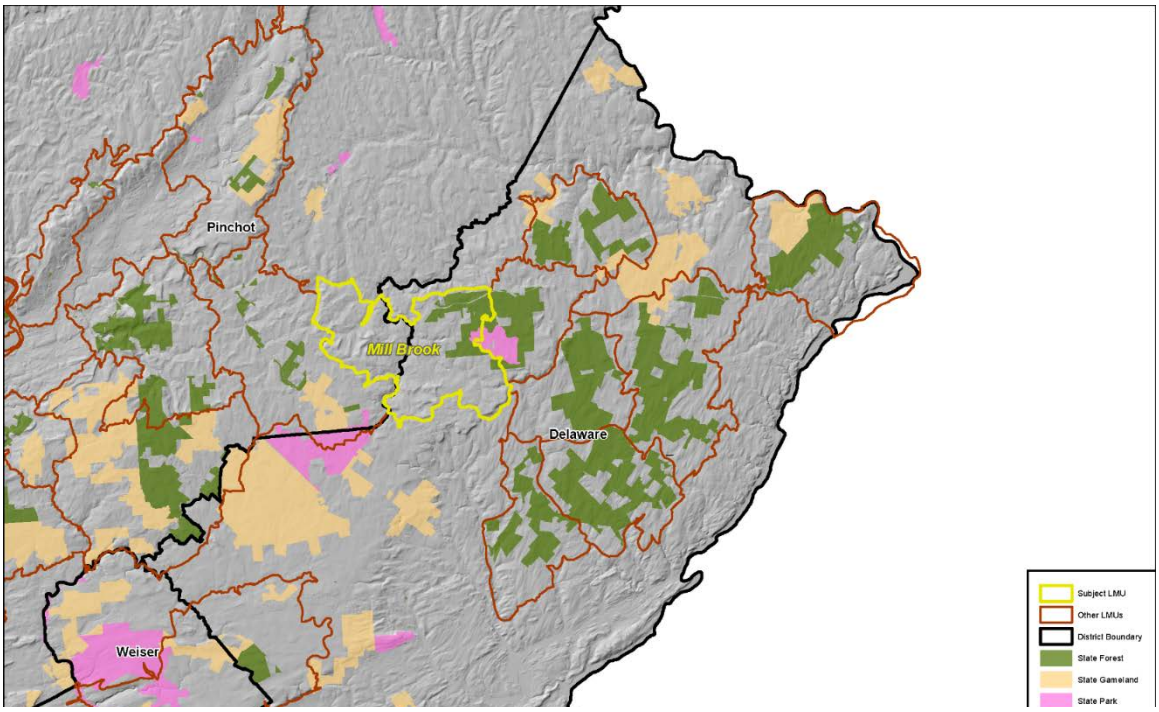


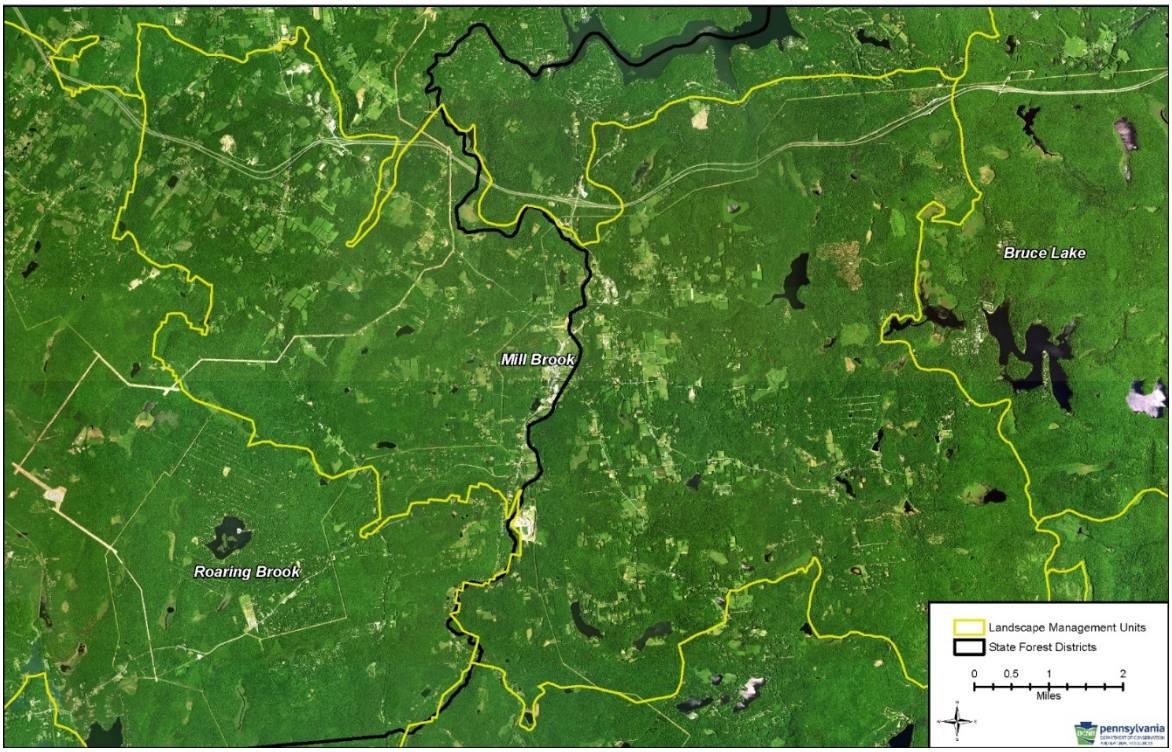
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

Millbrook

Landscape Management Unit



Mill Brook LMU



Overview

The Millbrook Landscape Management Unit (LMU) is an intriguing landscape in the western portion of the Delaware Forest District and the eastern portion of the Pinchot Forest District. The Millbrook LMU encompasses 44,594 acres including 5,209 acres of the Delaware State Forest in Pike County. The LMU is located in the Glaciated Pocono Plateau and Glaciated Low Plateau ecoregions. Situated on a plateau, the Millbrook LMU features dozens of boreal swamps, numerous high quality streams, many small farm fields, the small village of Newfoundland, and a large number of rural homes.

The extreme eastern portion of this LMU is primarily large tracts of forestland harboring abundant game species such as black bear, white-tailed deer, turkey, snowshoe hare, fisher, bobcat, and coyote. Numerous species of songbirds such as rufous-sided towhees and Baltimore orioles and waterfowl such as black ducks and wood ducks are also present. Rattlesnakes are also present in the LMU's southeastern section. Elevations range from 1200' to 2015'. Interstate 84 transects the extreme northern portion of this LMU in an east/west direction. The central portion of this LMU is mainly rural and small town housing associated with the village of Newfoundland. The western portion of this LMU is rural housing, small farm fields, and woodlots. Except for a narrow sliver of mixed oak with a heath understory on the LMU's extreme eastern edge, this LMU is comprised primarily of northern hardwood forest. The Millbrook LMU is severed diagonally from southwest to northeast by a large electric transmission line owned by PPL Corporation. In general, the Millbrook LMU soils are very stony in the uplands and mucky peat in the wetlands. Water drains from the LMU to the Delaware River via the Wallenpaupack Creek to the Lackawaxen River, and via the Brodhead Creek.

Prior to European settlers, this LMU was the hunting grounds for the Minsi Tribe of the Wolf Clan of the Lenni Lenape American Indians (Delaware). Following the ownership by the American Indians, European early settlers of the area logged the large conifers and hardwoods and erected sawmills to process the wood. Farmland, some of which is still existing in this LMU, was developed following the initial logging of the forest. The original composition of American chestnut, mixed oak, white pine, hemlock, sugar maple and beech was first harvested in the mid 1800's for ship masts, charcoal, homes, mines, and farmland. By 1900, following repeated clearcutting, the entire area was virtually treeless.

On Sunday evening, May 31, 1998, an F-2 tornado with winds of 113 -157 mph struck the eastern portion of this LMU. The tornado flattened hundreds of acres of state forest timberland on the eastern side of this LMU.

In the LMU's oak stands, gypsy moth defoliations since the 1970's have ranged from extremely severe to no defoliation at all. Frequency of severe defoliations has decreased substantially since the 1970's. In the LMU's northern hardwood stands, forest tent caterpillar and maple leaf-roller defoliated and killed many acres of sugar maple in this LMU around 2010 . The emerald ash borer has recently become established in this LMU, so tremendous mortality of ash is expected. In addition, the hemlock woolly adelgid has been impacting mature hemlock trees in the region. The Millbrook LMU contains many invasive species including Japanese barberry, Japanese stiltgrass, *Phragmites*, tree-of-heaven, Japanese angelica tree,Tatarian honeysuckle, multi-flora rose, and autumn olive.

Recreational activities on the state forest portion of the LMU attract visitors from nearby towns and major cities including New York City, Allentown, and Philadelphia. Many visitors also come from New Jersey. The nearby Promised Land State Park, which is located in the adjacent LMU, is the key attraction for conservation-minded recreationists. Promised Land State Park is one of the most visited parks in Pennsylvania and offers camping, cabins, hiking, horseback riding, snowmobiling, fishing, boating, hunting, biking, and birdwatching. The Delaware State Forest that surrounds Promised Land State Park offers similar recreational opportunities with the exception of camping but with the addition of trapping and dog training. The Pine Lake Natural Area on the Delaware State Forest excludes motorized recreation, biking, and horseback riding.

Priority Goals

a) Manage the commercial portion of the state forest using sustainable timber management to provide wood products for the economy, habitat for wildlife, and desirable trees for future generations.

b) Manage the state forest to provide abundant recreational opportunities to all citizens, including the visitors to Promised Land State Park.

c) Protect the water quality of the Delaware River watershed.

d) Protect the serenity, wild plant production, and recreational opportunities that are provided in the Pine Lake Natural Area.

Profile

Table 1. LMU acreage: total and state forest land only.

	Acres
State Forest Land	5,209
LMU Total	44,594

Ecoregion: Glaciated Pocono Plateau and Glaciated Low Plateau

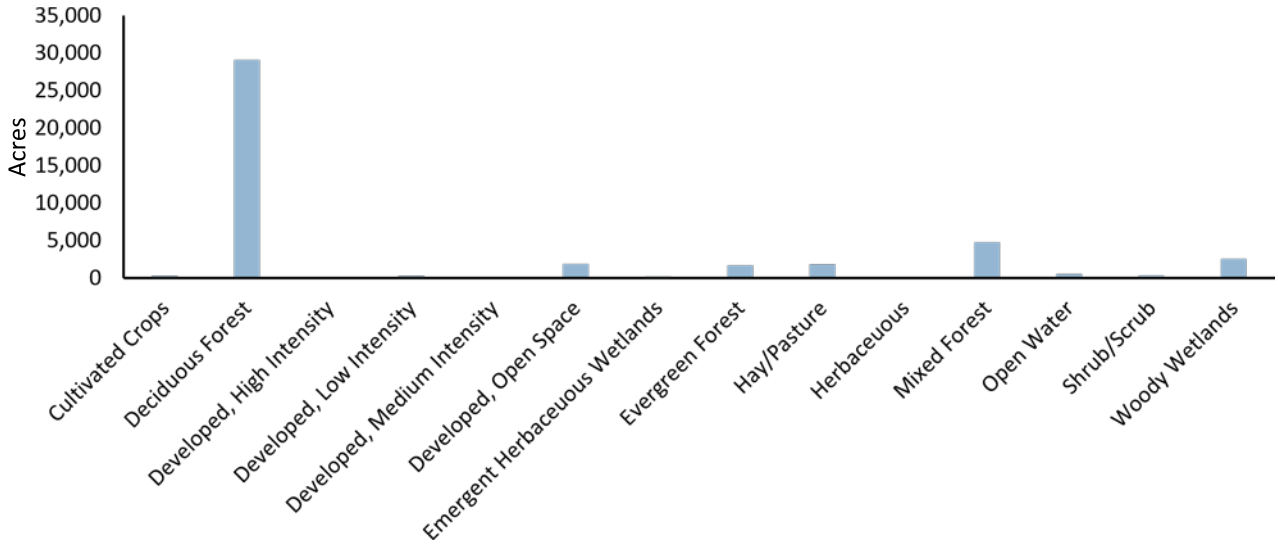


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. Situated on a plateau, the Millbrook LMU features dozens of boreal swamps, numerous high quality streams, many small farm fields, the small village of Newfoundland, and a large number of rural homes.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP.

Road Category	Total Miles
Z1 - Public Use Road	10
Z3 - Administrative Road (gated)	10
Total	**20**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing.

Trail Category	Total Miles
Hiking	25
Biking	24
Equestrian	24
X-Skiing	24
ATV I	0
ATV II	0
Snowmobile/ Joint Use Road	18

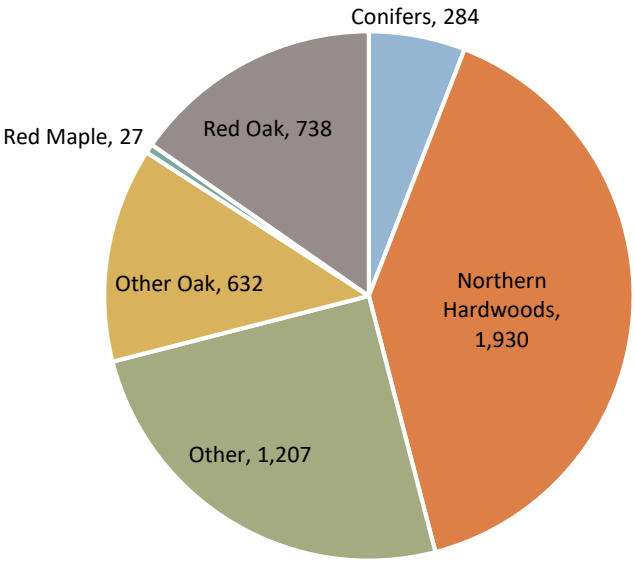


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. Except for a narrow sliver of mixed oak with a heath understory on the LMU's extreme eastern edge, this LMU is comprised primarily of northern hardwood forest.

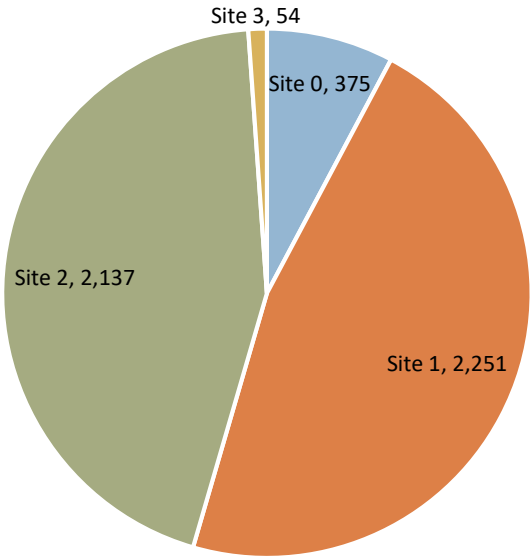


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

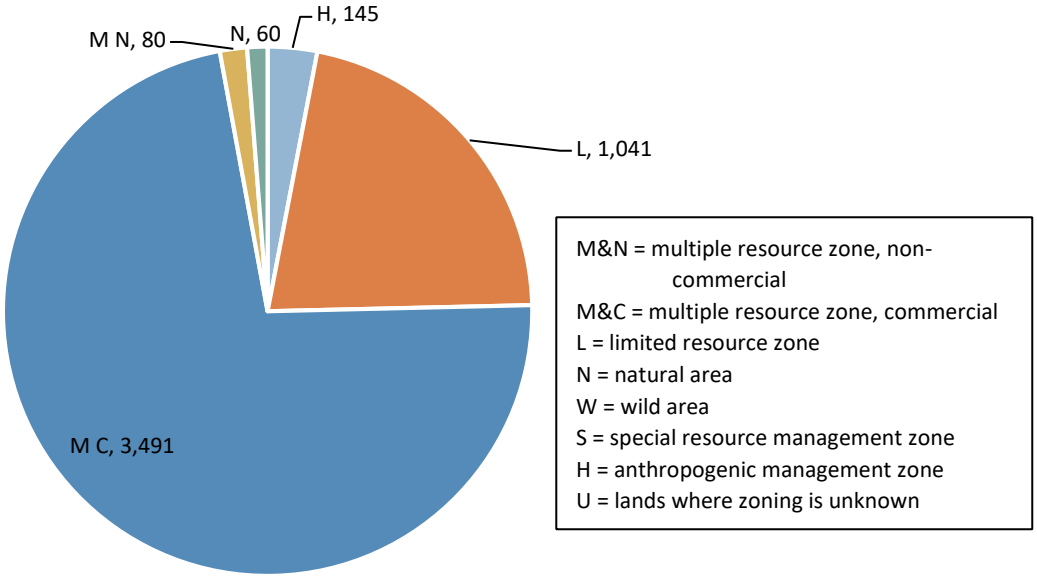


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

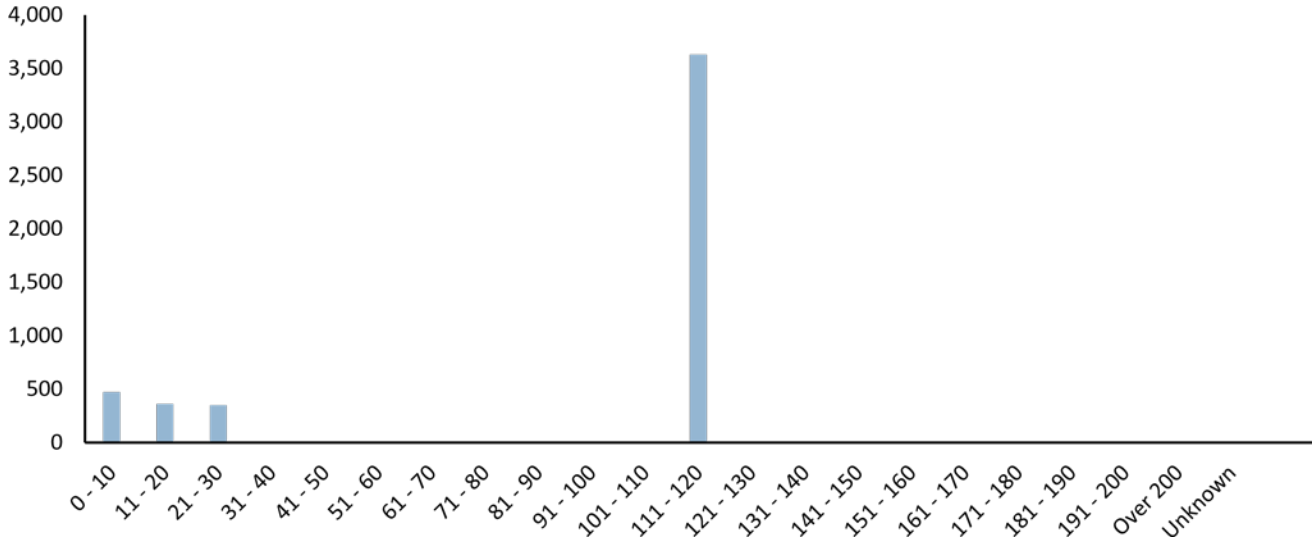


Figure 5. Acres of state forest land in this LMU by forest age classes. By 1900, following repeated clearcutting, the entire area was virtually treeless.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code.

