Moshannon 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, comprises 13 percent of the forested area in the commonwealth. The Bureau of Forestry is the steward of this land, and 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 resources and values, to ensure the overarching goal of state forest management – ensuring sustainability – is achieved.

State forest management is a coordinated effort involving field staff in 20 forest districts located throughout Pennsylvania and central office program area staff. Each district is responsible for managing wildland fire, destructive insects, and disease 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 provide for the protection, administration, 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 Moshannon 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 Moshannon 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 Moshannon 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 Moshannon 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 Moshannon 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 Moshannon 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 Moshannon State Forest consists of 190,000 acres of state forest lands and 6 Landscape Management Units (described below and on page 85), some of which may span boundaries with neighboring state forest districts. The Moshannon Forest District occurs in Elk, Centre, and Clearfield Counties in the northcental part of Pennsylvania, mostly in the Pittsburg Low Plateau and Allegheny Front Ecoregions. Landforms, geology, and totality of ecosystem factors have made this forest district notable for: northern red oak timber production, high occurrences of bogs and lakes, natural gas exploration, headwaters of the Susquehanna River, agricultural development, a reintroduced elk herd, thriving brook trout populations, high population density of human beings. Generally, soils and growing conditions on state forest lands here are of good quality in terms that impact biomass production.

Major historic impacts to the forests here have included: deforestation, uncontrolled wildfires, coal exploration, clay mining, Civilian Conservation Corps (CCC), Curtiss-Wright testing facility and various introduced pests and diseases.

Currently, most 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. For many reasons, this uniformity 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. Forest managers respond to these disturbances with silvicultural treatments to combat the forest threats and to capture the opportunity to improve the forest stands. The treatments consist of herbicide and pesticide spray programs, salvage timber sales, prescribed fires and deer fence exclosures. A few examples of these type of responses include: oak leaf roller infestation, 1985 tornado, gypsy moth outbreaks and the prevalence of hay scented fern in the forest understory.

As part of a public trust, the Moshannon 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 Moshannon 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 mixed oak-mixed hardwood forest, dry oak-heath forest, and red oak-mixed hardwood forest 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 1,970 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, 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 or Serpentine Pitch Pine-Oak forest or vernal pool complexes, 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 woodcock, northern flying squirrel, Allegheny woodrat, and brook trout.

Recreation is becoming an increasingly popular forest use on the state forest system and in this district. The State Forest's Moshannon State Forest contributes to a large, nearly contiguous block of forest unequalled in the eastern United States provides a unique setting, wrought with wild character and potential for remote backcountry activities. The remoteness and lack of proximity to developed areas especially in the Quehanna Wild Area of Moshannon State Forest has provided a conspicuous island of rugged forest land where people can experience a wild sense of place amidst the noise of surrounding development. The large land base offers a variety of recreation potential for long multi-day excursions or short day-hikes depending on the forest users desire. Located in the heart of the PA Wilds, Moshannon State Forest allows most users ample opportunities to interact with native ecosystems. Popular recreational uses of this state forest include: trout fishing, hunting, sightseeing, hiking, snowmobiling, horseback riding and mountain biking.

Additionally, the district seeks to couple some recreation opportunities with education and interpretation. This district manages multiple educational features, including: wayside exhibits, trailhead kiosks, forest driving tour and several informational and educational brochures.

To facilitate land management objectives and meet public use demands, the district manages an array of infrastructure, including but not limited to: nearly 300 miles of public use roads and a list of parking lots, bridges, culverts, trails, etc. The district is divided into 3 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):

- **Maintain High quality watersheds used for public water supplies and exceptional value streams with the use of healthy forest buffer guidelines and strategic planning and administration of forest operations.**
- **Protection and enhancement of rare, endangered, threatened species, cultural resources, and habitats from forest uses and activities.**
- **Practice intensive silvicuture by creating early successional habitat while taking advantage of natural desirable regeneration and meeting goals established by the harvest allocation model.**

- **Create a diversity of wildlife habitat through projects, such as food plots, fish habitat improvement, aspen cuts, orchard establishments, and maintenance of both shallow water impoundments.**
- **Maintain and improve existing recreational opportunities that are low density, dispersed and consistent with the experiences expected in the ROS zone where they occur. Priority emphasis will be given to maintaining Semi Primitive Non-motorized and Primitive experiences, since these can only be found in vast forest areas devoid of human impacts. This includes planning necessary to address the physical, social and administrative aspects of recreation management for common pursuits like hiking, hunting, fishing, trapping, horseback riding, mountain biking, camping, and snowmobiling, as well as planning for organized events and staying abreast of future recreational trends.**
- **Respond to wildfires and emergencies**
- **To work and maintain cooperative relationships with gas operators to minimize and mitigate recreational impacts (I.E. Dague and Tyler Trails), retire conventional gas wells and decommission infrastructure, minimize fragmentation, reclaims sites, while improving habitat and aesthetics.**
- **Maintain roads and infrastructure within the district.**
- **Communicate and promote forest values and benefits**.

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 85). LMUs are the "building blocks" of the Moshannon 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 6 LMUs in the Moshannon Forest District (Figure i). LMU plans for this district begin on page 85.