Class	Total (miles)
Undesignated	2
High Quality Waters	115
Exceptional Value Waters	20
Natural Lake/ Pond	1
Total	**138**

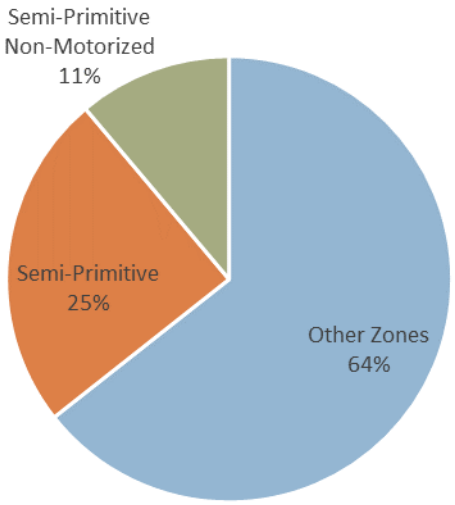
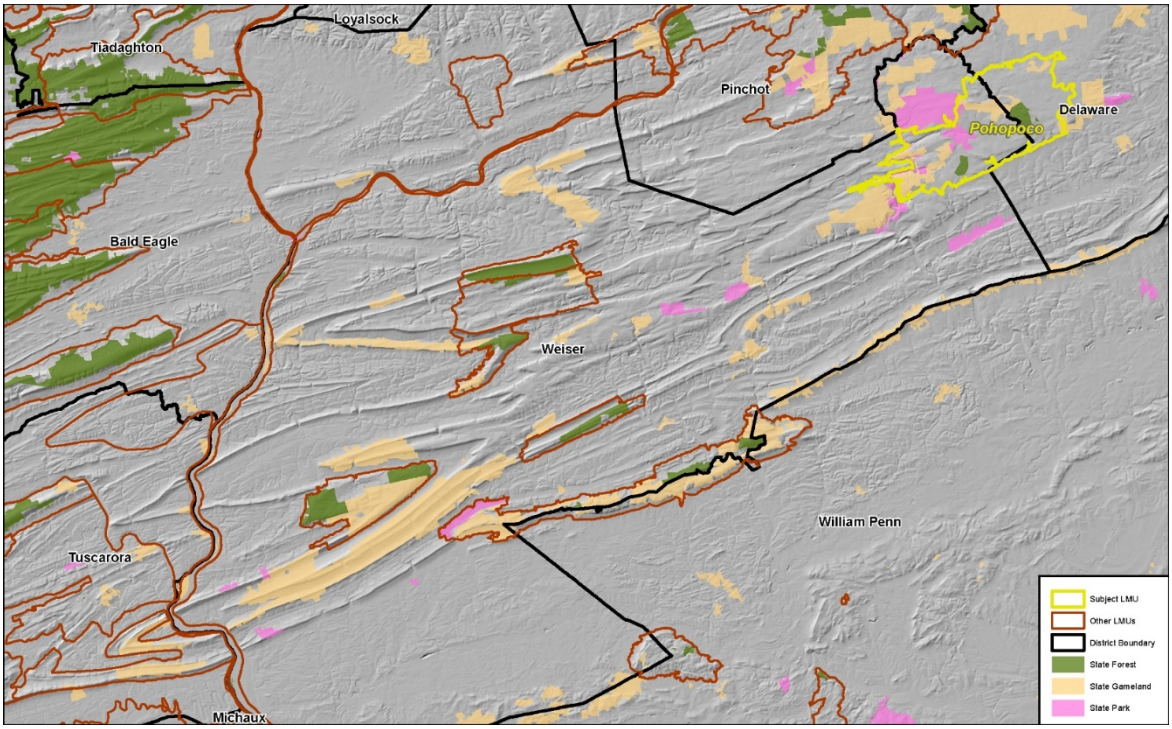


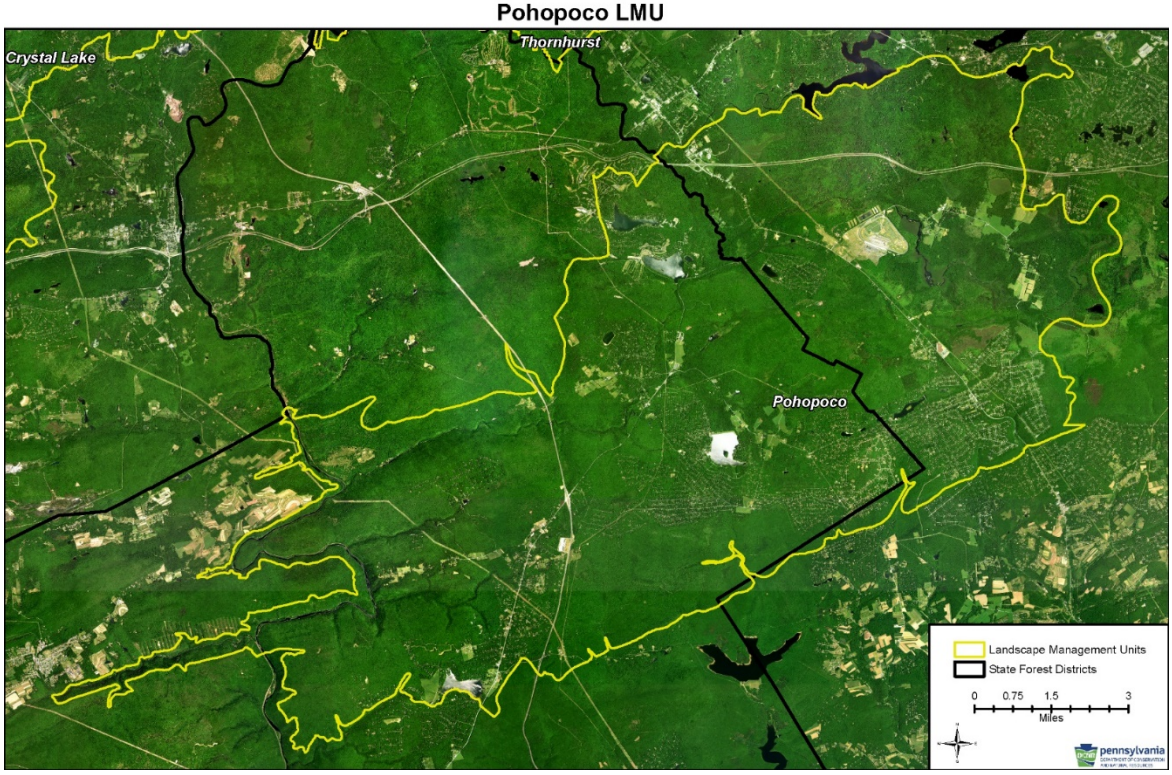
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

Pohopoco

Landscape Management Unit



Pohopoco LMU



Overview

The Pohopoco Landscape Management Unit (LMU) is located in Monroe and Carbon counties. The LMU is 74,298 acres in size and has 3,087 acres of State Forest Land in it. The LMU has parts of the Delaware State Forest, Weiser State Forest, Hickory Run
State Park, Lehigh Gorge State Park, and State Gamelands # 38, 318, 141, and 129. The Pohopoco LMU lies in the Glaciated Pocono Plateau and Ridge and Valley Ecoregion.

The Pohopoco LMU is 80% forested, with deciduous forest being the most common 58%. The LMU has a couple large housing developments in the southeastern portion of it. They make up 14% of the LMU. Most of the LMU is composed of smaller size class trees and scrubs in the 60 to 70 year old range. Much of the eastern portion of the LMU was burned repeatedly until the 1950's. The Pohopoco fire tower was used until recently for spotting wildfires. Scrub oak is a major component of the area.

The Dixon Miller tract of the Delaware State Forest was purchased in the mid 1940's as an experimental hydrological tract. It was named the Dilldown project of the Delaware – Lehigh Experimental forest. It was studied by the US Department of Agriculture and Interior. Many areas were planted with Red Pine, White Pine, and Larch to control the wildfires. Numerous other species were planted throughout the experimental forest and did not survive. The area had numerous weather stations, ground water stations, and a stream flow station. The tract has a well know frost pocket that is inhabited by little vegetation because of the cold temperatures. The tract was renamed the Dixon Miller Recreation Area after the long time towerman who live there for decades.

There has only been one recent timber harvest on the Dixon Miller tract. It was 250 acres of row thinning in the pine plantations. The tract has 15 miles of ATV snowmobile trails which are used heavily throughout the year. The tract has abundant illegal ATV use. The southern portion of the trail system was redone a couple years ago. Hunting and hiking area other popular recreational activities in the LMU. There are numerous species of special concern in the LMU. Most of the Dixon Miller tract is non-commercial land base. This is because of the poor quality timber, steepness, and rocky areas.

Priority Goals

a) Maintain the Dixon Miller Recreation area as a low density recreational opportunity area while protecting the valuable natural resources.

b) To conserve, manage, and enhance the wildlife habitats in the landscape and ecosystem.

c) To identify, conserve, and enhance a diversity of habitats for plant species and their communities.

Profile

Table 1. LMU acreage: total and state forest land only.

SFL Acres: 3,087 Total LMU Acres: 74,298 Ecoregion: Glaciated Pocono Plateau

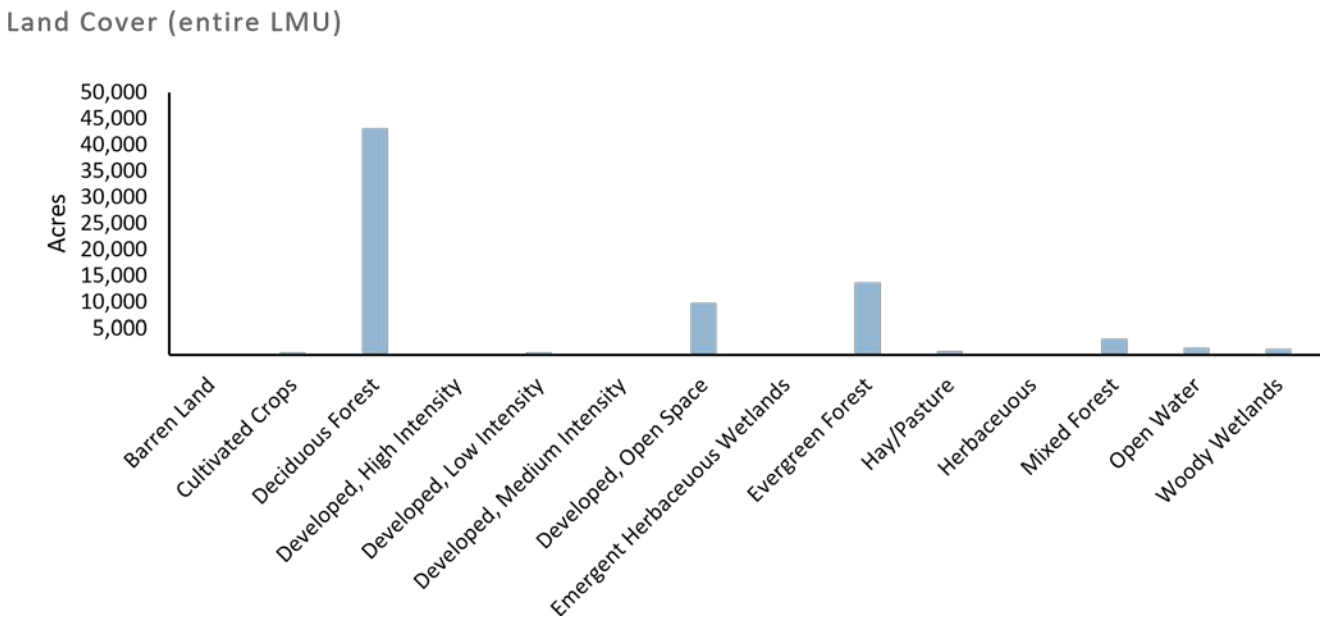


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. Situated atop the Pocono plateau, the Pohopoco LMU is composed of predominantly forested lands with a mixture of residential, light commercial, and agricultural lands. Two prominent features are the Long Pond bog-swamp complex and the Pocono Raceway.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP.

Road Category	Total Miles
Z1 - Public Use Road	1
Z3 - Administrative Road (gated)	6
Total	**7**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing.

Trail Category	Total Miles
Hiking	36
Biking	29
Equestrian	29
X-Skiing	29
ATV I	15
ATV II	15
Snowmobile	15
Joint Use	0
Total	**169**

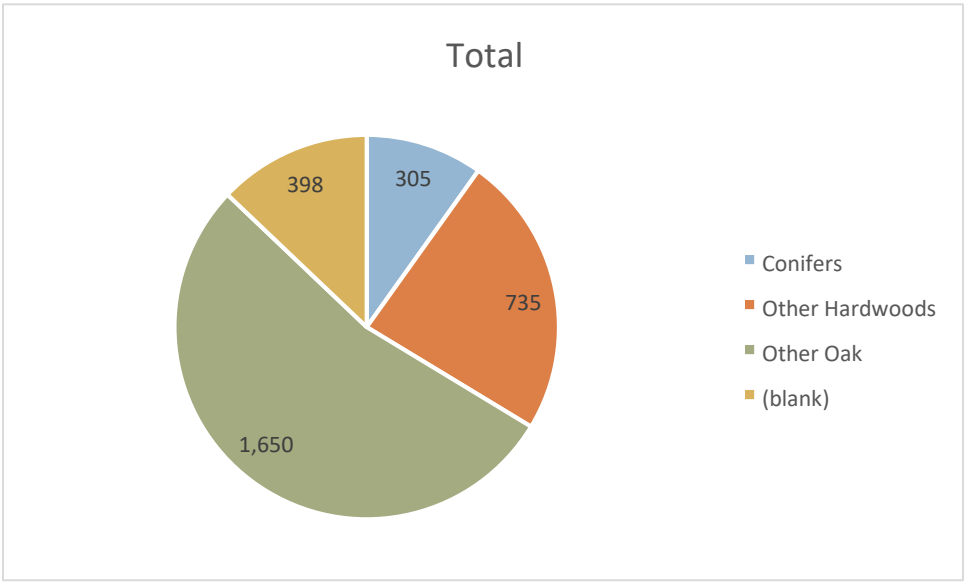


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. Approximately half of this unit is made up of mixed-oak forestlands and the remaining half is a mixture of northern hardwoods, forested wetlands, and coniferous forests.

Site Class (acres)

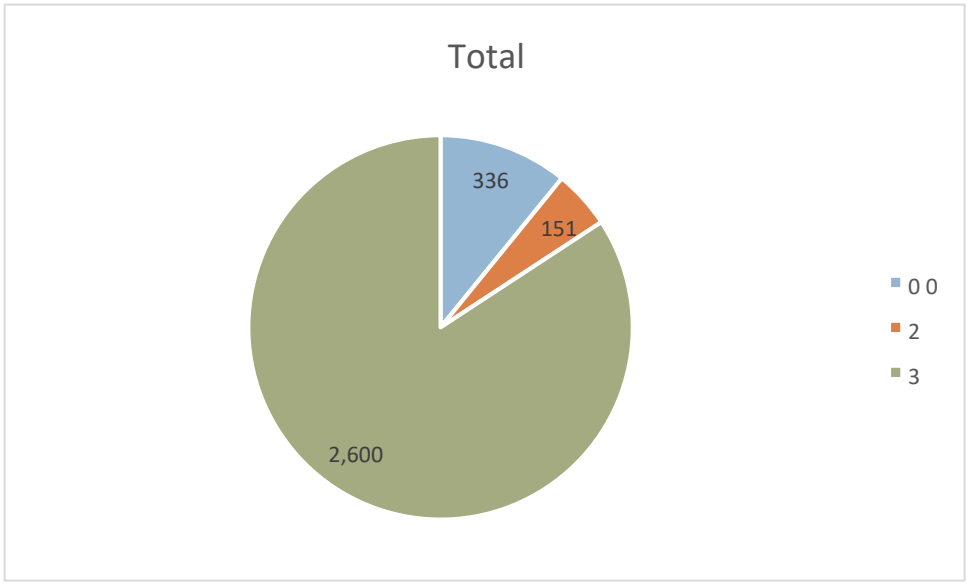
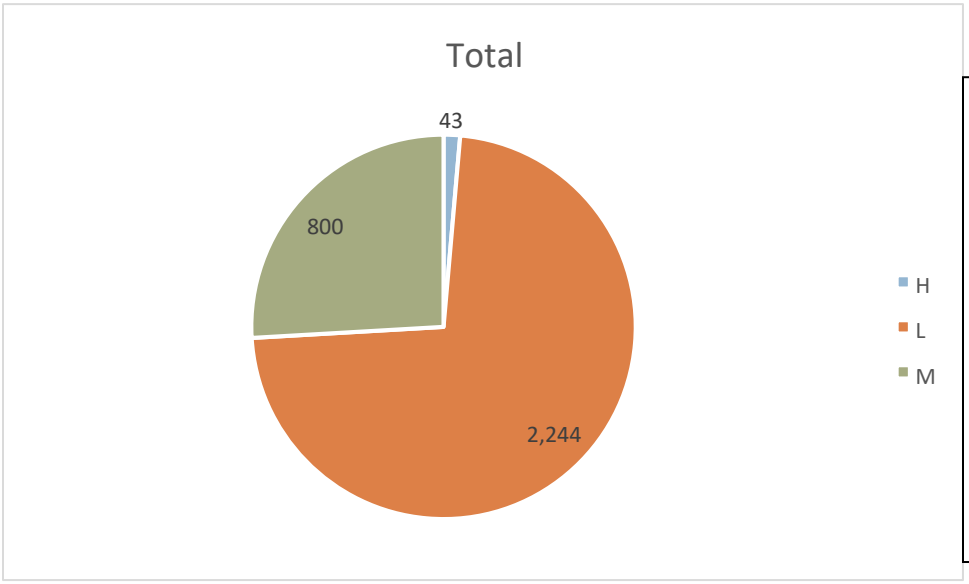


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

Zoning (acres)



M&N = multiple resource zone, non-commercial

M&C = multiple resource zone, commercial

L = limited resource zone

N = natural area

W = wild area

S = special resource management zone

H = anthropogenic management zone

U = lands where zoning is unknown

Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

Forest Age Class Distribution

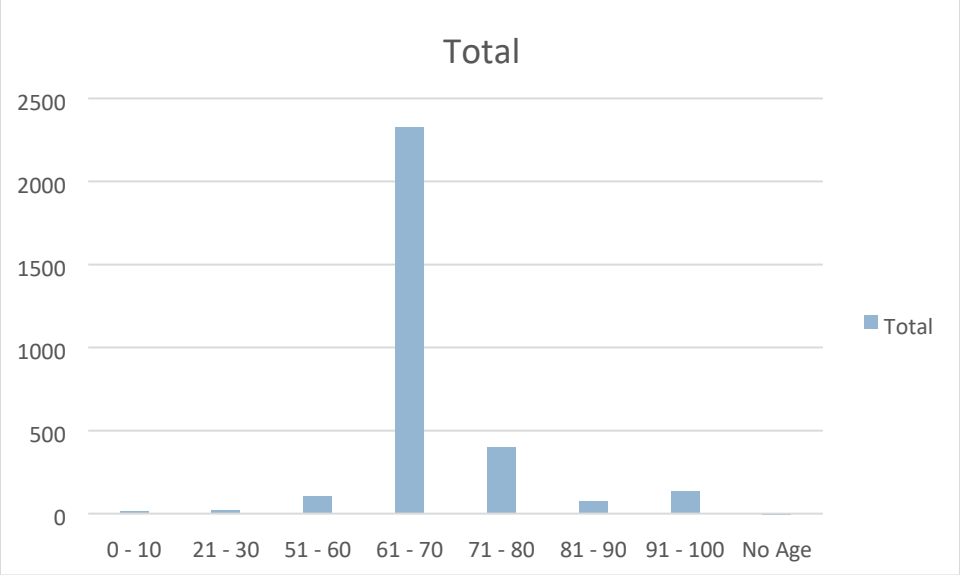


Figure 5. Acres of state forest land in this LMU by forest age classes.

Due to a high propensity of wildfires in the mid to late 1900's, and the regions mixed forest types, much of the forest has a younger age class than typically found throughout Pennsylvania's forest lands.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code.

Streams by Class

Class	Total Miles
Exceptional Value	11.8
High Quality	114.1
Warm Water Stream	16.2
Total	**142.1**

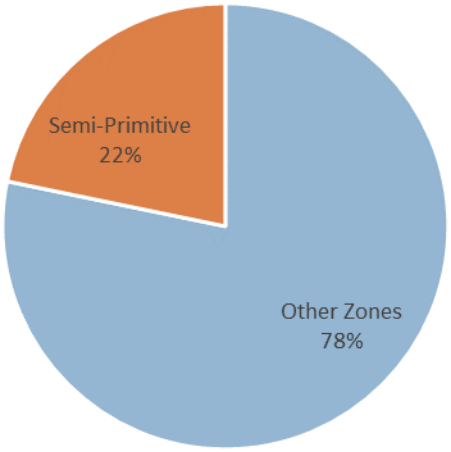
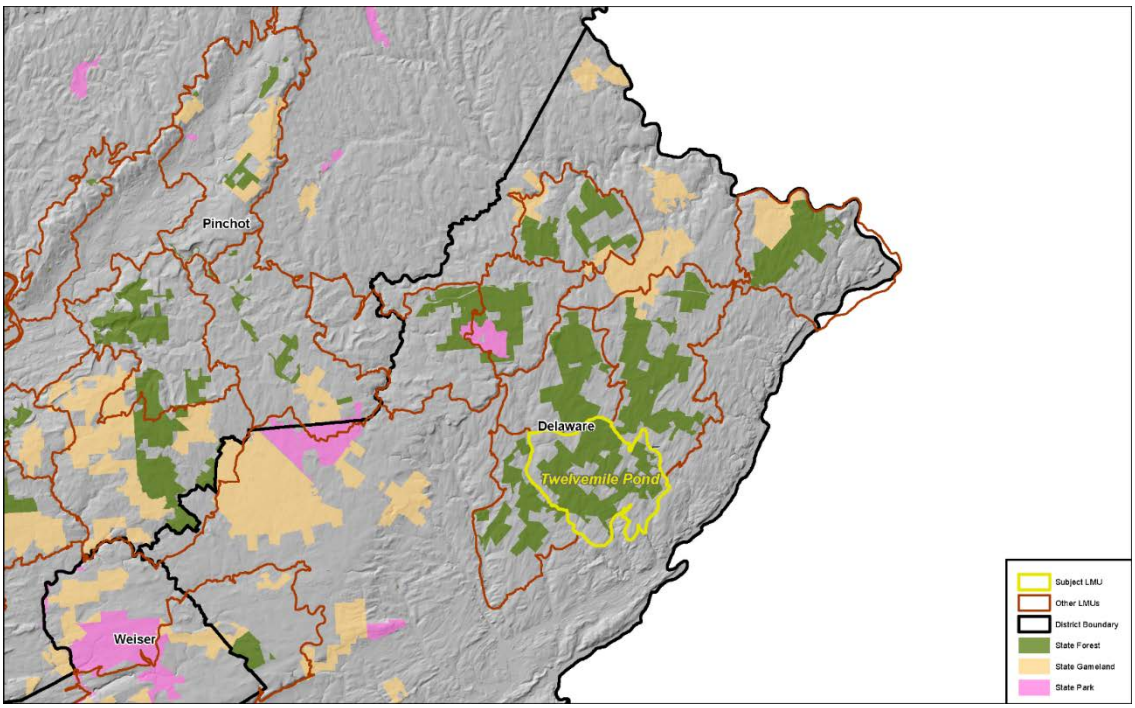


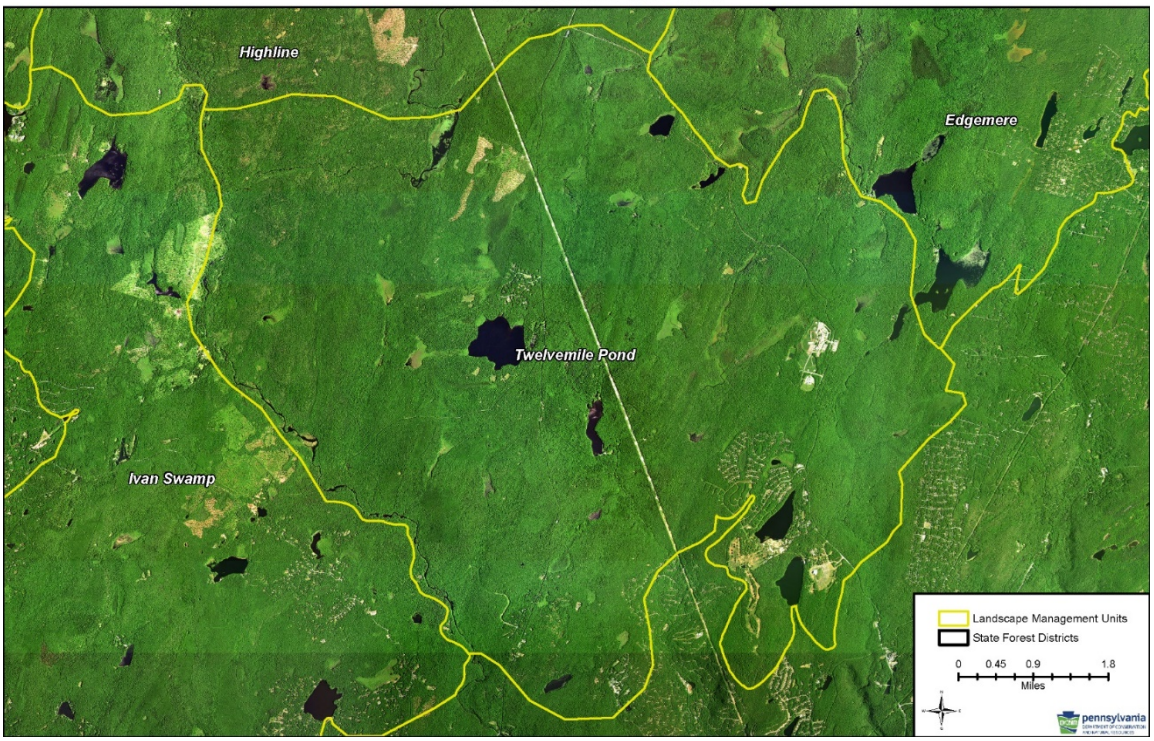
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

Twelve Mile Pond

Landscape Management Unit



Twelvemile Pond LMU



Overview

The Twelvemile Pond Landscape Management Unit (LMU) is located in southern Pike County. It lies in Porter township. The LMU is 31,515 acres in size and has 16,174 acres of State Forest Land in it. The Twelvemile Pond LMU lies in the Glaciated Low Plateau Ecoregion.

The Twelvemile Pond LMU is 81% forested, with deciduous forest being the most common 80%. Evergreen forest is lacking
in this LMU and makes up only .08% of the area, making this a prime place for plantings in the future. The LMU has a couple developments bordering it in the southwest corner. There are large hunting clubs that surround the rest of the LMU. There are also hunting clubs that are inholdings in the LMU and the East Stroudsburg North school that is an inholding in the eastern side. Most of the LMU is composed of small to medium size sawtimber trees in the 90 to 100 year old range.

The Twelvemile Pond LMU in the Delaware State Forest was purchased in the early 1900's. There have been a couple land acquisitions added to the area in the last 20 years and one this year. There has been very little change to the boundary of the original purchases from over 100 years ago. The Pennel Run natural area is 949 acres and lies in the western part of the LMU. There are numerous old bluestone quarries scattered throughout the LMU. There are many wetlands, stream, and vernal pools in the LMU. The large Sixteenmile Run fire was contained in the western portion of the LMU, along the Pennel Run natural area boundary.

The northern half of the LMU was devastated by Gypsy Moths in 2006, 2007, 2008, and somewhat in 2009. Large amounts of oak mortality occurred as a result. Many harvests were done since then to salvage the Gypsy Moth killed trees. Some of the harvests had over 90% oak mortality. Approximately 900 acres of overstory removal cuts were completed. The timber has been actively managed in the LMU for many years. The area had many fences erected from 10 to 15 years ago. Most of the fences have been removed and the deer population is now under control. Most of the past timber sales and all of the more recent timber sales have regenerated successfully into mixed oak and hickory.

The tract has 24 miles of hiking trails, which includes the Thunder Swamp State Hiking Trail. The trails are used often in the summer time. Hunting and bird watching are other popular recreational activities in the LMU. People come from many miles away to see the Golden Winged Warbler, which is an at risk species that prefers the timber management on the Delaware State Forest. There are numerous leased cabins in the unit. There are many roads and trails bisecting the LMU. There are many parking areas which allow access to the trails and State Forest Land.

Priority Goals

a) To conserve and manage the natural resources through sustainable practices.
b) To identify and implement strategies of forest acquisition to add valuable resources to the State Forest.
c) To identify, conserve, and enhance a diversity of habitats for plant species and their communities.
d) Maintain the Twelvemile Pond tract as a low density recreational opportunity area while protecting the valuable natural resources. Prioritize the maintenance of wild character and promote opportunities for primitive recreation experiences.

e) Prioritize the maintenance and promotion of core forest conditions and values.

Profile

Table 1. LMU acreage: total and state forest land only.

SFL Acres: 16,174 Total LMU Acres: 31,515 Ecoregion: Glaciated Low Plateau

Land Cover (entire LMU)

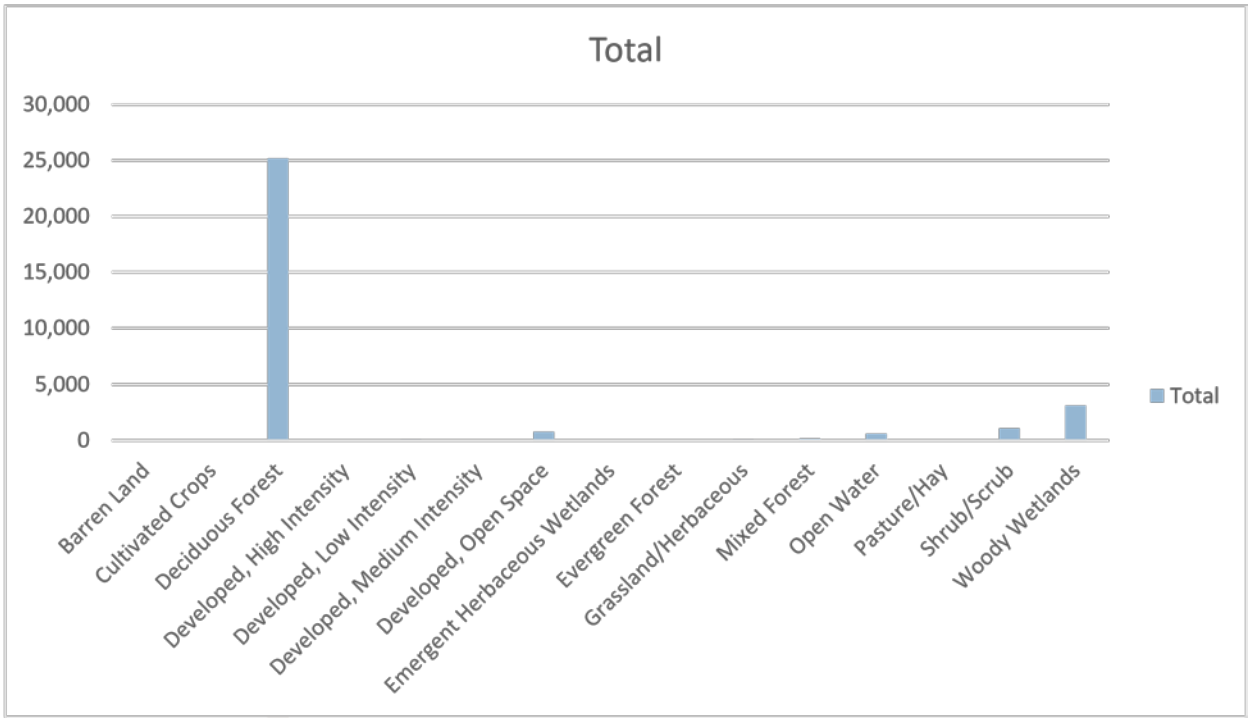


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. The majority of land in this unit is composed of deciduous forests with a mixture of wetlands, wetland forests, and a limited amount of light residential development. More than half of this land management unit is comprised of state forest lands.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP.