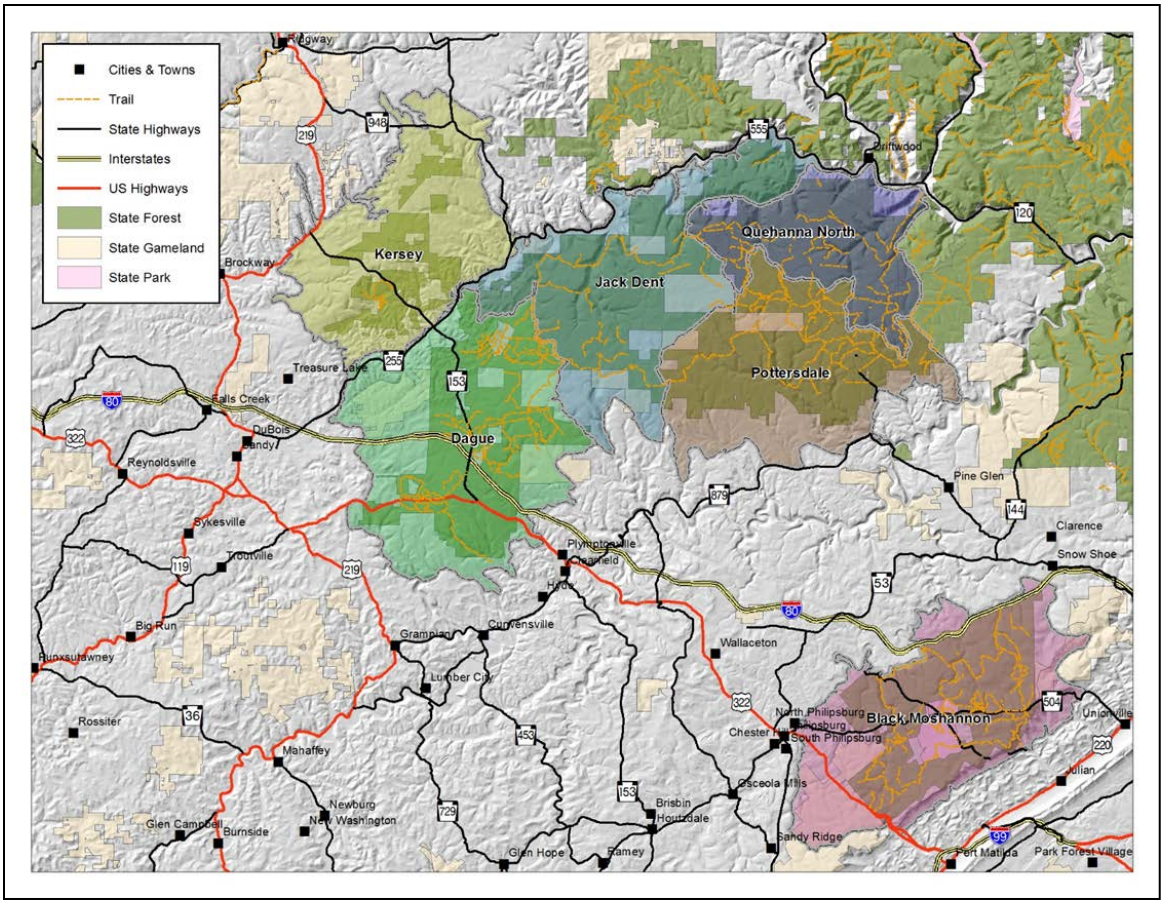


Figure i: LMUs for the Moshannon Forest District

List of LMUs in Moshannon State Forest

- Black Moshannon Landscape Management Unit
- Dague Landscape Management Unit
- Jack Dent Landscape Management Unit
- Kersey Landscape Management Unit
- Pottersdale Landscape Management Unit
- Quehanna North Landscape Management Unit

District Priority Goals

The 2018 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 Moshannon State Forest over the next 5-10 year planning horizon.

The Moshannon has set ten principles of focus for the next planning horizon.

- **Maintain High quality watersheds used for public water supplies and exceptional value streams with the use of healthy forest buffer guidelines and strategic planning and administration of forest operations.**
- **Protection and enhancement of rare, endangered, threatened species, cultural resources, and habitats from forest uses and activities.**
- **Practice intensive silvicuture by creating early successional habitat while taking advantage of natural desirable regeneration and meeting goals established by the harvest allocation model.**
- **Create a diversity of wildlife habitat through projects, such as food plots, fish habitat improvement, aspen cuts, orchard establishments, and maintenance of both shallow water impoundments.**
- **Maintain and improve existing recreational opportunities that are low density, dispersed and consistent with the experiences expected in the ROS zone where they occur. Priority emphasis will be given to maintaining Semi Primitive Non-motorized and Primitive experiences, since these can only be found in vast forest areas devoid of human impacts. This includes planning necessary to address the physical, social and administrative aspects of recreation management for common pursuits like hiking, hunting, fishing, trapping, horseback riding, mountain biking, camping, and snowmobiling, as well as planning for organized events and staying abreast of future recreational trends.**
- **Respond to wildfires and emergencies**
- **To work and maintain cooperative relationships with gas operators to minimize and mitigate recreational impacts (I.E. Dague and Tyler Trails), retire conventional gas wells and decommission infrastructure, minimize fragmentation, reclaims sites, while improving habitat and aesthetics.**
- **Maintain roads and infrastructure within the district.**
- **Communicate and promote forest values and benefits**.

District Overview

1) Location and Description

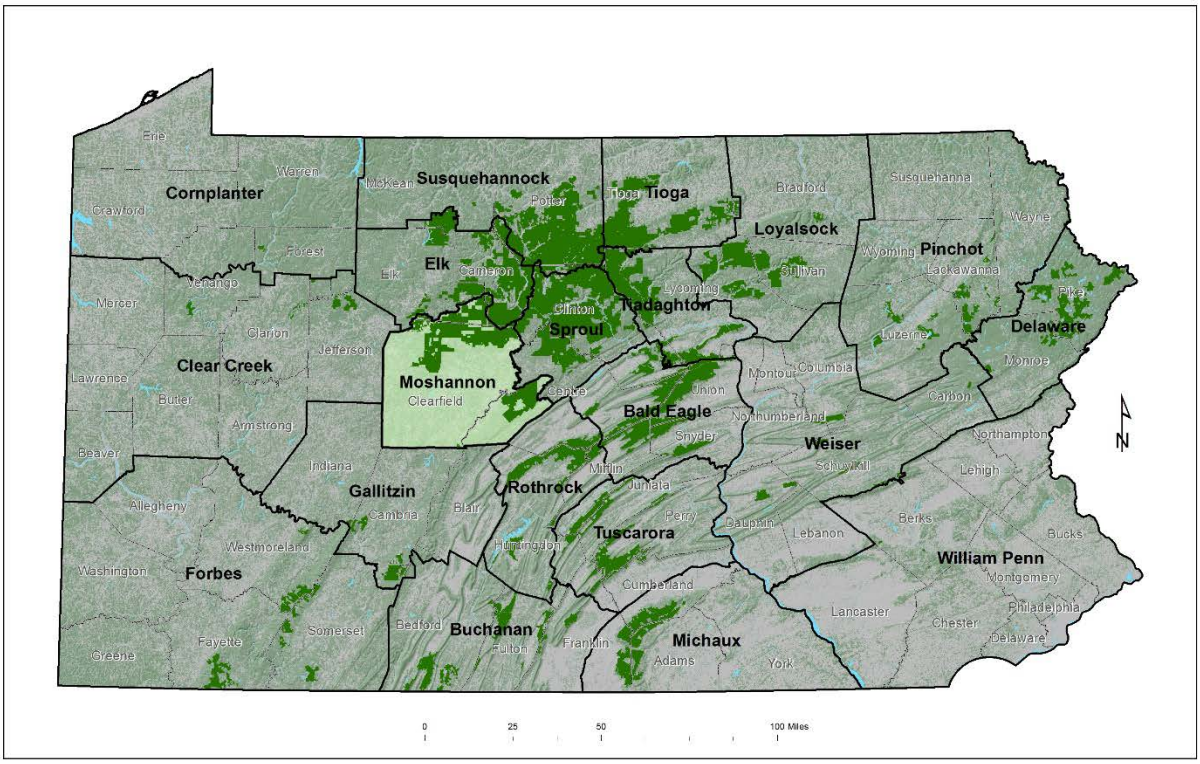


Figure 1-1. Location of Moshannon Forest District with state forest land (dark green).