Road Category	Total Miles
Z1 - Public Use Road	16
Z3 - Administrative Road (gated)	17
Total	**33**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing.

Trail Category	Total Miles
Hiking	24
Biking	11
Equestrian	11
X-Skiing	11
ATV I	2
ATV II	2
Snowmobile	8
Joint Use	1
Total	**70**

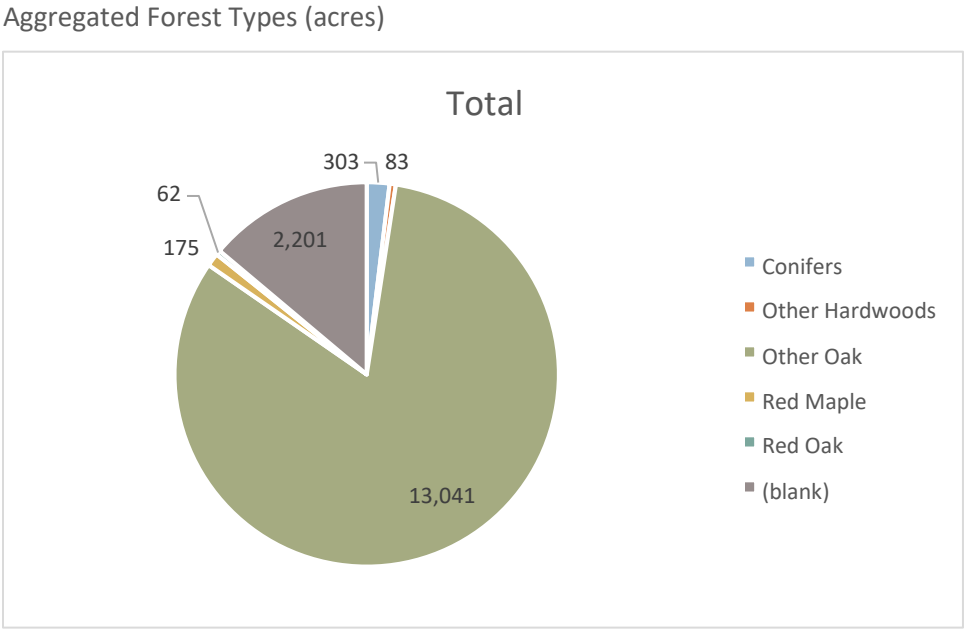


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. More than three quarters of this unit is classified as mixed-oak forests.

Site Class (acres)

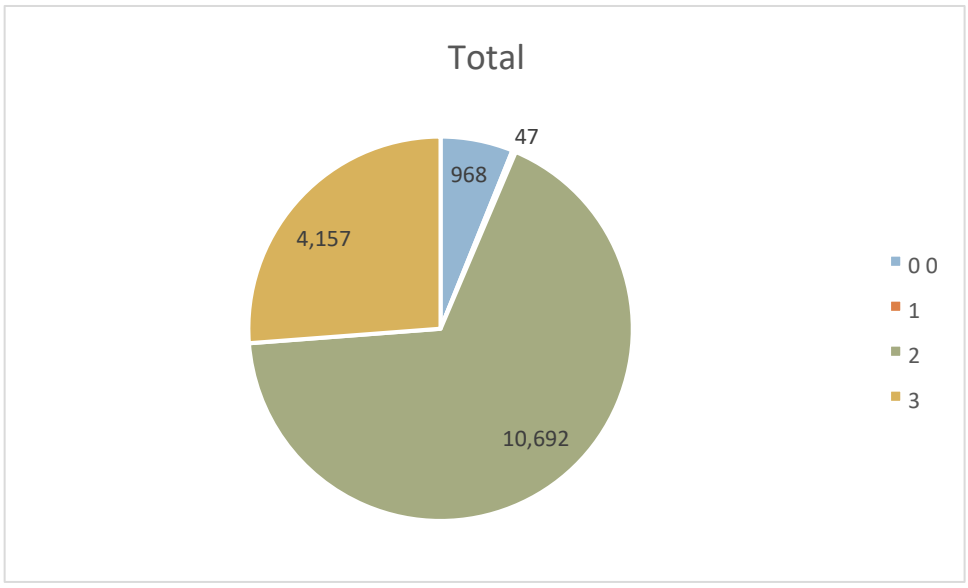
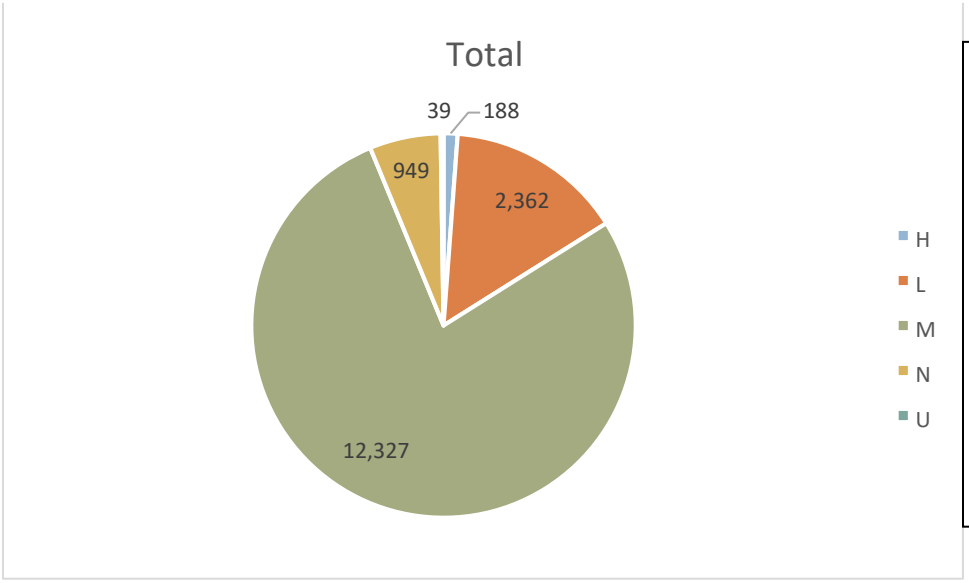


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

Zoning (acres)



M&N = multiple resource zone, non-commercial

M&C = multiple resource zone, commercial

L = limited resource zone

N = natural area

W = wild area

S = special resource management zone

H = anthropogenic management zone

U = lands where zoning is unknown

Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

Forest Age Class Distribution

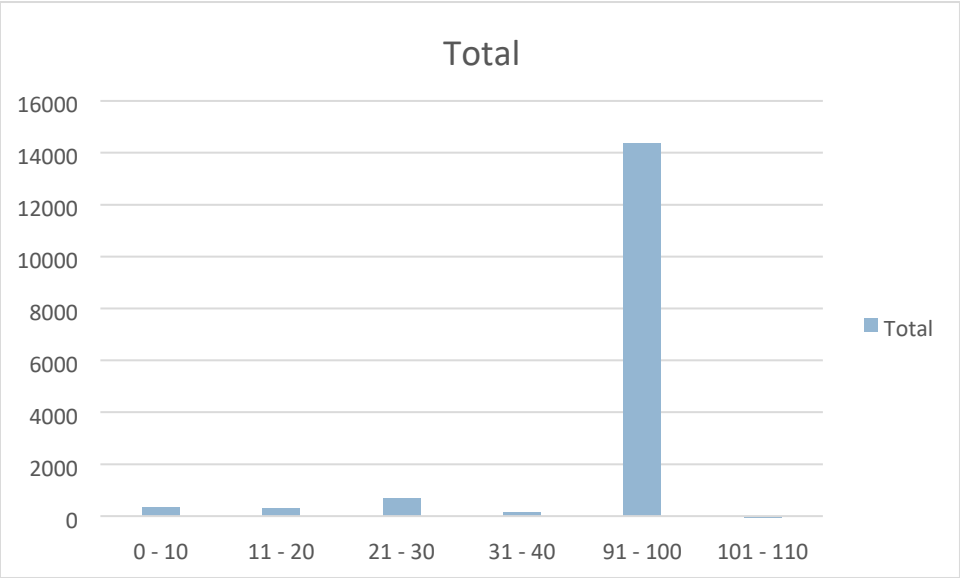


Figure 5. Acres of state forest land in this LMU by forest age classes.

The age class distribution in this unit is typical for the region and the majority of Pennsylvania's forest lands, where most of the forests are 91-100 years old.

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code.

Streams by Class

Class	Total Miles
High Quality	32
Total	**32**

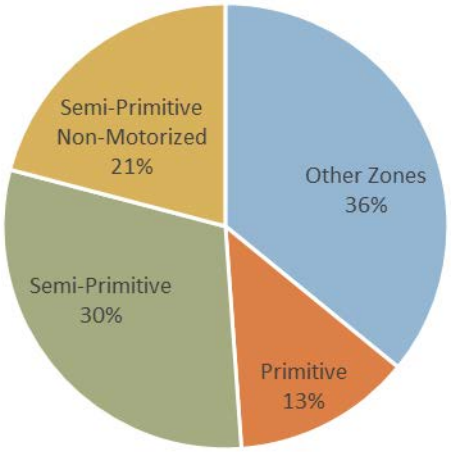
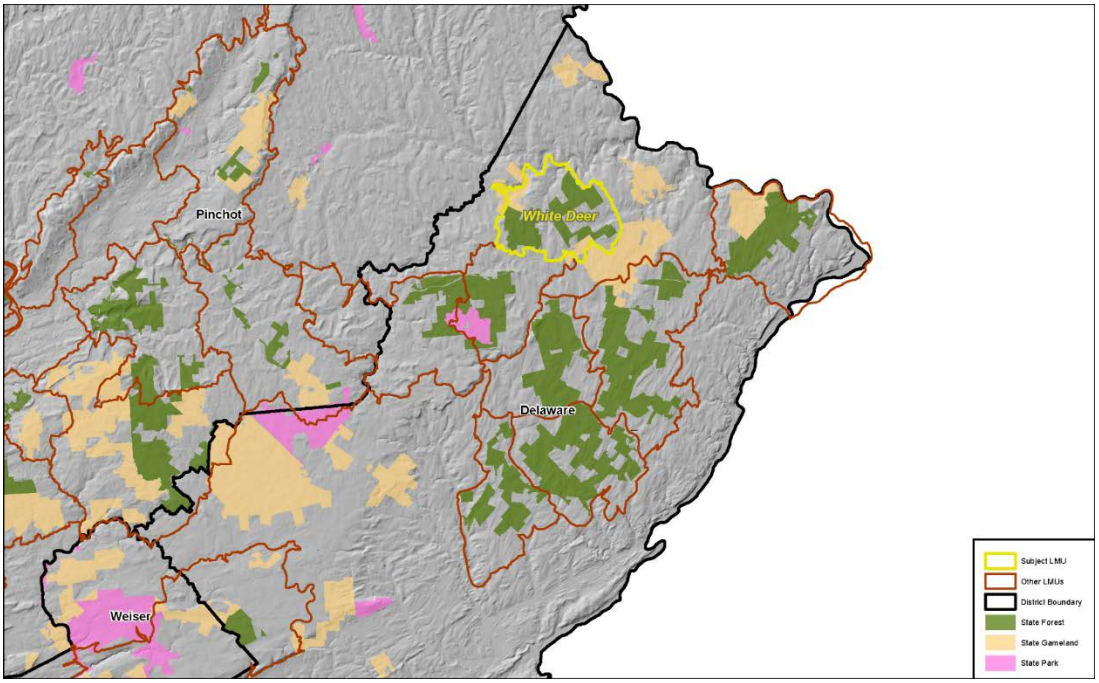


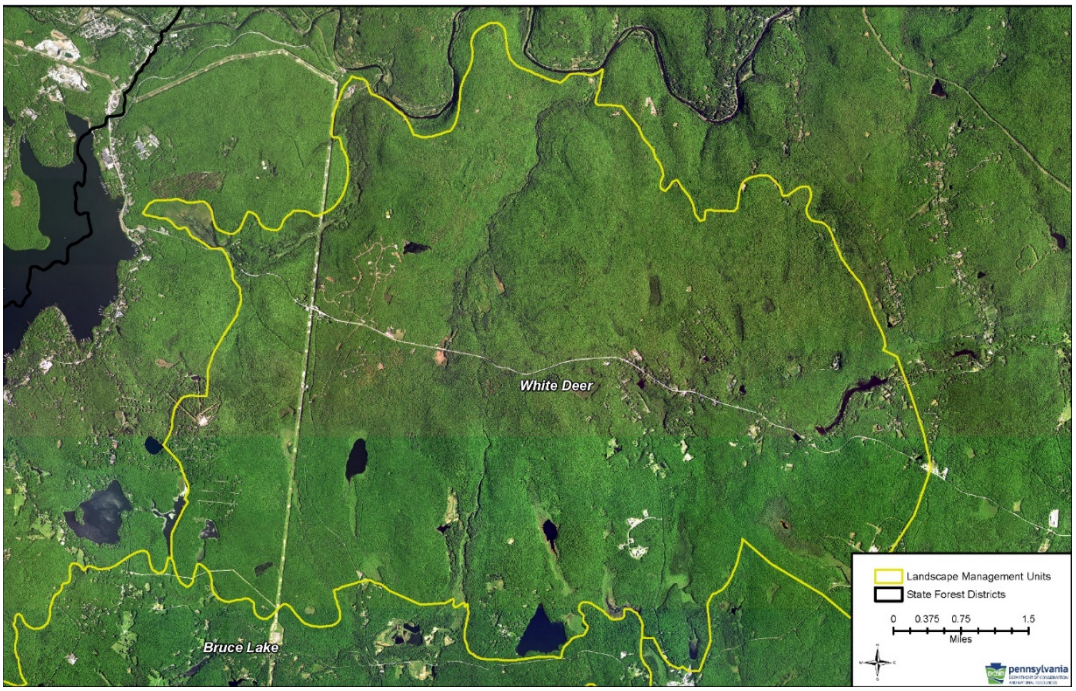
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

White Deer

Landscape Management Unit



White Deer LMU



Overview

The White Deer LMU is in the eastern part of Pike County not far from the Delaware River. It encompasses 21,255 acres of glaciated Pocono mountainous land. The Bureau of Forestry manages 7,675 acres within this landscape. A small portion of State Game Lands #183 is found within it. The Little Mud Pond Swamp Natural Area, a 182-acre piece, contains a mix of emergent plants growing within a glacial bog. Species include black spruce, tamarack and pitcher plant which are more common at more northern latitudes. Several smaller housing developments provide user pressure on this LMU. VFD's in the area provide assistance during fire season. A few hunting clubs and associations own land within the LMU. One very large one, Blooming Grove Hunting & Fishing Club, owns approximately 18,000 acres. The rest of this LMU is privately owned.

Gypsy moth defoliation, past firewood cutting, and rocky, glaciated rubble keeps the basal area of these forests rather low. Swampy areas filled with highbush blueberry and red & black spruce are found in and around White Deer Lake. The forests are dominated by black huckleberry understory, black birch mid-canopy, and poor-quality oaks. This more northern LMU also has large patches of mountain laurel. Oak is the predominant tree species, but red maple, hickory, pitch pine and white pine are also found here. These oak forests provide an abundant mast crop for wildlife in the area. Their timber quality is lacking with one to one-and-a-half log heights being the norm during timber cruising and appraisal.

Blooming Grove Creek appears to be the main waterway within the LMU. Timber management is low. Mechanized logging affords foresters the opportunity to complete timber sales on mediocre quality sites. Most of these sales are larger due to the amount of volume needed to make it profitable. Recreation in the form of private cabin leases, hunting, fishing, hiking and biking seem to dominate the major forest usage. ATV and snowmobile riding is not permitted within this portion of the Delaware State Forest. Old bluestone quarries can be found throughout the area as well. This stone was often chiseled out of the exposed rock, hauled by wagons down the mountainside, and taken by rail to New York City to line residents walkways.

There is just one state forest road within the LMU. White Deer Lake Road provides access to White Deer Lake and cabin lessees. One major issue with this LMU is the lack of suitable road base to provide access for heavier trucks. Gated roads are in ill-repair and some are washed out. With proper access achieved, timber management, recreational opportunities, and trail development could occur.

Priority Goals

a) More in the way of wildlife enhancement projects is being done in the Cowgill Tract. A 2-acre herbaceous opening and surrounding 9 acres are being rehabilitated. Create better wildlife habitat, More wildlife habitat openings creating by small-scale projects or large-scale timber sales.

b) Continuing timber sales. Timber harvesting has been active in this LMU.

c) Providing access to state forest land to allow the public to enjoy the scenic wonders of PA. Improve road system. This LMU lends itself to improved roads, especially in the Cowgill Tract. provide better maintained roads and trails, inability to accomplish professional timber management due to poorly maintained gated roads.

d) Prioritize the maintenance and promotion of core forest conditions and values.

Profile

Table 1. LMU acreage: total and state forest land only.

	Acres
State Forest Land	7,675
LMU Total	21,255

Ecoregion: Glaciated Low Plateau

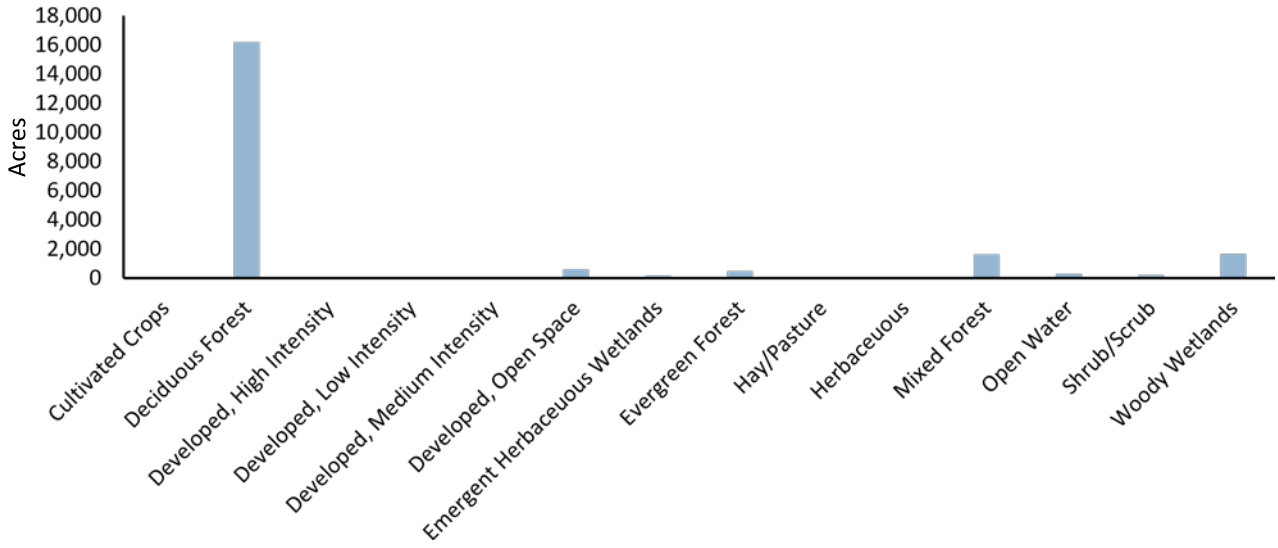


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU. The LMU is dominated by deciduous forest. Developed, open space and woody wetlands pose unique management issues.

Table 2. Miles of roads by category on state forest land in this LMU. Road categories are described on p. 199 of the 2016 SFRMP. A total of eight miles of Z1 roads exist within the LMU. Ten miles make up Z3 roads. White Deer Lake and Bethany Turnpike make up the Z1 roads.

Road Category	Total Miles
Z1 - Public Use Road	8
Z2 - Drivable Trail	0
Z3 - Administrative Road (gated)	10
Total	**18**

Table 3. Miles of trails on state forest land in this LMU open to various types of recreational use. Note that miles are not additive and a single trail may be open to multiple use types. Shared-use trails, which make up the majority of trails on state forest land, are open to hiking, biking, horseback riding, and cross-country skiing. Bald Barren ATV Trail provides for 6.5 miles of ATV riding pleasure. Thunder Swamp Trail, a state hiking trail, is found in the southern portion of the LMU. Cross-connectors for this trail include Painter Swamp West, Coon Swamp, and Bear Swamp. Marcel Lake, Tarburner Ridge, and Tarburner North trails are under-utilized except for illegal ATV activity. Two unnamed trails connect portions of Standing Stone Road with Saw Creek Road.

Trail Category	Total Miles
Hiking	23
Biking	23
Equestrian	23
X-Skiing	23
ATV I	0
ATV II	0
Snowmobile/ Joint Use Road	0

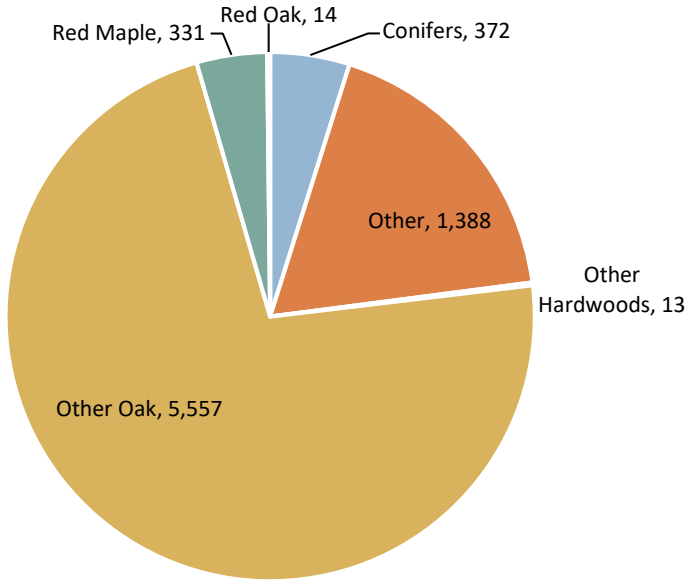


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP. The vast majority of this LMU is oak forest. Enhancing the coniferous component would be beneficial.

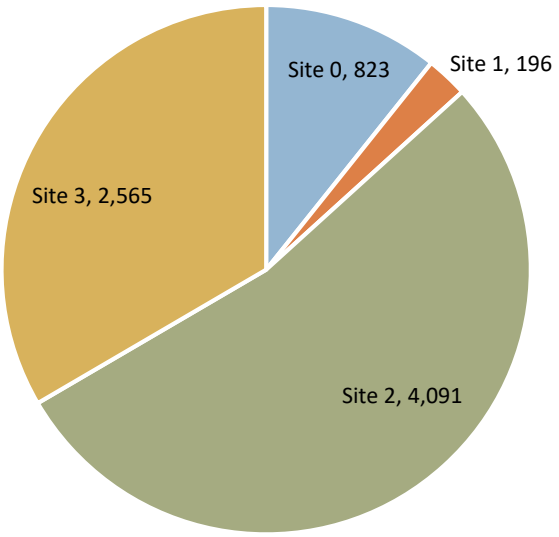


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP. Site Class 2 and 3 make up over half the LMU. Unrepresented here, is the inability to access some of these sites.

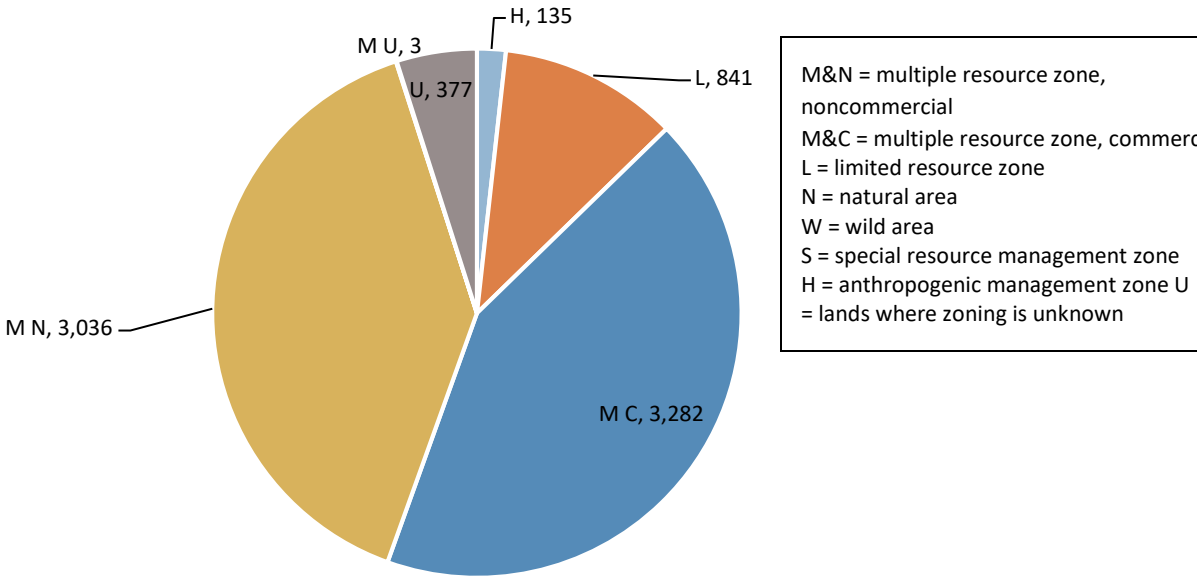


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP. Wild and Natural Areas make up a large portion of the LMU.

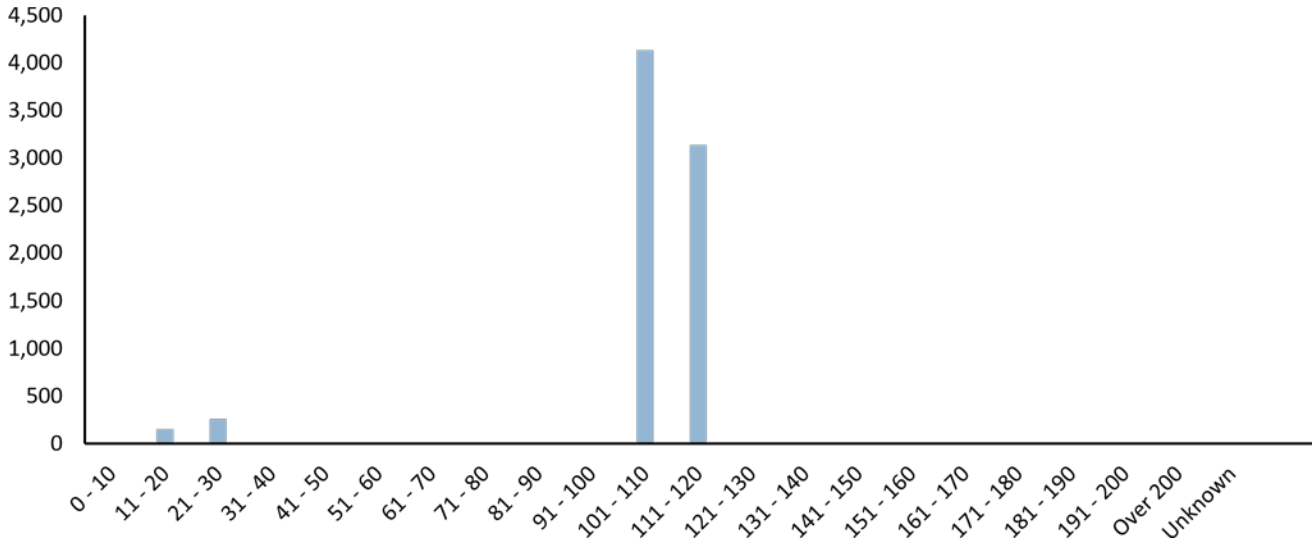


Figure 5. Acres of state forest land in this LMU by forest age classes. This LMU is representative of "old age." Executing more timber harvests would be favorable to balance out the age

Table 4. Miles of stream by classification within entire LMU. Department of Environmental Protection stream classifications are described in Chapter 93 Water Quality Standards of Title 25 in the Pennsylvania Code. The Little Bushkill Creek makes up the major stream flow in this LMU.

Class	Total (miles)
Undesignated	1
High Quality Waters	49
Natural Lake/ Pond	0
Total	**50**

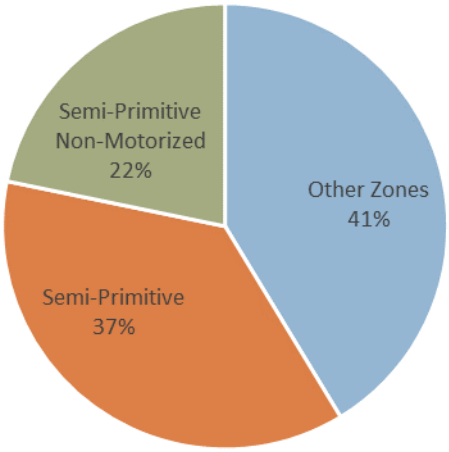


Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones. Semi-Primitive and Non-Motorized/Semi-Primitive recreation make up a large portion of this LMU providing for undisturbed recreating opportunities.

Glossary of Terms and Acronyms

Acceptable Regeneration – Seedlings or saplings of specific tree species deemed appropriate by forest manager to replace larger trees removed by timber harvesting on an individual stand basis. Appropriate species often include species that currently exist in the overstory, species of desirable trees for the area/region, or native species that can thrive in the ecosystem of the site.

Acid Deposition — Acid deposition occurs when acid-forming substances are transferred from the atmosphere to the surface of the earth (into the soil), often through precipitation. The deposited materials include ions, gases, and particles typically resulting from power generation and heavy manufacturing. Research has shown that acid deposition can cause slower growth, injury, or death of trees, particularly sugar maple and red spruce. Acid deposition generally causes stress to trees by interfering with calcium and magnesium nutrition and the physiological processes that depend on these elements.

Age Class — An interval into which the age range of trees or forest stands is divided for classification or use (e.g., 0–10 years, 10–20 years).

Basal Area — The area of the cross section of a tree stem, including the bark, generally at breast height (4.5 feet above the ground).

Buffer Treatment (harvesting) – A management activity that happens with in a vegetated strip or management zone of varying length and width maintained along a road, stream, wetland, lake, or other special feature. Buffer areas are managed differently than other zones of state forest land for many reasons, including aesthetics, water quality, or ecological resource protection or enhancement. Some buffers are no-management (i.e. tree cutting) zones, and others require at least a partial canopy be maintained. In general, timber harvesting within buffers is more limited than in other zones and the width of the buffer depends on the feature which is being surrounded.

Charcoal Hearth - Excavated area where wood fuel was stacked, covered with soil, and lit on fire to produce charcoal.

Clearcut — The removal of the overstory in the absence of advance regeneration. Regeneration may be dependent on natural seed, root suckers, stump sprouts or from artificial plantings. The differentiating factor that sets this cut apart from an overstory removal is that less than 50% of the site is stocked with adequate advanced regeneration and relies on seedlings or sprouts that will become established after the cut. For clearcuts, as with overstory removals on State Forest Lands, 10-20 square feet per acre of basal are must be reserved per acre. Clearcuts on State Forest Lands can be referred to as “clearcuts with residuals.”

Climate Change — The long-term fluctuations in trends in temperature, precipitation, wind, and all other aspects of the earth’s climate.

Core Forest Index - The core forest analysis was based on the density of fragmenting features within a given area, which includes roads, pipelines, well pads, certain large rivers (large enough to show up on NLCD), etc. Based on fragmentation of an LMU, each LMU was given an index score between 0-100, representing the density of fragmenting features with a higher score representing a less fragmented area.

Crop Tree Thinning — Crop tree thinning is done for many of the same reasons as improvement cuts but at a much younger, pre-commercial age. The primary reason for entering a stand in the pre-commercial stage versus waiting until merchantable volume can be extracted is to alter the species composition of the stand prior to the most desirable stems losing positions of competitive advantage. No more than 50 crop trees should be selected per acre and a crown-touch release should be used, cutting all trees that touch the crown on a crop tree on three out of four sides. Co-dominant and intermediate trees should be the focus of crown-touch release treatments. Trees in the dominant stage will most likely be in the stand at the time of commercial thinning and most likely already enjoys dominance over it closest competitors.

Cultural/ Historic Resources — A site, structure, object, natural feature, or social account that is or was of significance to a group of people traditionally associated with it. A significant cultural resource is defined as one which is listed or eligible for listing in the National Register of Historic Places. Archaeological sites are important in elucidating information about past cultural behavior.

Damage-causing Agents - Something that negatively effects ecosystems such as, non-natural or exotic pests, disease and invasive plants, climate change, inadequate forest regeneration, acid mine drainage, acid deposition, waste and littering, habitat fragmentation, overabundant deer populations and wildfire.

Deer Management Assistance Program (DMAP) — DMAP is a Pennsylvania Game Commission program that provides additional means for landowners to meet land-use goals by allocating additional antlerless deer tags to reduce deer populations in specific areas.

Defoliation – the destruction or causation of widespread loss of leaves usually by insects or disease.

Early Successional Habitat – The period in forest development, soon after establishment, in which the growing forest is not yet dominated by tree canopies. This stage is characterized by high productivity, high structural and spatial complexity and provides habitat with vigorously growing grasses, forbs, shrubs and trees that usually require full sun exposure. Early successional habitat provides excellent food and cover for wildlife but needs disturbance to arrest forest succession and prevent the site from progressing to a more mature stage of stand development.

Ecoregion — A contiguous geographic area having a relatively uniform macroclimate, possibly with several vegetation types, and used as an ecological basis for management or planning.

Ecosystem — A conceptual unit comprised of abiotic factors and biotic organisms interacting with each other and their environment, having the major attributes of structure, function, complexity, interaction and interdependency, temporal change, and no inherent definition of spatial dimension.

Ericaceous Plants – Plants in the heath family, such as mountain laurel, rhododendron, and blueberry, that do not grow well in alkaline or basic soils (soils that have a high pH).

Even-aged Stand - is a given area of a forest in which the trees are within 20 percent of a given age, relative to the rotation length. Rotation length is the segment of time that forest trees are grown before they are cut, and a new regeneration cycle starts.

Extirpated — A species is eliminated from a certain geographic area, while it still exists elsewhere.

Fee Simple Ownership — An ownership situation whereby the landowner owns both the surface and subsurface rights.