Moshannon State Forest derives its name from the Native American description of the waterway that runs through the district 'Moss-hanne' or 'moose stream'.

The Moshannon Forest District lies on the Allegheny Plateau, which is the northern edge of the Allegheny Plateau ecological region. The plateau is bound on the north and east by the Deep Valley Ecological Region created by drainages to the Susquehanna River and on the west by the Pittsburgh Low Plateau Ecological Region. The highest elevation in the forest (2,400 feet) lies near the Knobs Fire Tower site about six miles north of exit 123, off interstate 80. The lowest elevation in the forest is 874 feet, near the village of Mix Run.

On the North edge of the forest the Bennett's Valley breaks the Allegheny Plateau into dendritic deep V-Shape valleys with 30 to 50% slopes and changes in elevation of around 1,000 feet. The Allegheny Front breaking into the Bald Eagle Valley Drops similarly, but with very few dendritic incursions.

The forests of Moshannon Forest District lies within the transitional zone between the northern hardwood and Allegheny hardwood forests to the north and mixed oaks, and oak hickory forests to the south. The central portion of the Plateau typically has black cherry, sweet birch, red oak, red maple, beech, cucumber and some tulip poplar. The forest on the outer edges of the plateau are made up of red oak, white oak, chestnut oak, red maples and white pine. The poorer soils of the drier sites are dominated by chestnut oak, sassafras, black gum and pitch pine. Along the streamsides and cooler

moister sites, species typically found are eastern hemlock, white pine, sweet birch, red maple, beech and some sugar maple.

2) District Organization and Human Resources

The Moshannon State Forest is one of the 20 state forests administered by the Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry.

With over 190,000 acres, Moshannon State Forest comprises about 8.8% of the 2.2 million-acre state forest system. Within the bureau, the administrative responsibility of the Moshannon State Forest is delegated to the district forester, whose office is located at 3372 State Park Rd. Penfield PA 15849. The district forester is responsible for executing all of the sections of the State Forest Resource Management Plan. The district forester has two assistants. One manages primarily the forester staff in conducting resource management activities including timber sales, landscape planning, and gas management. The other manages primarily maintenance staff in conducting forest operations including roads, bridges, and boundary lines as well as wild land fire suppression and service forestry activities. The following is an organizational chart displaying the personnel of the Moshannon Forest District.

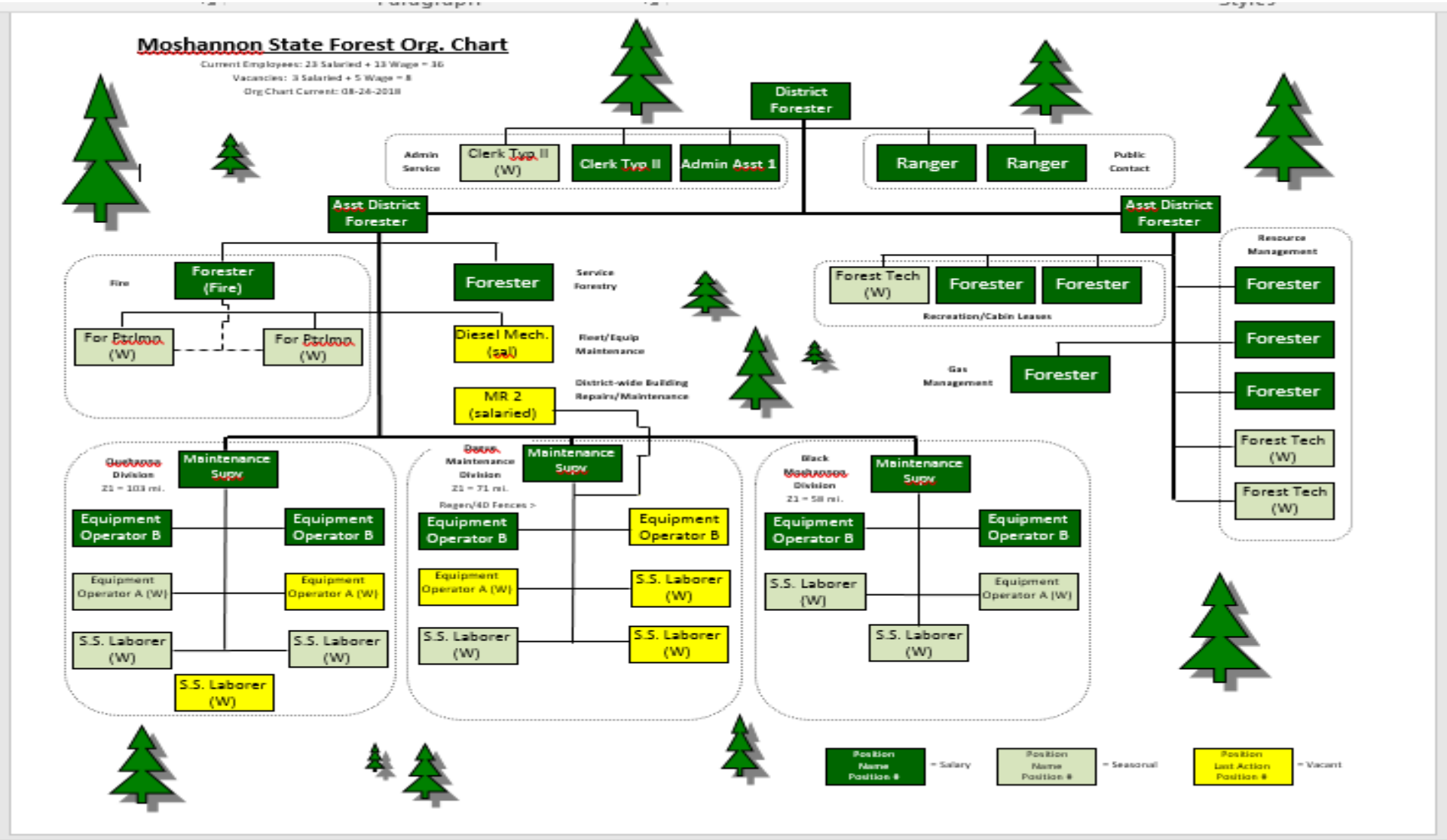


Figure 2-1. District organization chart

The forest is divided into the three maintenance divisions:

- Black Moshannon Headquarters
  40 Airport Road, Philipsburg, PA 16866
- Dague Headquarters
  3372 State Park Road, Penfield, PA 15849
- Quehanna Headquarters
  943 North Lincoln Road, Weedville, PA 15868

3) Historical Land Use and Disturbance

ORIGINAL FOREST TYPE OF THE MOSHANNON STATE FOREST

As the settlers penetrated the region drained by the West Branch of the Susquehanna River, they found the ridges that blocked the way to the west frequently had a higher proportion of evergreens than the lowlands. White pine and hemlock appeared in the moist plateaus and shady locations on the slopes. On the sandier and rocky slopes, pitch pine and chestnut oak were common. However, mixed with these trees was an assortment of hardwoods such as beech, yellow poplar, birch, ash, maple, hickories, chestnut, mixed oaks, and cherry. Usually these forests were the mixed hardwoods and conifers characteristic of the northern type of forest, but in certain favorable localities drained by the West Branch of the Susquehanna River, large pure stands of white pine were to be found. This was the report given by J. E. Defebaugh in his book of 1906 on the "History of the Lumber Industry of America."