Fire Adapted Ecosystem –Natural communities or ecosystems that have evolved with a regular fire interval and can rebound readily and benefit from fire that is consistent with the regimes to which they are adapted. A “fire regime" describes the frequency at which fires in a given forest type typically burn, the season(s) in which they burn, and the amount of vegetation killed.

Fire Dependent – Natural communities or ecosystems requiring one or more fires of varying frequency, timing, severity, and size to achieve optimal conditions for population survival or growth.

Forest Fragmentation — The process by which a forest landscape is converted into islands of forest within a mosaic of other land uses.

Forest Type – A category of forest community usually defined by its vegetation, particularly it dominant vegetation as based on percentage cover of trees. All delineated stands on State Forest Land are coded with a ‘forest type’. Most vegetated types are based on the plant community types recognized in *Terrestrial & Palustrine Plant Communities of Pennsylvania 2nd Ed*. Non-vegetated types are based on specific anthropogenic use. See the Bureau of Forestry’s *STATE FOREST RESOURCE DESIGNATIONS, CLASSIFICATIONS AND TYPING MANUAL* for more information

Fully Stocked – A quantitative measure of the area occupied by trees, usually measured in terms of well-spaced trees or basal area per hectare, relative to an optimum or desired level of density. A classification of forest land in terms of potential annual cubic-foot volume growth per acre at culmination of mean annual increment in fully stocked natural stands. Stocking is a relative concept - a stand that is overstocked for one management objective may be understocked for another.

Group Selection — A treatment in which the desired outcome is to create an uneven-aged or all-aged stand structure over time by performing small group overstory removals or clearcuts, creating patches of younger trees. Through time, the entire stand is removed in groups (3 or 4 harvests spaced 20–30 years apart) creating patches of several age classes throughout the stand.

Habitat Diversification — The process by which a forested landscape is broken into a mosaic of seral or successional stages of vegetation types, through management practices and/or natural processes, for utilization by a diversity of organisms.

Hibernacula – Latin for “tent for winter quarters" is a place in which a creature seeks refuge, such as a bear using a cave to overwinter. The word can be used to describe a variety of shelters used by many kinds of animals of various species. Behavior other than hibernating can also occur at hibernacula. Often used in description of sites for over-wintering bats.

High Canopy — The uppermost vegetative layer of a mature forest. High-canopy species, such as oaks and hickories, have the potential to form the dominant overstory layer of the forest. Species that would NOT be considered high-canopy species include trees that reach their full potential in the understory or mid-canopy layers, such as dogwood or striped maple.

General Permits (GP) – Department of Environmental Protection (Department) permits for Chapter 105 Wetland and Waterway Obstruction and Encroachment.

Important Bird Areas – (IBA) As identified by the Audubon Society, these are geographic regions that offer key habitat factors for the occupancy and survivability of some bird species. There are over 80 IBA sites encompassing over two million acres of Pennsylvania’s public and private land. These areas include migratory staging areas, winter roost sites, and prime breeding areas for songbirds, wading birds, and other species.

Improvement Cutting — An intermediate treatment (after establishment of the new stand and prior to final harvest) is conducted to remove trees that will improve residual stand composition and improve residual tree quality, and where the intention of the harvest is not to establish natural regeneration. The goal of this treatment is to expedite growth of higher quality trees by allowing more sunlight and nutrients to residual trees by reducing competition. This is a non-reproductive treatment and the stand’s residual basal area should be at least B level stocking or greater. The difference between this and a crop tree treatment is that this type of treatment is performed later in the rotation and through a commercial sale.

Intermediate (harvest) – A timber harvest to enhance growth, quality, vigor, and composition of a stand of trees after establishment or regeneration and prior to final harvest.

Invasive Insects - is an insect that is not native to a specific location (an introduced species), and that has a tendency to spread to a degree believed to cause damage to the environment.

Invasive Plants — Non-native plant species that grow quickly and aggressively, spreading and displacing other native plants. Their establishment causes or is likely to cause economic, environmental or human harm. Invasive plants are usually introduced by people either accidentally or on purpose, into a region far from their native habitat.

Iron Furnace - A historic type of blast furnace that is used for smelting to produce industrial metals, generally pig iron, but also others such as lead or copper. Most iron furnaces used large amounts of wood charcoal as fuel.

Landscape — A land area of generally large size and commonly a mosaic of land forms and plant communities irrespective of ownership or other artificial boundaries.

Natural Area — A Natural Area is a state forest zone that is an area of unique scenic, historic, geologic or ecological value that will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. They are set aside to provide locations for scientific observation of natural systems, to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty.

Natural Regeneration — A newer age class of trees created from natural seeding, sprouting, or suckering that will serve to replace trees removed from the canopy, either through aging or harvesting.

Oak Savannah –A type of savanna, or lightly forested grassland, where oaks are the dominant trees. These savannas were maintained historically through wildfires set by lightning or humans, grazing, low precipitation, and/or poor soil.

Overstocked – Is the state of having too many trees in a forested area for the most efficient growth, usually measured in terms of well-spaced trees or basal area. A desirable level of stocking is often considered that which maximizes timber production.

Overstory — The portion of the trees, in a forest of more than one story (stratum), forming the upper most canopy layer.

Overstory Removal — The complete removal of the overstory to release established advanced regeneration. The differentiating factor between this cut and a "clear cut," is that advanced regeneration is present and established with at least 50% stocking of the site. On State Forest Lands, 10-20 square feet of basal area per acre must be retained. Overstory removals on State Forest Lands are referred to as "Overstory Removals with Residuals".

Pennsylvania Conservation Explorer (Explorer) — An online tool designed to facilitate conservation planning and environmental review (PNDI) for threatened and endangered species, species of special concern, and other natural resources of concern. The environmental review portion of Explorer screens projects for potential impacts to species under the jurisdiction of PA Game Commission, PA Fish and Boat Commission, PA DCNR, and the US Fish and Wildlife Service. All silviculture and land management activities should be submitted through the PNDI system. The purpose of this system is to call attention to the forester that species of concern, threatened or endangered nature are nearby or within the project area.

Pennsylvania Natural Heritage Program — The Pennsylvania Natural Heritage Program (PNHP) is a member of NatureServe, an international network of natural heritage programs that gather and provide information on the location and status of important ecological resources (plants, vertebrates, invertebrates, natural communities and geologic features). Its purpose is to provide current, reliable, objective information to help inform environmental decisions. PNHP information can be used to guide conservation work and land- use planning, ensuring the maximum conservation benefit with the minimum cost. PNHP manages PNDI (see above).

Pennsylvania Scenic Rivers Program — Scenic river designations are intended to preserve the primitive qualities the natural, and aesthetic values of a river and to protect the existing character and quality of both the river and its adjacent land environment. They shall be free-flowing and capable of, or under restoration, to support water-cased recreation, fish and aquatic life. The view from the river or its banks shall be predominately wild but may reveal some pastoral countryside. The segment may be intermittently accessible by road. The Pennsylvania Scenic Rivers Act of 1982 authorized the statutory designation of outstanding aesthetic or recreational rivers.

Recreational Opportunity Spectrum Continuum (ROS) — ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation and experiences. This version adopted by the Bureau of Forestry defines five recreation classes for the state forests (primitive, semi-primitive non-motorized, semi-primitive, semi-developed, developed).

Regeneration — Seedlings or saplings existing in a stand or the act of renewing tree cover by establishing young trees naturally or artificially.

Regeneration period — The time between the initial regeneration treatment and the successful re-establishment of a new age class by natural means, planting, or direct seeding.

Reserve or Residuals trees — Trees, pole sized or larger, retained after an intermediate or partial timber harvest of a stand.

Rotation — In even aged systems, the period between regeneration establishment and final cutting.

Salvage Harvest — A timber harvest in which only dead and dying trees are harvested while they still retain a degree of economic value, or in conjunction with other treatments in which the goal is both economic salvage and a silvicultural goal such as salvage-overstory removal, salvage-shelterwood, salvage-improvement, etc. Timber sales in which 20% or more of the volume being removed is dead or dying should be classified as salvage, or salvage along with any other treatment being implemented.

Seed Tree Cut — The attempted establishment of a new stand from a partial overstory removal and retention of scattered trees for genetically superior seed production and seedling establishment. Usually less than 40 BA is retained to allow almost full exposure of a site to sunlight. Species that are shade intolerant and wind dispersed usually benefit under this type of cut. Once advanced regeneration is established the seed trees are removed.

Severed Ownership — an ownership situation whereby the surface landowner has either partial ownership of the subsurface or the subsurface is owned completely by another entity.

Shade Tolerance – The relative capacity of a plant to become established and grow beneath overtopping vegetation, where sunlight is fully or partially obscured.

Shelterwood (harvest) — The attempted establishment of a new cohort of natural regeneration from the partial removal of the overstory. A shelterwood harvest may be a single treatment or a series of cuts to ensure that adequate seed source is retained, and light levels are manipulated to allow the establishment or promotion of a target species or group of species. The essential characteristic is that the new stand is being established naturally or artificially under the overstory or the "shelter" of the original stand. The characteristic difference between this cut and a seed tree cut is that a relatively contiguous canopy is retained (approximately ≥40 BA) and most often species regenerated under this system are moderate to shade tolerant species. Once advanced regeneration is established, the overstory is removed.

Single Tree Selection (harvest) — A harvest in which the desired goal is to create an all-aged stand by removing a uniform number of trees from each age class in an uneven-aged stand or size class in an even-aged stand. This leaves an inverse j-shaped curve for diameter distribution, creating space for the establishment of new seedlings and increased growth of remaining trees.

Silvicultural System — A planned process whereby a stand is tended, harvested, and re-established. The system name is based on the number of age classes and/or the regeneration method used.

Site Class – A classification of growing site quality, expressed in terms of ranges of dominate tree height at a given age or potential mean annual increment at culmination. For the Bureau of Forestry, site classes are numbered 1 (the best), 2 and 3 (the poorest). These classes are designated as follows:

0 **Non-Forest**

1 **Site 1**: Characterized by moist, well-drained, fairly deep soils that usually occur in protected coves, along streams, or in bottomlands that remain moist throughout the year. On northern exposures, Site 1 may extend higher up a slope than on southern exposures because of more favorable soil moisture conditions. Dominant and codominant total tree heights have the potential to average > 85 feet at maturity.

2 **Site 2**: Characterized by soil intermediate in moisture, depth, drainage and fertility that may dry-out for short periods during the year. This site is usually located on slopes between the ridge tops and the coves and bottomlands. Dominant and codominant total tree heights have the potential to average > 65 feet but < 85 feet at maturity.

3 **Site 3**: Characterized by shallow, rather dry, stony or compact soils which usually occur on ridges or broad flat plateaus. Dominant and codominant total tree heights average < 65 feet at maturity.

Site Index – a species-specific measure of actual or potential forest productivity expressed in terms of average height of trees included in a specific stand component at a specific index or base age. Site index curves are created for different regions to show the total height expectations for a certain species given the site conditions (index) and the age of the tree or stand.

Stand — A contiguous group of trees sufficiently uniform in age class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

State Forest Environmental Review — SFER is the process used by the bureau to assess impacts to a variety of forest resources for projects that may or will disrupt, alter or otherwise change the environment.

Stems Per Acre – a standard measure of the density of trees within a given area, which is given as an average number of stems on an acre. Stem is considered the trunk of an individual tree.

Stocking Level – An indication of growing space occupancy relative to a pre-established standard.

Succession – The gradual supplanting of one community of plants by another; the aging of the forest from young to mature.

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 and use.

Systemic Insecticides – Pesticide that is absorbed by and permeates some or all host tissues and is more toxic to the target insects and pathogens than to host.

Two-Aged Harvest — The final overstory removal or clearcut in a stand in which a significant portion of the stand will be retained until the next rotation. Usually 20 to 30 square feet of BA is retained in oak stands and 10 –20 BA in northern hardwood stands. The residual stand is not removed upon successful regeneration, but instead carried as an older age class (creating two distinct age classes on the same site) well into the next rotation, and usually removed before the next age class reaches maturity.

Two-Aged Shelterwood — This treatment is a preparatory cut for a two-aged harvest. A shelterwood treatment or treatments performed in a stand to establish or promote advanced regeneration, once there is seedling establishment a two-aged harvest will occur.

Under Stocked – Is the state of not having enough trees in a forested area for production of most board feet volume in standing trees measured in terms of basal area. A desirable level of stocking is often considered that which maximizes timber production.

Uneven-aged stand - is a given area of a forest in which the trees are having at least three distinct tree-age classes. Classic uneven-aged forest management aspires to perpetuate an all-aged stand, with many young trees and progressively fewer older trees.

Wild Area — A Wild Area is a state forest zoning category which characterizes an extensive area, which the public will be permitted to see, use and enjoy for such activities as hiking, hunting, fishing, and the pursuit of peace and solitude. No development of a permanent nature will be permitted to retain the undeveloped character of the area.

A

ACB – Alliance for the Chesapeake Bay

ACF – Association of Consulting Foresters

ADA – American Disabilities Act

AFF – America Forest Foundation

AHUG – Allegheny Hardwood Utilization Group

ALB – Asian Longhorn Beetle

AML – Abandoned Mine Land

ANF – Allegheny National Forest

APHIS – Animal and Plant Health Inspection Service

ARRI – Appalachian Regional Reforestation Initiative

ATFS – American Tree Farm System

ATV – All Terrain Vehicle

B

BAMR – Bureau of Abandoned Mine Reclamation

BCAP – Biomass Crop Assistance Program

BMP – Best Management Practice

BOF – Bureau of Forestry

BRC – Bureau of Recreation and Conservation

BSP – Bureau of State Parks

C

CAA – Commercial Activities Agreement

CAPS – Cooperative Agriculture Pest Survey Program

CAR – Corrective Action Request

CARS – Cooperative Accomplishment Report System

CBF – Chesapeake Bay Foundation

CCC – Civilian Conservation Corps

CFHP – Cooperative Forest Health Management Program

CFI – Continuous Forest Inventory

CFM – Cooperative Forest Management

CHR – Cultural Historical Resource

CLEAR – Center for Land Use Education and Research

CLI – Conservation Landscape Initiative

CREP – Conservation Reserve Enhancement Program

CSP – Conservation Security Program

CWD – Chronic Wasting Disease

CWPP – Community Wildfire Protection Plans

CWWA – Cooperative Weed Management Area

D

DCED – Department of Community and Economic Development

DCNR – Department of Conservation and Natural Resource

DEP – Department of Environmental Protection

D & G – Dirt and Gravel

DGS – Department of General Services

DHS – Delaware Highlands Conservancy

DMAP – Deer Management Assistance Program

DOI – Department of the Interior

DRBC – Delaware River Basin Commission

DVRPC – Delaware Valley Regional Planning Commission

E

EAB – Emerald Ash Borer

E & S – Erosion and Sedimentation

EAC – Environmental Advisory Council

EDRR – Early Detection Rapid Response

EES – Environmental Education Specialist

EHS – Hemlock Elongated Scale

EMA – Emergency Management Agency

EMAC – Ecosystem Management Advisory Committee

EPA – Environmental Protection Agency

EPLO – Emergency Preparedness Liaison Officer

EV – Exceptional Value

EQIP – Environmental Quality Incentives Program

F

FDC – Facility Design and Construction

FED – Federal

FEMA – Federal Emergency Management Agency

FEPP – Federal Excess Personal Property

FERC – Federal Energy Regulatory Commission

FFA – Future Farmers of America

FFP – Forest Fire Protection

FFW – Forest Fire Warden

FHM – Forest Health Monitoring

FHTET – Forest Health Technology Enterprise Team

FIA – Forest Inventory and Analysis

FLAME act – Federal Land Assistance Management Enhancement

FIMS – Forest Information Management System

FMP – Forest Management Plan

FPM – Forest Pest Management

FPUF – Friends of Pittsburgh Urban Forest

FS – Forest Service

FSA – Farm Service Agency

FSC – Forest Stewardship Council

FSP – Forest Stewardship Plan

G

GIS – Geographic Information System

GM – Gypsy Moth

GP – General Permit

GWWA – Golden Wing Warbler

H

HAM – Harvest Allocation Model

HCVF – High Conservation Value Forest

HDC – Hardwood Development Council

HQ – High Quality

HUD – Housing and Urban Development

HWA – Hemlock Wooly Adelgid

I

IBA – Important Bird Area

ICS – Incident Command System

IMT – Incident Management Team

IPCC – Intergovernmental Panel on Climate Change

IPM – Integrated Pest Management

IQS – Incident Qualification System

ISA – International Society of Arboriculture

ITC – Instructor Training Course

K

KTA – Keystone Trail Association

L

LiDAR – Light Detection and Ranging

LOA – Letter of Authorization

LWCF – Land Water Conservation Fund

LMU – Landscape Management Unit

M

MAFFC – Mid-Atlantic Forest Fire Compact

MBF – 1000 Board Feet

MST – Mid State Trail

MTRP – Municipal Tree Restoration Program

N

NAAEE – North American Association for Environmental Education

NAASF - Northeastern Area Association of State Foresters

NAI – Natural Areas Inventory

NASF – National Association of State Forest

NGO – Non-Government Agency

NLT – Natural Lands Trust

NPS – National Parks Service

NRCS – Natural Resource Conservation Service

NTFP – Non-Timber Forest Products

NWCG – National Wildland Fire Coordinating group

NWTF – National Wild Turkey Federation

O

OGIT – Oil and Gas Tracking System

OGM – Oil and Gas Management

OHV – Off Highway Vehicle

P

PABS – Pennsylvania Biological Survey

PACD – Pennsylvania Association of Conservation Districts

PAFS – Pennsylvania Forest Stewards

PA-IMT – Pennsylvania Incident Management Team

PALTA – Pennsylvania Land Trust Association

PASA – Pennsylvania Association for Sustainable Agriculture

PCC – Pennsylvania Conservation Corps

PDA – Pennsylvania Department of Agriculture

PEMA – Pennsylvania Emergency Management Agency

PennDOT – Pennsylvania Department of Transportation

PFA – Pennsylvania Forestry Association

PFBC – Pennsylvania Fish and Boat Commission

PFPA – Pennsylvania Forest Products Association

PGC – Pennsylvania Game Commission

PHMC – Pennsylvania Historical and Museum Commission

PHS – Pennsylvania Horticulture Society

PILT – Payment in lieu of Taxes

PLNA – Pennsylvania Landscape and Nursery Association

PLT – Project Learning Tree

PNDI – Pennsylvania Natural Diversity Inventory

PNHP – Pennsylvania Natural Heritage Program

PPFF – Pennsylvania Parks and Forest Foundation

PSP – Pennsylvania State Police

PSSA – Pennsylvania State Sportsmen's Association

PSU – Penn State University

Q

QDMA – Quality Deer Management Association

R

RAC – Recreation Advisory Committee

RAWS – Remote Automated Weather Station

RC&D – Resource Conservation and Development

RCF – Rural and Community Forestry

RGS – Ruffed Grouse Association

RMC – Resource Management Center

ROS – Recreation Opportunities Spectrum

ROW – Right of Way

RPF – Rare Plant Forum

RTE – Rare Threatened Endangered

RUA – Road Use Agreement

Rx – Prescribed

S

SAA – Special Activities Agreement

SAF – Society of American Foresters

SAR – Search and Rescue

SCORP – Statewide Comprehensive Outdoor Recreation Plan

SFER – State Forest Environmental Review

SFI – Sustainable Forestry Initiative

SFL – State Forest Land

SFO – State Forest Officer

SFRMP – State Forest Resource Management Plan

SLF – Spotted Lantern Fly

SRBC – Susquehanna River Basin Commission

STC – Shade Tree Commission

T

TACF – The American Chestnut Association

TCUSA – Tree City United States of America

TIMO – Timber Investment Management Organization

TMDL – Total Maximum Daily Loads

TNC – The Natural Lands Trust

Topo Geo – Topographical and Geologic Services

TPO – Timber Products Output Survey

TSP – Technical Service Provider

TU – Trout Unlimited

U

UTC – Urban Tree Canopy

USDA – United States Department of Agriculture

USFS – United States Forest Service

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

V

VFD – Volunteer Fire Department

VPTC – Vascular Plant Technical Committee

VUM – Visitor Use Monitoring

W

WHIP – Wildlife Habitat Incentives Program

WOA – Woodland Owner Association

WMU – Wildlife Management Unit

WNA – Wild and Natural Areas

WPC – Western Pennsylvania Conservancy

WRCA – Wild Resource Conservation Act

WUI – Wildland Urban Interface

Appendix A - District Interpretive Plan

Delaware Forest District: Interpretive Plan



Date Completed: October 10, 2018

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pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

Table of Contents

Introduction

It is the intent of the Bureau of Forestry to have an interpretive plan in place within each state forest district. Once completed, this plan can stand alone or be placed as an addendum to the District Resource Management Plan. This plan is directly linked to the State Forest Resource Management Plan through key messages and guiding principles.

Interpretation is defined as a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource. The interpretive plan is a goal driven process that helps us achieve our mission, protect the resource and provide visitors with the best possible interpretive service.

This State Forest District Interpretive Plan uses a thoughtful planning process to identify the stories, management issues and resources that are specific to each state forest district. Completed plans will help us determine which communication strategies are best suited for achieving our goals and setting priorities will help allocate funds for interpretive projects. Resource conservation requires public understanding and support. Interpretation is one tool to help us achieve that goal.

DCNR and Bureau of Forestry Missions and Key Messages

Both the department and bureau missions and key messages should be present in our interpretive efforts. Keep these in mind as you plan your interpretive projects. If an interpretive project does not address our mission or contain a key message, it should not be considered.

The Bureau of Forestry's Mission…

…is to ensure the long-term health, viability and productivity of the commonwealth's forests and to conserve native wild plants.

Bureau of Forestry's Key Messages:

The Bureau of Forestry has developed a set of forest-related key messages that complements the department's communications efforts. The bureau considers and uses these key messages when developing communications products.

Natural resources are critical to our health, economy, and quality of life.

- Forests are Pennsylvania's principal land use.
- Forests provide vital services to society. They clean our air, purify our water, provide habitat for plants and animals, and support key ecological processes.
- Forests provide a renewable source of wood products to society.

Everyone uses and has the opportunity to enjoy Pennsylvania's vast natural resources.

- Healthy forests benefit all citizens, no matter where they live.
- Forests provide nearly boundless opportunities for healthful recreation.
- Forests serve as a source of inspiration and wonder.
- There is a forest to explore near you.

DCNR leads everyday efforts to conserve Pennsylvania's natural resources and connect people to the outdoors.

- DCNR Bureau of Forestry leads Pennsylvania in forest and native wild plant conservation and stewardship.
- DCNR Bureau of Forestry seeks to foster an awareness of the forests' many uses and values and inspire people to conserve them.

The future of Pennsylvania's natural resources depends on you.

- People and communities every day shape the future of Pennsylvania's forests.
- Sustaining our forests and associated values depends on wise stewardship.
- We have a responsibility to manage our forests for current and future generations.

State Forest Resource Management Plan: Communications Management Principle

This guiding principle for Communication Management is established in our State Forest Resource Management Plan and should assist in setting the direction of interpretive efforts.

Communications Management Principle

The citizens of Pennsylvania appreciate the forests of Pennsylvania and their resources and values and are engaged in the issues that affect them.

Goals	Objectives
1. To provide education and interpretive opportunities regarding the values, services, and benefits of sustainable forest management.	**1.1** Promote Project Learning Tree with Pennsylvania educators and youth leaders through workshops and material support.
	1.2 Promote forestry and conservation through public education and outreach such as the statewide Envirothon, natural gas tours, ECO Camp, and other public programming partnerships.
	1.3 Provide forest demonstration areas throughout the state forest system that show forest management practices.
	1.4 Create statewide and district interpretive plans and increase the use of interpretive resources.
	1.5 Promote a public stewardship ethic regarding the commonwealth's forests and wild plant resources.
	1.6 Develop state-of-the-art resource management centers to house educational displays and stimulate interest in forest conservation.
2. To provide customer service and information that promote the use and enjoyment of the state forest system.	**2.1** Maintain a steady and available supply of our public use maps, guides, and printed materials.
	2.2 Continually update and utilize electronic media, providing information in an engaging format on the bureau and its work.
3. To engage the public and consider input in state forest management decisions.	**3.1** Utilize advisory committees to engage stakeholders.
	3.2 Provide information on forests, forest issues, and native wild plants.
	3.3 Plan and coordinate public meetings on specific bureau topics including the SFRMP process and shale-gas management as well as issues of local interest at the district level.
	3.4 Monitor and respond to social media questions and comments.

	3.5 Coordinate responses to public inquiries on state forest management topics.

Overview of Delaware State Forest

Introduction

Located in northeastern Pennsylvania, the Delaware State Forest totals 83,915 acres in Pike, Monroe, and Carbon counties. The forest district derives its name from the Delaware River that drains the entire area. The river was named after the Delaware Indians, a tribe of the Algonquain Nation, who inhabited its shores, valleys, and cliffs.

The forest is characteristic of the Pocono region, with remote glacial lakes and bogs rich with plants, wildlife, and scenic beauty. Two main forest types meet in the Delaware State Forest. The most common forest community is dominated by a mix of oaks, including chestnut oak, black oak, scarlet oak, northern red oak, and white oak. Scrub oak achieves its best growth on some local mountain tops, sharing these windswept areas with pitch pine. On the Pocono plateau of northern Monroe and western Pike counties, where glacial ice scoured the earth until 15,000 years ago, northern hardwoods including American beech, red maple, sugar maple, black cherry, sweet birch, yellow birch, grey birch, northern red oak, and white ash dominate. There are often scattered eastern white pine and eastern hemlock. Swamps and peat bogs are common throughout the district. Wetland forests are dominated by a mixture of conifers and hardwood species. Eastern hemlock, eastern white pine, red spruce, and tamarack are common. Wetland shrubs include rosebay rhododendron, highbush blueberry, winterberry, and swamp azalea.

History

Prior to Europeans coming to Pennsylvania, the entire state, with the exception of a few natural meadows in the lowlands and scattered rocky areas in the highlands, was covered with a dense forest growth.

The vast timber tracts, which seemed inexhaustible to the early settlers, provided charcoal for the iron and steel industries, ties for railroads, wood for fuel, lumber for homes and buildings, and chemical distillation wood as well as wood for furniture, barrels, and boxes. It did not seem possible that such forests could ever disappear. As the increasing population of the state turned forest land into farms and as expanding industry consumed more and more wood, the amount of standing timber in the state grew smaller.

In the later 1800's, awareness began to grow that the forests were not inexhaustible. Large tracts of land once covered with virgin forests had been cutover and abandoned by the owners. Forest fires ran uncontrolled throughout much of the cutover area. Between 1860, when Pennsylvania led the nation in lumber production, and 1900, when it had to import lumber from other states to fill its needs, various efforts were made to halt the depletion of the forests. The future wood supply and the restoration of the denuded areas became a source of concern to conservation-minded citizens.

In 1887, the General Assembly authorized the Governor to appoint a committee to examine and consider the subject of forestry in Pennsylvania and report its findings at the next regular session of the legislature. In 1888, a Governor's Commission was appointed to study the forest situation. A second commission authorized by the legislature was appointed in 1893. As a result of these studies, in 1895, Dr. J.T. Rothrock was appointed Commissioner of Forestry in the newly created Division of Forestry in the Pennsylvania Department of Agriculture. The legislature of 1897 passed an act authorizing the purchase of unseated lands for forest reservations, thus marking the beginning of the state forest system. This act provided for the acquisition of not less than 40,000-acres in the headwaters of each of the main rivers of the Commonwealth, mainly the Delaware, Susquehanna, and Ohio, providing the land selected shall be of a character better suited to the growth of trees than to mining or agriculture and that 50% of the area have an elevation of not less than 600 feet above sea level.

The first purchase for the Delaware State Forest was 1,521 acres purchased at a tax sale from George Daumann on June 13, 1898, for the price of fifteen cents per acre. This was the second purchase of State Forest land by the Commonwealth. Four warrants, all in Pike County, were included in the Daumann purchase: the Aces Ridge tract near Rattlesnake Creek, Dingman Township; the isolated Brights Creek tract in Greene Township; the area immediately surrounding the Hunters Range School, Porter Township; and an area on the headwaters of Shohola Creek near Bruce Lake, Blooming Grove Township.

The second major purchase was made in July of the same year when 3,716 acres, also in Pike County, were bought at a tax sale for fourteen and one-half cents per acre. The third major acquisition was made in September, 1898, when another 3,482 acres was purchased for fourteen and one-half cents an acre at a tax sale. Additional purchases from 1900 through 1904 brought the total Delaware State Forest area to more than 53,000 acres. In 1948, several large tracts were purchased, including an area of 2,000 acres in western Monroe County which was designated as the Delaware-Lehigh Experimental Forest. Numerous land exchanges and purchases to consolidate and eliminate interior holdings have taken place in recent years to bring the Delaware State Forest to its present size and shape.

Lumbering, fire, and the chestnut blight had the most profound effect on the original forests in the Poconos. The town of Milford, founded in 1796, was the center of the white pine lumber industry. Pine planks, shingles, and lath were milled and traded in Milford for farm produce brought across the Delaware River from New Jersey. During the 19th century, the local economy flourished by producing barrel staves, heads, and hoops from oak. Tannic acid extracted from oak and hemlock bark supported an extensive leather tanning industry in the region.

Large scale lumbering commenced after the Civil War, harvesting only the biggest and best trees, with little thought given to what remained, and creating incredible waste. This desolation left abundant fuel for terrible fire which followed logging operations across the Poconos. This process consumed the original forests by 1900. Ensuing fires created ideal habitat for the ecology and culture of huckleberries, which the local residents turned into a cash crop. As the fire problem was brought under control, pioneer species such as aspen and grey birch became dominant vegetation. Some aspen and birch stands remain while others have been replaced by oaks.

Around 1909, chestnut blight invaded the region. The American chestnut comprised over fifty percent of many early stands but by 1917, most of it was dead. This left white and chestnut oaks to fill the gaps on the ridge tops while red, scarlet, and black oaks took over the lower slopes.

Also, occurring in the 19th century up along the banks of what is known today as the Upper Delaware Scenic and Recreational River was the beginning of a major industry in Pike County known as the Bluestone Quarrying Industry. This process involved removal of the timber first by logging. Then the top layer of earth and worthless stone was removed with dynamite. The quarrying began in the spring of the year after the frost had begun to open seams in the sandstone deposit known as bluestone. Hand tools such as sledge hammers, drills, wedges, and chains were used to free the stone from the mountain. At the height of the industry there were thousands of men employed and hundreds of horses working on the side hill above the river. The bluestone was hauled off the mountain by horse and wagons and was shipped to cities such as New York, Boston, Philadelphia, Trenton, Passaic, Minneapolis, Scranton, and Wilkes-Barre. The stone traveled by railroad, floated downriver on rafts and on boats in the Delaware-Hudson Canal. Today there are still remnants of this industry found in the Stairway Wild Area. The large piles of waste rock sit idle but are an interesting peak into the region's bluestone industry history.

The Civilian Conservation Corps was created in 1933 to create jobs during the depression. Many CCC camps were located on State Forest land; including two that were located on Delaware State Forestland.

Camp S-93-PA was located on Laurel Run Road and Camp S-94-PA was located near Edgemere. These CCC camps fought wild fires, built trails, roads, dams, fire towers, and other projects on State Forest land that are still in use today.

Key Resources and Events

Wild and Natural Areas

Pennsylvania's state forest system includes dozens of special Wild and Natural areas set aside to protect unique or unusual biologic, geologic, scenic and historical features or to showcase outstanding examples of the state's major forest communities. Natural areas are "managed" by nature and direct human intervention is limited. They provide places for scenic observation, protect special plant and animal communities and conserve outstanding examples of natural beauty. Wild areas are generally extensive tracts managed to protect the forest's wild character and provide backcountry recreational opportunities.

Bruce Lake Natural Area

This natural area covers 3,160 acres including two lakes, Bruce Lake and Egypt Meadow Lake. Bruce Lake is a glacial formed lake and is completely spring fed. Virgin stands of pine and hemlock were cut in the late 1800's leaving the area vulnerable to fires that destroyed the rich humus soil layer. Egypt Meadow Lake was constructed by the Civilian Conservation Corps in 1935.

Stillwater Natural Area

This natural area provided a sanctuary for Union Army deserters and young men evading conscription during the Civil War. Shacks were built on the islands of the swamp or in the dense growth. This 1,931-acre tract contains a mix of conifers and hardwoods. About one mile of the Little Bushkill Stream offers "stillwaters" for canoeing.

Pennel Run Natural Area

Scrub oak, gray birch, aspen, and mixed oaks dominate the landscape of the Pennel Run Natural Area. This elevated area is comprised of 936-acres. A portion of the Utts Swamp is located within this natural area. Reptiles and amphibians are protected by special regulations within Pennel Run Natural Area.

Buckhorn Natural Area

A high mountain swamp surrounded by mixed oaks is located within the 535-acre Buckhorn Natural Area. Reptiles and amphibians are also protected by special regulations within the Buckhorn Natural Area.

Pine Lake Natural Area

Located in this 67-acre site is a ten-acre glacial bog that exhibits plant zones ranging from open water to tree cover. Various flora and fauna inhabit this truly fascinating tract.

Little Mud Pond Swamp Natural Area

This 182-acre natural area features a boreal swamp. Various emergent plants grow within the glacial bog including species normally found at more northern latitudes such as black spruce, tamarack and picture

plant.

Stairway Wild Area

This 2,882 acre wild area is truly unique for its historic significance as a blue stone quarry during the 1840's, for its wetlands, remoteness and wild natural beauty. Featuring Stairway Lake and the nearby vista overlooking the Delaware River makes this wild area a remote, quiet get away for shared use recreationists. Stairway Wild Area buffers Buckhorn Natural Area to the northeast.

Recreation

The Delaware State Forest is an epicenter for recreational opportunities. The area is easily accessible and within a two-hour drive of New York City and Philadelphia. The scenic beauty is outstanding and the area draws millions of visitors annually.

Hiking

The Blooming Grove 4-H Hiking Trail
This nearly seven-mile trail system was developed by Pike County 4-H Club members in cooperation with the Bureau of Forestry. It features two loop trails encircling hardwood swamps and a meadow. The trail is also open to snowshoe users in winter and is located just west of PA Route 402, about one-half mile south of US Route 6.