James Mitchell states in his book on "Lumbering and Rafting in Clearfield County" (1922) that the forest was predominantly white pine. In fact, white pine in some localities ran as high as 100,000 board feet to the acre. If a tract of hardwoods also contained 20,000 board feet of white pine to the acre, it was considered good. The species of next greatest abundance was hemlock followed by white oak. Mitchell also states that the area encompassing the headwaters of Anderson Creek, Lick Run, Trout Run, the upper drainage of Bennett's Branch of the Sinnemahoning, and the headwaters of the West Branch of the Susquehanna River was claimed by some lumbermen to constitute the best white pine district in the United States. This area, with the exception of the headwaters of the Susquehanna, is now within the Moshannon State Forest.

R. Dudley Tonkin, raftsman and author, stated that white pine growing in the upper drainage of the West Branch attained a greater height than that growing downriver beyond the present boundaries of the Moshannon State Forest, although white pine in both areas attained the same diameter.

From 1860 to the early 1900s, practically all the virgin timber growing on what is now the Moshannon State Forest was removed. The last timber operation on future State Forest land was conducted in the 1920s by the Whitmer-Steele Lumber Company located at Clearfield, Pennsylvania. This company's operation, which was located in the hollows of Stone Run, Doctors Fork, Lick Run, Cold Stream areas and the headwaters of Laurel Run, was completed in early 1921.

After the removal of the virgin forest, catastrophic events such as windstorms, drought, and fire proved to have a detrimental effect before, during and after the establishment of the second growth forest. As a result, it is doubtful that the new forest will ever attain the size and volume per acre over vast areas that existed prior to the arrival of the early settlers.

EARLY HARVESTING AND FIRE

Over time timber cutting proceeded at an ever-increasing rate. Even though the forests of this area seemed to continue on forever across the mountains, and the trees themselves were of unbelievable size - neither could survive the onslaught of cutting that began in the mid-1880s and lasting for 60 years. White pine, hemlock, oak, beech, poplar, ash, and maples - all succumbed to the loggers' cross-cut saw and axe. The entire area was cut without regard for the future. Although other factors may have had a greater influence on this area—wholesale removal of the forest was perhaps the most dramatic.

During the logging operations of the early 1800s, those portions of trees not used for square-timbered raft construction and ship spars did not constitute a hazardous build-up of fuel. In this type of operation individual trees were selected and felled throughout the forest. As a result, there was no concentration of slash in any one area, and very few forest fires started in the logging debris.

During the late 1870s and into the 1880s, the accumulation of slash from the hemlock and remaining white pine created tremendous fire hazards. Later in the 1890s and into the early 1900s, the remaining virgin hemlock and hardwood forests were harvested. All saw logs, pulpwood, and hemlock bark were hauled from these timber operations to the permanent mills and tanneries on logging railroads that had been constructed into the forest area. The residue left on the forest floor in the form of slash and small-sized trees not considered merchantable, and sparks from logging locomotives frequently led to disastrous fires.

Between 1880 and 1900 forest fires consumed the tremendous accumulation of slash left behind after the removal of the virgin timber. Lumber companies, in many instances, realized the possibility of forest fires burning from their previous cutting operations into adjacent timber stands. Consequently, they actually set their old slashing's on fire when weather conditions were favorable to eliminate this potential fire hazard.

James Mitchell, who was a timber buyer and raftsman from the late 1880s to early 1900s, stated in his book that very little virgin timber was burned in this area before lumbering operations began. This, of course, was due to the fact that the forest was predominately coniferous, which meant that the accumulation of heavy fuel on the forest floor was negligible, the dense canopy of the forest decreased the wind velocity, and, the humidity within the forest was increased. In addition, the area was not heavily populated. All these factors decreased the possibility of forest fires burning over large areas.

Fire also had a definite role in the establishment of the vegetative and forest cover that exists today in the Moshannon State Forest. The third Annual Report of the Pennsylvania Department of Agriculture for the year 1897 records forest fires burning through large cutover areas of the future Moshannon State Forest. In many areas both hardwood and coniferous regeneration were destroyed.

Areas that had supported pure stands of pine and hemlock contained the heaviest build-up of slash after logging. Fires in these areas burned hot and deep into the soil, consumed all organic material and natural reproduction, and destroyed any remaining seed source. Today, areas such as these in the Moshannon State Forest where the water table is high, are either void of tree growth or are very poorly stocked with poorly formed hardwoods. Lower vegetation consists of sod, bracken fern, or huckleberries. The abundance of huge pine and hemlock stumps in these areas is a constant reminder of the tremendous size trees that existed until the removal of the virgin forest.

Areas that consisted of hardwood species were either pure stands of hardwoods or hardwoods that grew in mixtures with white pine and hemlock. When cutover or consumed by fire, these areas typically produced a new hardwood forest by sprouting, which is also referred to as a coppice method of reproduction. As a result, many

burned-over portions of the Moshannon State Forest developed into either poorly stocked or well-stocked coppice hardwood stands.

Pure aspen stands often become established as a result of fires sparing a few aspen remnants, which in turn seeded the exposed mineral soil. Hardwood species also developed into stands as a result of direct seeding from scattered cull hardwood trees, which were not felled during the timber operations due to their lack of commercial value.

The 1910-1911 report of the Pennsylvania Department of Forestry stated that every effort of the department must be exerted towards fire protection as a primary feature before considering artificial regeneration. The report also stated that more roads, trails, fire towers, and telephones were necessary for the control of forest fires in order that a new forest could develop on the land again.

Forest fires burned over most of the land area in the Black Moshannon Division of the Forest repeatedly. Foresters of the former Department of Forests and Waters, inspecting the land, which was offered for sale to the state in 1911 by Harris & Gray, found that practically the whole ownership was covered with scrub oak. These foresters reported the tract, as a whole was not worth the price that Harris & Gray asked. However, in 1929 the state did acquire this ownership.