Thunder Swamp Trail System
This trail system traverses 26 miles of southern Pike County. The trail is highlighted by mountain streams, swamps, varieties of forest types, forest management practices and other natural features found on the Pocono Plateau. This trail system offers short loop trails for day use and longer loops for overnight camping. Permits are required if campers "car camp," group camp, (more than 10 persons) or stay at the same location for more than one night. Overnight backpack camping is allowed.

The Tarkill Forest Demonstration Area was established in the Delaware State Forest in 1948. This "outdoor Textbook Area" of 82-acres is located north of Peck's Pond along PA Route 402 in Pike County. Along marked trails, trees have been identified, examples of forest management practices can be viewed, and interesting facts about trees are provided. The area is a good example of multiple-use forestry as it supports a high population of wildlife, protects and maintains the Tarkill watershed, is a source of recreation to hunter and hiker, contains a leased forest campsite, and supports a stand of quality timber. The interpretive trail is currently being re-established with updated signage and a corresponding trail map.

Cross Country Skiing & Snow Shoeing

Cross country skiing can be done on any trail, road or forest land. Bruce Lake Natural Area focuses on non-motorized, non-equine and non-bicycle travel. Bruce Lake is the district's cross country ski and snow shoe trail prospect. These trails are not groomed and offer skiers and snow shoe enthusiasts an opportunity to experience the forest's beauty on a marked trail system.

Mountain Biking

Mountain bikes may be used on all roads and most trails in the Delaware State Forest. Natural areas and the Thunder Swamp Trail system are closed to this activity. The degree of riding difficulty can vary

considerably.

Horseback Riding

All though horses may be ridden on all state forest roads and trails within the Delaware State Forest except in natural areas or the Thunder Swamp Hiking Trail; motorized recreational trails offer an extensive trail system for equine users. The Promised Land tract of Delaware State Forest has in excess of 26 miles of trails for equine enthusiast to enjoy. This system links to Promised Land State Park by Hemlock trail.

ATV Riding

The Delaware State Forest maintains three ATV trails totaling more than twenty-eight miles. Class 1 and Class 2 ATV trails, summer and winter riding opportunities exist. Maple Run has been designated class 1 and 2 ATVs for summer use and is 8 miles. Two ATV trails are open for summer and winter riding. Located in Monroe County, Dixon R. Miller Recreation Area offers ATV enthusiasts thirteen miles of Class 1 and Class 2 winter and summer riding opportunities. Burnt Mills ATV trail located south of Interstate 84 on S.R. 402 in Pike County feature's a 7 mile, Class 1 and Class 2 winter and summer trail.

Snowmobiling

The Delaware State Forest maintains nearly 150 miles of snowmobile trails which are open to the public. This system provides trails for both long and short rides. Trail grooming is conducted on about 70 miles of this trail network. Groomed trail systems include the snowmobile trail system at the Promised Land Tract – which connects to Promised Land State Park. The Edgemere Snowmobile Trail System, predominately in Porter Township, Pike County, is also groomed. Dixon Miller Recreation Area and Snow Hill Snowmobile Trail system offer Snow Machine enthusiasts additional opportunities to recreate on their snowmobiles.

Picnicking

The Snow Hill Picnic Area in Monroe County is located one-quarter mile south of the Snow Hill Ranger Station just off Laurel Run Road. A picnic pavilion with tables, charcoal grills and rest rooms are convenient for users. There is NO potable water available at the Snow Hill Picnic Area. A pond stocked with early season trout provides limited fishing. Pecks Pond Picnic Area in Pike County is located along the south shore of Pecks Pond approximately ½ mile east of PA Route 402 off Brewster Road. Potable water, charcoal grills and several picnic tables are the amenities offered. There is no picnic shelter at this picnic area. There is also a picinic pavilion located at Lily Pond, Milford Township, Pike County. This pavilion is situated next to Lily Pond.

Boating

Boat launches are located at: White Deer Lake, two at Peck's Pond, Little Mud Pond, Lake Minisink, and Lily Pond. A launch, mooring permit or Pennsylvania Fish and Boat Commission registration is required to launch any boat on Commonwealth waters. All row boats, canoes and kayaks are required to be registered. Electric motors are permitted on all water except those in natural areas: Bruce Lake, Egypt Meadows Lake, Pine Lake and Little Mud Pond Natural Area Pond.

Fishing

The Delaware State Forest is awash with angling opportunities. The lakes and ponds mentioned below are not to be outdone by the numerous brooks, streams and river that meander their way across the State Forest. Many of these watercourses are stocked with the native species, (brook trout) of trout and rise readily to a fly. Saw Creek, Bushkill Creek, Little Bushkill Creek are all stocked with brook trout. Poplar Run, Saventine Creek, East Spring Run and Red Rock Run to name a few all have native trout. The Delaware River fronts on one mile of State Forest land and is accessible by boat and hiking. Camping permits are required for any overnight stay on this parcel. Anglers on the Delaware River may catch, species including: trout, bass, walleye, shad, musky, catfish, eel, and pan fish.

There are fifteen lakes and ponds within the Delaware State Forest-seven glacial: Rock Hill Pond , Pine Lake, Bruce Lake, White Deer Lake, Little Mud Pond, Long Pond and Little Mud Pond Natural Area Pond and eight man-made: Egypt Meadow Lake, Stairway Lake, Lily Pond, Peck's Pond, Painter's Swamp, Camp William Penn Lake, Snow Hill Pond and Lake Minisink. Many clear mountain streams originate on the state forest and eventually tumble down to the Delaware River over stunning waterfalls. The streams provide excellent trout fishing while warm water fishing is good at many of the lakes and ponds.

Hunting

Hunting for deer, turkey, grouse, woodcock, squirrels, waterfowl, rabbits, hares, coyotes and black bear is a popular use of the forest during designated seasons. Other than a few safety zones around buildings and picnic areas, hunting is permitted throughout the state forest. Additionally, the Delaware State Forest is enrolled in DMAP. DMAP areas are open for antlerless deer harvest only and provide deer hunters with additional opportunities to pursue their sport. For the past nine plus years, the Delaware State Forest has cooperated with Promised Land Sportsmen Association to offer opportunities for youth hunters on liberated Pheasants. These pheasants linger long after the mid-October youth hunt. Trappers have the option to pursue coyotes, bobcats and beaver to name a few. With all the steams, ponds and wetlands; beaver, muskrats and mink are often very plentiful.

Camping

Delaware State Forest offers several different opportunities for motorized camping and primitive camping. The district has 29 established sites for motorized camping where campers will find a fire ring, picnic table, and sign board. An approved permit, free of charge, is required for all motorized camping in Delaware State Forest. The sites vary in size; some may accommodate a vehicle and a tent while others may accommodate several vehicles or an RV. The sites also vary in location and ease of access; many are accessible by sedan/car while others are better accessed by 4WD vehicles. The Delaware State Forest has one established camping area along the Upper Delaware Scenic and Recreational River. Access to this parcel of Delaware State Forest is by boat and hiking. The camp site is administered by the National Park Service and a permit is required.

Sightseeing

The 70,000-acre Delaware Water Gap National Recreation Area abuts the forest district to the east. The district's hundreds of miles of state forest roads provide excellent wildlife and fall foliage viewing. Scenic vistas are found on Cummins Road and Stairway Wild Area. Stairway Wild Area vista is only accessible by hiking to Stairway Lake. From the vista on Cummins Road you can look across the Delaware River drainage to" High Point". High Point is the highest point in neighboring New Jersey. From the vista at Stairway Lake, the view is the Delaware River below.

Meesing Nature Center

The Meesing Nature Center is located on the Delaware State Forest near Marshalls Creek in Monroe County. The Monroe County Conservation District operates the center. Educational programs at Meesing are conducted for individuals and groups of all ages, from preschoolers to senior citizens. Their programs encompass a broad range of interests and activities including teacher education, guided group visits, research, naturalist apprentice training, nature study, maple syrup production demonstration, conservation and natural history.

Timber and Regeneration

The Delaware State Forest has approximately 25,777 acres that is zoned for timber management. The forest district's group of three management foresters annually looks to promote the regeneration of the forest accordingly to the Bureau of Forestry's timber harvest allocation model for even-aged forests. Some ways of promoting this new forest growth are through but not limited to:

- Timber harvest
- Mechanical disturbance
- Prescribed fires
- Herbicide application to treat inhibiting vegetation
- Mowing of inhibiting vegetation
- Tree seedling planting
- Deer exclusions

Part of the Bureau's mission is to provide a sustainable supply of forest products to the surrounding communities. The sale of timber products from state forests returns money to the Commonwealth and provides a resource base for the forest products industry. A portion of that money is also set aside and used for the promotion of new regeneration on the forest floor and the associated treatments to sustain and grow those seedlings into the forest of the future.

All Pennsylvania State Forests are certified by a third party as "well managed and sustainable". The timber cut from Pennsylvania's State Forests can be marketed with a "green label", which ensures end-use consumers they are purchasing wood that has been cut from a forest that is managed in an environmentally sensitive manner.

Fire Towers

There are four fire towers located within the Delaware State Forest: Big Pocono Tower, next to Camelback Ski Area; Pohopoco Tower off of Route 115 in Blakeslee; Buckhorn Ridge Tower overlooking the Pinchot Estate; and High Knob Tower, overlooking Peck's Pond. The Big Pocono and High Knob towers are still staffed during the spring fire season to help detect wild fires. In 2017, the old tower at Big Pocono was disassembled and replaced with a new, taller fire tower. The old tower that was erected in 1921 will be relocated to Grey Towers National Historic Site, the home of pioneering forester Gov. Gifford Pinchot, where it will be refurbished and re-erected. Buckhorn Ridge, Big Pocono, and the Pohopoco fire towers are all listed on the National Historic Lookout Register.

Purpose and Goals

Purpose

The Bureau of Forestry's mission is to ensure the long-term health, viability, and productivity of the Commonwealth's forests and to conserve native wild plants. The Delaware Forest District's purpose is to uphold the Bureau's mission. We provide a variety of forest recreational activities for both in state and out of state residents. We also manage state forest lands for sustainable timber resources while retaining its wild character. Most notably, the Delaware State Forest provides clean water for the Delaware River Watershed and helps maintain high quality aquatic ecosystems.

District Interpretive Goals

1. Encourage exploration and participation in low impact recreation within the Delaware State Forest.
2. Promote awareness and encourage sustainable use of resources by communicating, promoting and modeling good stewardship and best management practices.
3. Support effective partnerships with local communities that benefit the community, the resource and the visitor.
4. Develop engaging experiences that promote intellectual and emotional connections between the resource and visitors.
5. Communicate the ongoing challenges of balancing natural resource use with society's needs, wants and desires.
6. To foster an appreciation and understanding of the history of Pennsylvania's forests and their role in our lives.

Objectives

Outputs: What the Delaware State Forest will do for the visitor:

1. **Interpret and communicate to the visitor our resource management efforts while maintaining the wild character of the state forest. (Goal 2,4,5,6)**
2. **Interpret the dam repair and ecology at Peck's Pond. (Goal 2, 3, 4, 5)**
3. **Provide and maintain historic, cultural and natural history waysides. (Goal 2, 4, 5, 6)**
4. **Increase the variety or recreational program offerings (Goal 1 and 4)**
5. **Increase the visibility of the state forest by attending one community event where the state forest is promoted. (Goal 1, 3, 4, 5)**
6. **Work cooperatively with local school districts and conservation districts to serve as outdoor educators. (Goal 2, 3, 4, 5)**
7. **Develop at least one additional volunteer opportunity. (Goal 3, 6)**
8. **Seek public volunteer help for district clean-up days. (Goal 2 and 3)**
9. **Block roads that are too risky to pass due to winter conditions.**
10. **Promote a clean land ethic with "pack in, pack out" signage at all tracts. (Goal 1 and 2)**
11. **Continue to provide a public contact at local festivals and public events. (Goal 1-6)**
12. **Create recreational special use maps and specific area maps. (Goal 1)**

Outcomes: The anticipated short-term action resulting from the above outputs – "What the visitor will do."

1. **Volunteerism will increase by 1% at Delaware State Forest.**

2. **Vandalism will decrease by 10%.**
3. **Litter will decrease by 15%**
4. **School group visitation will increase by 2%.**
5. **Logging complaints will decrease by 5%.**
6. **Decrease of 25% of visitors getting stuck on winter roads.**
7. **Attendance of public programs on Delaware State Forest will increase.**

Impacts: The long-term benefits to the state forest as a result of the above outputs and outcomes – What happens long-term.

1. **Staff time devoted to litter pick up will decrease by 15%.**
2. **Demands on staff time and operational budget required for state forest projects will be re-directed to other needs because of volunteer efforts.**
3. **Staff involvement of recreational and volunteer events will increase.**
4. **Visitors will have an overall more enjoyable experience on State Forest Land.**

Audiences and Market Considerations

- **Current Visitors:** Hikers, mountain bikers, equestrian riders, hunters, fishermen, campers, ATV riders, snowmobilers, school groups, Boy and Girl Scout groups, local residents, leased campsite owners, and out of state visitors.
- **Current Web Visitors:** All of the above. Interaction on the district's Facebook page.
- **Key Audiences:** Hikers, hunters, fisherman, leased campsite owners, woodland owner groups, campers, trail groups, out of state visitors from New York City and surrounding areas.
- **Future Markets and Trends:** Increase in mobility device permit users. Increase in social media outlets and usage. Increase in visitors from out of state/large cities.

Theme and Subthemes

Central Theme: The Delaware State Forest connects visitors to nature by providing a range of recreational opportunities while also providing for sustainable natural resource management.
Subthemes:
Delaware Forest District will continue to provide a quality experience to the visiting public for generations to come through sound management of its resources and active stewardship.

- The work of the CCC and PA Conservation Corps will be preserved by maintaining roads/trails, structures, and dams and maintaining signage that details the work.
- The multiple wild and natural areas provide conservation of an array of unique plant and wildlife species for public enjoyment.
- Timber harvesting occurs in accordance with the ecosystem management philosophy of the Pennsylvania State Forest Management Plan and FSC/SFI certification.
- Delaware State Forest is within close driving distance to several metropolitan areas, providing for a great recreational opportunity to those visitors.
- Delaware State Forest provides clean water for the Delaware River Watershed.
- Delaware Forest District has a rich history in wildfires and the prevention and suppression of fires.

Current Interpretation (personal and non-personal)

- Personal-
    - County fairs
    - Walk in Penn's Woods hikes
    - Forest Fire Prevention Programs
    - Festival of Wood
    - Envirothon trainings
    - Natural Resource Outreach; i.e. school programs
    - Public Meetings; i.e. Pecks Pond update, SFRMP public meetings
    - Leased Campsite Inspections/Cabin Administration
- Non-personal-
    - Tarkill Interpretive Trail
    - Delaware State Forest Facebook Page
    - State Forest Leased Campsite Newsletter
    - CCC Camp signage
    - Wood Duck Propagation Area
    - Deer Exclosure Demonstration site
    - Pecks Pond Duck Habitat sign
    - Kiosks (28)
    - Maps
        - Public use
        - Thunder Swamp Trail System
        - ATV
        - Snowmobile
        - Buckhorn Natural Area
        - Dixon Miller Recreation Area

Issues, Challenges and Opportunities

- Educate forest users on the importance of balanced ecosystem management and what that means to them and future generations.
- Illegal forest dumping.
- Illegal ATV riding.
- Vandalism to signage and structures.
- Educate the public on the ecology and impact of Pecks Pond and the dam project.
- Leased cabin break-ins/vandalism.
- Controlling invasive species.

Recommendations for Personal (P) and Non-personal (NP) Media

This section includes the specific descriptions for personal (staffing, programs) and non-personal (exhibits, publications, waysides, etc.) media as well as costs for each recommendation.

This is how you accomplish the objectives and prioritize your interpretive projects and funding.

This section is linked to the Project Request Sheet/Share Point Site. Your priorities become our priorities.

*Priority	*Rec Number	Recommendations (in priority order)	Corresponding Objectives	Estimated Cost	Project Lead
		Personal Services (P):			
		Non Personal Services (NP):			
	NP1	Big Pocono fire tower signage			Roche
	NP2	Pecks Pond ecology/impact			Balch/Maza
	NP3	Equine trail maps			Balch/Maza
	NP4	Tarkill Interpretive Trail signage & maps			Roche/Beers
	NP5	Bruce Lake Trail maps			Balch/Maza
	NP6	Pohopoco and Buckhorn Fire Tower Historic Interpretation Panels at lookout sites			Roche
	NP7	State Leased Campsite newsletter			Balch/Maza

*The Priority number and Recommendation Number are needed when requesting an interpretive project from the Communication Section.

Evaluation Strategies

- Review this plan every cycle in conjunction with the District Management Plan and SFRMP to discuss updates and changes needed.
- Evaluation of comment cards received.
- Keep notes from personal interactions with forest users and share amongst staff.
- Have discussions with volunteer groups, clubs, and leased campsite owners to evaluate the effectiveness of our interpretation efforts.

Implementation Plan

- Continue to utilize Facebook and the district's website to post information.
- Update Tarkill interpretative trail including map.
- Create/update area specific maps.
- Continue to keep visitors/leased campsite owners updated on the Pecks Pond dam project.
- Update hiking trail signage.

References

- Delaware Forest District Resource Management Plans
- Delaware State Forest Public Use Map
- Delaware Forest District Website
- Various resources in the district's history files