The original forest was converted into two predominant hardwood forest types. These types developed, not as a result of the complete removal of the virgin forest, but due to the fact that forest fires repeatedly burned over the area and destroyed practically all coniferous reproduction. Fires continued to burn over vast acreages during 1912, 1913, and 1930. Gradually, large scale and widespread fires ceased due to extensive efforts of our predecessors, that included development of roads, trails, firebreaks, a network of statewide fire towers, and a network of fire wardens and crews to suppress fires. Without such efforts, our second growth forests might not exist.

The greatest percentage of second growth in the Moshannon State Forest developed into an oak-chestnut type. Occasionally throughout this oak-chestnut type, northern hardwoods and pure aspen developed into small stands. However, the northern hardwood type also developed extensively over a large area in the northern portion of the forest.

Second growth white pine and hemlock became established on very small areas in isolated pure and mixed stands in the stream bottoms and northern and eastern exposures, or occasionally as single specimens in the vast hardwood forest.

4) Acquisition History

Prior to Europeans settling Pennsylvania, dense forests nearly covered the entire state, with the exception of a few natural meadows in the lowlands and scattered rocky areas in the highlands. These seemingly inexhaustible timber tracts provided the early settlers with raw materials to produce charcoal for the iron and steel industries, ties for railroads, fuel wood and chemical distillation wood, as well as lumber for homes, buildings, furniture, barrels and boxes. The settlers never envisioned that such forests could ever disappear. Over time, as Pennsylvania's increasing population turned forest land into farms, and as expanding industries consumed more and more wood, the amount of standing timber grew smaller. Between 1860 (when Pennsylvania led the nation in lumber production) and 1900 (when it had to import lumber to fill its needs).

In the late 1800s, 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 burned uncontrolled throughout much of the cutover area. With no trees left to take up moisture, water tables increased making it more difficult for tree seedlings and other plants to grow in some areas. The perched water tables also kept rainfall from infiltrating into the ground. Increased amounts of water cascaded down through the barren landscapes until it reached a log slide or skid trail that carried it rapidly down the hills to streams and rivers. This led to devastating floods, since no flood control dams existed yet. Nature took its course and the roots from the former trees decayed, and the widespread and devastating fires kept any new plants from establishing new roots. With no roots to hold the soil in place and a perched water table, soils easily eroded and washed away with the increased runoff following the logging remnants to the streams and rivers. This had two detrimental effects. The first being the loss of productive soils to establish new forests, and the even more devastating effect of choking the aquatic life from our streams and rivers. The future wood supply and the restoration of once-forested areas greatly concerned conservation-minded citizens.

In 1887, the Pennsylvania 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. Authorized by the legislature once again, the governor appointed a second commission 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.

In 1897 the legislature passed an act authorizing the purchase of unseated lands for forest reservations, thus marking the beginning of the Pennsylvania 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 Pennsylvania, 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. In 1898, 7,500 acres of land in Clinton County became the first land purchased under this new act.

The largest tract of land under single ownership in the area of the future Moshannon State Forest was owned by the Dodge, James and Stokes Company of New York and Baltimore. This continuous tract of 60,000 acres was located in the northern part of Karthaus, Girard, Covington, Goshen, and Lawrence Townships in Clearfield County and also extended into Elk and Cameron Counties. Eventually most of this land was purchased by the Pennsylvania Joint Land and Lumber Company and then by the Commonwealth.

The first purchase of land for the Moshannon State Forest was 353-acres located on the headwaters of the North and West Branches of Montgomery Run north of Clearfield in Pine Township, Clearfield County. This parcel of land was acquired on September 28, 1898 at a tax sale by Clearfield County Treasurer Dyer. Total purchase cost to the Commonwealth for this acreage, in payment for delinquent taxes, was $65.45.

As funding and land tracts become available the Moshannon is looking for "in holding" acquisitions moving forward.

Table 4-1. Land acquisition record by decade for Moshannon State Forest.

Decade	Acres
1890	60,353
1900	48,877
1920	33,031
1930	19,306
1940	13,500
1950	9,909

1980	2,933
1990	1,497
2000	4,210
2010	579

5) Cultural and Historic Resources

There are 10 original CCC Camp locations on state forest lands. Several archaeological sites are located on the forest. These sites are where "Indian Mills" have been located. Remnants of railroad grades, logging camps, early mine sites and coke ovens are scattered throughout the forest.

INFRASTRUCTURE AND DEVELOPMENT ON THE MOSHANNON STATE FOREST

Our First Highways – Susquehanna River Logging History

The entire land area within the present Moshannon State Forest occupied a very important position—both economically and physically—during the heyday of logging along the West Branch of the Susquehanna River. The river and the timber growing along its banks and tributaries proved to be the backbone of a logging and sawmill industry that lasted for over 60 years. Timber and lumber from this area was not only used to help build cities and towns down-river but also along the Atlantic coast, as well as to build sailing ships.

Road Construction

The earliest Department Report that mentions what is now the Moshannon State Forest (1908-09) talks about the fine work William F. Dague was doing. It further went on to recommend that when he finishes the topographic survey he was working on, that he indicate what roads he intended to open and where to construct firebreaks. This report described the condition of many of the roads that had been built 20-30 years earlier for logging. The roads were overgrown. In rough or wet places, they placed corduroy surfaces. The bridges were made of logs. Both the bridges and corduroy sections had deteriorated. Since the primary objectives were to make the lands accessible for purposes of fire control and reforestation of burned-over and open areas, roads, firebreaks, and trails were good places to start. To achieve these objectives, a road development program was initiated around 1910. In many areas the only access to the forest, other than on foot, was by logging railroads. When the logging railroads disappeared the ties and rails were removed, and the logical place to build roads was on these old railroad grades. In fact, many of the forest roads were built on the old logging railroad grades. The following represent the few details that are known about the Moshannon State Forests early road program.

In 1910, Dague established 30 miles of fire lines and trails and made 20 miles of road useable by a team of draft animals, which included construction of new bridges and replacement of three bridges with fords. He also constructed 6 miles of new roads. In another section of the reserve, Carl Kirk brushed and improved 20 miles of old roads and replaced bridges with fords.

In 1911, Dague improved 33 miles of old roads and fire lines. Carl Kirk opened and improved 21 miles of old roads and fire lines. Nelson McNaughton opened and improved 5 miles of roads and fire lines, as he was new to his area.

In 1912-13, details were reported by each Reserve and further subdivided by division. The Clearfield Reserve, Clearfield Division provided a detailed list of the roads they worked on that totaled 48 miles both years. The removed stones, cut brush, built bridges and fords on these roads.

The Clearfield Reserve, Karthaus Division worked on four roads totaling 16 miles in 1912. They remove stones,

filled holes, and repaired bridges. In addition, this division brushed raked and burned four miles of fire lanes and brushed about 30 miles of trail. This division repaired 23.5 miles of roads fire lanes and boundary in 1913.

The Clearfield Reserve, Penfield Division brushed just over 7 miles of road for the first time and another 21.5 miles of road were re-brushed and improved in 1912. In 1913, this Division improved 25 miles of road.

The Sinnemahoning Reserve, Medix Division described all their roads in bad condition needing ditching and surfacing. Fire lanes had heavy grass on them. They improve 8 miles of roads and nine miles of fire lanes in 1912 for a total of 18 miles of road open and 14 miles of trail. In 1913, they improved 4 miles total.

With the acreage of State Forest growing and Mont Alto turning out a number of foresters since 1906, the decision to condense the 1914-15 Department Report. No longer would they contain written descriptions of each forester's accomplishments. Instead, they contained a table that broke accomplishments down as an overall total from 1901-1915, by Division. The Clearfield Division improved 100 miles of old road, built 22 miles of new road, built 25 miles of trail and opened 3 miles of fire lanes. The Karthaus Division improved 32 miles of old road, built 5 miles of new road, built 1.5 miles of trail and opened 13 miles of fire lanes. The Medix Division improved 37.5 miles of old road, built no miles of new road, built 5 miles of trail and opened 4.5 miles of fire lanes. The Penfield Division improved 39 miles of old road, built no new road, built 5 miles of trail and opened no fire lanes.

The Department Report for 1916-17 condensed the accomplishments even further lumping all road, trail and fire lane improvements or extensions into one column by Division by year. The results are as follows: Clearfield – 41 miles 1916, Clearfield – N/A 1917, Karthaus – 60 miles 1916, Karthaus – 65 miles 1917, Medix – 24 miles 1916, Medix – 14 miles 1917, Penfield – 41 miles 1916, and Penfield 41 miles 1917.

The Department Report for 1918-19 looked like a high level executive summary of accomplishments that had no details on roads trails or fire lanes.

The Department Report for 1920-21 had even fewer details, but it did contain a summary of expenditures that would illustrate what direction the Department's road program would head. In 1920, the Department spent $1,888 statewide on roads. The Department went through its initial growing pains where staff and funds to do the work were limited. Now, we had more staff, but the funds and machinery was lacking. This would change with Pinchot's $1,000,000 lobby. In 1921, the Department spent $45,038 on roads or 45 times as much as the year before.

Our fire suppression and reforestation efforts, encouragement for the public to use the forests and parks, increased leisure time for recreation, and acquisition efforts had slowly changed the notion that these exploited lands were worthless. The Department had entered a prosperous period where public support brought funds to carry on conservation efforts. These protection funds would lead to the *development of 1232 miles of roads and 2500 miles of trails from 1920-1927.*

A February 1929 issue of Forest Leaves contains a reference to what could be the first road maintenance equipment purchase consisting of trucks, graders, etc.

The Department Reports continued until 1935 but are missing. Their brevity kept them from providing information anyway. A report from the Secretary of the Department in January 1933 to the Pennsylvania Forestry Association showed that the Department had worked on 256 Miles auto roads in 1932, had 1,064 total miles of auto roads, worked on 530 miles of secondary roads and trails in 1932 and had 4,586 miles of secondary roads and trails in total. Given these numbers, the funding obviously carried through to the Great Depression hit.

The CCC and ECW funds would pick up from here and provide funds and manpower for the road program from 1933-1939. Anecdotally, it is widely accepted that the CCC built all of the roads that exist today. The numbers

above refute this to some extent. However, the CCC did finish what the Department started and improve upon earlier efforts.

If we accept the fact that most of the roads were in built and in usable shape in their current locations by the end of the CCC era, the road program likely shifted from a focus on building and improvement to more of a maintenance and improvement program.

Records from 1939 to now about our road program may or may not exist, and their existence probably varies from district to district. Given this fact and the fact that few have probably attempted to detail the history of the Departments road program, the remainder of this section will attempt to do so. Since maintenance and improvements of roads is dependent on funding, we can assume the road program had boom and bust cycles that mirrored Department funding. By examining the various funds we use today, we can at least fill in some of the gaps by looking at when various funds came into existence.

From 1939 – 1945, the CCC was winding down and most resources were devoted to World War II. It isn't hard to assume, times were lean for the road program with missing staff and lack of resources.

The first of the funds we used in our road program came into existence in 1955 when the Oil and Gas lease fund was established. This funding stream was available for a host of projects, including roadwork and would vary depending on fluctuations in the gas market. Despite the variability, this funding would remain relatively consistent until the Marcellus Gas Play. Given the price that the lease fetched, the legislature transferred the "bonus bids" of $383 million from the Oil and Gas fund to the General Fund in 2009-10, which caused controversy and a court case. In 2009, Act 50 provided for an annual transfer of $50 million to DCNR from this fund. In 2012, Act 13 authorized annual transfers of $35 million from this fund to the Marcellus Shale Gas Legacy fund to be passed to the Growing Greener Environmental Stewardship fund and the Hazardous Site Cleanup Fund.

The Land and Water Conservation Fund was established in 1965. Many of the State Parks developed under Project 70 used these funds, but a few road and bridge repair projects occurred throughout a multi county area between 1978-1986. Even though these were one time repairs to roads, the use of the funds has lasting implications because of the conditions associated with the funds. Large 6f polygons were drawn around the funded roads and the restriction associated with the LWCF apply in perpetuity on the entire polygons.

June 17, 1976 a law passes requiring DER to register snowmobiles, license dealers, enforce snowmobile laws and it authorizes construction and maintenance of snowmobile trails in State Forests. Restricted Snowmobile Fund is established for use on snowmobile trails and other provisions of the law.

In January 1979, the Young Adult Conservation Corps started in Quehanna. Up to 45 youth at a time, ages 18-22, stayed at Camp Quehanna and performed a variety of tasks. Their duties included headwall construction; trail improvement and construction; timber stand improvement; sign construction and installation; building and shelter construction and rehabilitation; gate construction; tree planting; stream and wildlife habitat improvement; and fire fighting. The Camp closed in 1982.

In April 1984, the Pennsylvania Conservation Corps was established to provide job training and education for youths aged 18-25. The Recreational, improvement and Rehabiltation Act provided funds for PCC projects until 1989. Eight new Forest District Offices; 5 District Offices expanded; 11 maintenance headquarters, including Dague; and 10 maintenance headquarters were expanded or built by the PCC. In addition to building construction, the PCC improved habitat, performed timber stand improvement, built and maintained hiking trails, improved recreation areas, rehabilitated bridges, and built deer fence exclosures throughout the state.

On July 11, 1985, the Snowmobile Law was amended to include ATVs with the similar provisions for ATVs, which allowed the development of the current ATV trails on State Forests and the restricted Snowmobile and ATV

Fund.

1993 – The Keystone Recreation Park and Conservation Fund (Key 93) is established from a 15% of the realty transfer act, of which DCNR receives 65%. The fund is used for C2P2 grants and acquisitions, as well as other recreation related improvements.

April 1997 – Act 3 of 1997 revised the Vehicle Code to create the Dirt and Gravel Road Program. The impetus for this was a grass roots effort by Trout Unlimited to access points where roads and sediment were impacting HQ and EV streams. At first this act provided $1,000,000 to DCNR annually. The Recreation Section administers this fund that is appropriated in proportion to the mileage of public use roads in a district. Eligible roads include those in proximity to HQ or EV Streams. An off shoot of this program has been the formation of the Center for Dirt and Gravel Road studies who has provided technical expertise and training, aided in developing specifications for driving surface aggregate (DSA), worked in conjunction with DCNR on Demonstration Projects, and aided in the research and development of many of the Best Management Practices found in the Road Manual.

October 1997 – Liquid Fuels and Fuels Tax fund established that is funded by a sales tax on gas for motorized recreational vehicles. The funds are originally assigned to motorized and non-motorized trails and not joint use roads as intended.

1999 Growing Greener Environmental Stewardship fund established allocating $150 million to DCNR, mostly for State Park maintenance backlog.

2005 – Growing Greener II Environmental Stewardship Fund is established.

2005 - The Liquid Fuels and Fuels Tax Act is modified to allow up to a $1,000,000 refund to be placed in the restricted Snowmobile and ATV Fund. The funds can be used for improvement of joint use roads, highways, bridges, including grooming.

2009 – Act 50 provides $50 million annually from Oil and Gas fund for DCNR operations.

2012 – Act 13 provides for the transfer of $35 million from the Oil and Gas fund to the Marcellus Shale Legacy Fund to be passed to Growing Greener ESF and Hazardous Site Cleanup funds.

2013 – Act 89 of 2013 amended the Dirt and Gravel Road Act by increasing the amount of funding and allowing funds to be expended on low volume roads. DCNR's portion of the fund increased to $7,000,000. With the addition of low volume roads, State Parks also qualifies. About $1.5 million goes to Parks annually. The Recreation Section disperses most of the remaining funds to the district based on their road mileage. Any funds not committed to the districts goes to the annual demo project, DSA testing, research or to the Center for their services. Given the increase in funds, all stone must be paver-placed. Dave Shearer and other Center staff take a more active role working with the paving contractor and checking DSA quality. The increased funding has allowed the completion of roads quicker rather than piece-meal over multiple years. The other aspects described above still occur.

2016 – Act 97 modifies the Liquid Fuels Act so that the Liquid Fuels Tax refunds are distributed into separate restricted accounts for Snowmobile and ATV proportionately. The spending must also occur proportionately, meaning Snowmobile Funds can only be spent on Snowmobile Trails and Liquid Fuels funds from Snowmobiles must be used on joint use snowmobile roads. The same holds true for ATV funds

In addition to all the funds listed above, the Moshannon State Forest can also choose to use General Government Operational funds on roads.

Fire Towers, Telephone Lines, and Radio

Earlier, we discussed the large-scale devastation cause by early wildfires and their effects on the environment. It should come as no surprise that one of the key infrastructure developments on all of our State Forests was the development of fire towers for the early detection and rapid suppression of fires. The first towers were nothing more than an open lookout or a few boards forming a platform in the top of a remaining tree. By 1905, George H. Wirt, the first State Forester and future first Chief Forest Fire Warden, built the first wooden tower. It was constructed in what is now the Michaux State Forest. In the years that followed, other state forest reservations also started to build wooden towers, as funding permitted.

Between 1912-1913, the District Forester Act and a Supplemental Act that allowed the Department to work with Forest Protective Associations, which allowed the Department to reimburse the Associations in an amount equal to what the Association spent on patrol. This act did not allow the Department to expend money on roads, trails, towers, telephone or printed materials on private lands.

A 50-foot tower between Bloody Springs and Smith Place was established, as well as three other towers in the Karthaus Division according to the 1912-13 Department report.

In 1914, the Department of Forestry built its first four or five steel fire towers, which were 50 feet in height and had an open platform on the top. Realizing that the cold and windy conditions made it unsuitable for the towerman to spend a long time in trees or on wooden or steel platforms, the next advance would be the addition of an enclosed cab. By this time, the Department had also built 100 miles of telephone lines. In 1914, District Forester's were also directed to extend fire protection and suppression efforts to private forests in PA.

In 1915, the current warden law came into existence. It established the Bureau of Fire Protection. George Wirt became the first Chief Fire Warden. The Department could now reimburse Protective Associations one-half the cost of all protective work. This allowed for improved protection and expenditures to build fire towers and phone lines in areas enrolled in a Forest Protective Association. The Pocono Forest Protective Association built three fire towers in 1915.

Between 1916-1917, the first comprehensive tower list was published that included 197 Towers\Observation Stations consisting of 9 Steel Towers, 36 Wood Towers, 84 Tree Towers and 68 Bare knobs.

In 1917, the Department of Forestry purchased two steel towers with enclosed cabs from the Aermotor Co., which had previously specialized in building windmill towers for farmers. These two structures had a ladder that ran up the exterior. Concerns about the towerman safety and a new Workers Compensation law led the Department to retrofit one of the two towers with an exterior set of stairs in 1918.

Summoning Fire Wardens and crews was also a concern, as there were no telephone lines, radios, cell phones, and in most cases only a few roads, firebreaks and trails created to suppress fires on the forest reservations. The towerman would need to climb down from his post, saddle his horse and ride to summon help. This delay was unacceptable and often let fires grow too large, which in turn increased the cost of extinction. Recognizing this fact, and the fact that foresters (now District Foresters) and rangers needed better methods to communicate between themselves and with fire wardens, George Wirt quickly realized that the towers, district offices, and ranger's headquarters needed to be connected by telephone. Since commercial lines only existed to towns and communities and not to rural areas, the Department soon found itself in the business of building telephone lines to connect the offices, ranger's headquarters and fire towers. With few exceptions, all of the towers built from this point forward (1918) would eventually be connected to a telephone. Additionally, the Department would allow wardens and other subscribers in rural areas to connect to the Department owned lines by paying a fair share of the Departments cost for construction of the line that they connected to as well as the charges that the commercial companies charged each subscriber. The forester would then pay the companies the commercial charges for the private subscribers. Between telephone charges, rights of way,

leases for towers on private properties, and other paperwork, administration of the tower network proved to be quite and administrative challenge, especially as commercial phone company ownerships changed and consolidated throughout the years. To complicate matters more, one tower might have to reach wardens who resided in a different telephone companies area, which meant that more than one line might be needed to reach wardens, at least initially.

The 1918 Chief Warden Report identified a need for 100 primary and 100 secondary towers. It also stated that the Anthracite Protective Association built two 60-ft. towers at Brockton and Broad Mountain. A wooden tower was built at Woodward (Round Top) in what is now the Bald Eagle State Forest. In comparing the cost of this tower to the new steel towers, it was found to be nearly as expensive to build the wooden tower and the wooden towers would require more investment in maintenance and painting.

In 1919, six steel additional towers were purchased and constructed at the following locations on state lands: Crandall Hill, West Pike, Fox Mountain, Goodall, Tamarack, Pump Station, and Big Poe, Seven additional towers were ordered. The tower system still consisted of lookouts, trees, wooden towers and steel towers.

In 1920, Pinchot lobbied for funds to purchase additional land and stop fires. He also encouraged recreational use of the State Forests. The Department was reorganized into 24 districts.

By 1920, there were approximately 19 steel towers. However, the fire tower system did not advance as rapidly as the Department would have liked, primarily due to a lack of funding. This would soon change as Pinchot lobbied the legislature for $1,000,000 for the 1920-1921 and 1922-1923 fiscal years for fire protection efforts.

By the end of 1920, the Pocono Forest Protective Association installed two more wooden towers, bringing their total number of towers to five. According to a Bulletin published by the Department, the Anthracite Protective Association built four steel towers. An August 1921 issue of Forest Leaves indicated that they had erected five steel towers

With those funds, the Department purchase and installed 50 fire towers from Aermotor Co in 1921. Most of these towers were 60 feet in height, eleven were 47 feet, and two were 22 feet. These towers were purchased and installed by October 1921 - Quite a feat given the lack of infrastructure and manpower. These early towers would ship from Chicago and arrive at the nearest railroad freight siding and had to be hauled by truck, wagon, or other means to their sites. Then they were constructed by hand using a gin pole to lift the pieces into place.

These towers would be constructed at the highest point on both public and private lands. The 1920-21 Department report listed the break down as follows: State Forest Towers - 24 Steel, 27 Wood, and 44 Tree; Private Towers - 46 Steel and 14 Wood

Towers constructed on the Moshannon State Forest in 1921 included Boone Mountain, Knobs, Smith Place, and Summit or Sandy Ridge. The public were encouraged to visit and use the towers, and the towerman was expected to convey the importance of forestry and the protection of forests from fire. Early on, the Department recognized the towers were an invaluable educational and public contact tool for fire prevention and suppression.

The Department also built 43 towerman cabins and drafted five tower maps in 1921. The tower system consisted of 155 towers made up of trees, wooden towers and steel towers on public and private lands. In addition, the Department now had 687 miles of phone lines.

By February of 1922, the Lehigh Coal and Navigation Company built two steel fire towers with phones. The Anthracite Protective Association had four steel towers and leased one wooden tower at this time, and by October, they construct two additional steel secondary towers bringing their total to six (6) steel and one (1) wooden tower.

With the funds allocated for 1922, the Department purchased 28 fire towers from the Blaw Knox Co., a firm that specialized in building radio towers. Most of these towers were constructed in 1923. Several reasons made the Aermotor tower a more preferable design and most of the purchases that followed were of this design.

Little to no information exists in the Moshannon State Forest office about the Grass Flat Tower. Merle Waltz's research suggests it was a 60-foot enclosed steel tower built in 1923 and had a towerman's cabin. Based on the construction date, one might assume it was one of the recently purchased Blaw Knox towers. However, a note that accompanied this stated that it was dismantled in 1931 and shipped to Black Moshannon. If a 20-foot extension was added to the base, this might have been re-erected as Rattlesnake Tower? Rattlesnake was an Aermotor design, which may have meant that Grass Flat might have been an Aermotor too? Since records are almost non-existent, this may remain an unsolved puzzle.

By 1923, the number of primary towers numbered 100, mostly steel. At this time, 700 miles of phone lines existed. An act also passed this year allowing the Department additional powers to lease, buy and erect phone lines. This allowed subscriber to attach to Rural Phone lines. The subscribers that attached to Department lines were required to pay toll and fees for commercial service to the district. In turn, this added another administrative headache to the District Forester who had to account for these fees and see that the commercial providers received payment, since the Department line eventually connected to a commercial provider's line.

The Faunce Tower was the only Blaw Knox Tower built in the Moshannon State Forest. However, Three Runs Tower, another tower manufactured by Blaw Knox, was built on the border of the Sproul and Elk State Forest in 1923. Later, the compartment that Three Runs Tower existed in was transferred from the Elk State Forest to the Moshannon State Forest. Tracking which forest district administered this tower is difficult. So, in a way, Three Runs belonged to all three forest districts.

Most of the towers would have a small cabin built at it where the towerman was expected to stay during fire season. Most had a cistern, stove, cots, utensils, and fire fighting tools. The telephone was not installed in the cabin to ensure that the towerman stayed in the tower. Instead a gong was installed in the cabin to alert the towerman of a call and they would need to climb the tower to answer it. Initially, many of the cabins were small (10 ft X 15 ft) and some photos even labeled them as shanties. In some cases this changed as you will later read.

Due to Pinchot's involvement, you might hear the first 100 towers referred to as "Pinchot Towers." Other considerable changes occurred during Pinchot's tenure which included the reorganization of the state forest reserves into Forest Districts with a District Forester, an emphasis on using the State Forest for Recreation, and the change from the Department of Forestry to the Department of Forests and Waters.

A few rangers, from what is now the Rothrock State Forest, became adept at constructing towers and would often be called upon to travel across the state erecting fire towers. At least, until the C.C.C. provided a new supply of manpower for building towers.

The fire tower system was not yet complete. New sites were still needed and some of the original sites could be improved upon and towers were sometimes moved. A 1924 report still referred to bare lookouts, tree towers, wood towers, and 102 steel towers.

By October 1924, the newly established (September 1923) Allegheny National Forest built the only Federal style fire tower in Pennsylvania history. This style has a larger, 14ft. X 14ft. cab.

In 1925, the first Forest Fire Wardens' Manual was developed.

The Departments efforts regarding land acquisition, tree planting, road trail and fire break construction and fire detection and suppression gradually allowed forests to grow. By 1928, trees had grown to the point where

some of the 60-foot towers could barely see over them. Studies conducted by the Department showed that eleven of the towers would benefit from an increase in height. For that reason, it was felt that 80-foot towers would be more effective. Some of the subsequent towers that would be moved would have extensions put on them before being re-erected.

Several new 80-foot towers were purchased by 1928 and the primary tower system had 116 towers. One of these was the Old Towne tower, in Hillsdale, near Clearfield, PA. This tower was administered by the Moshannon State Forest. Coinciding with the development of towers was the advent of commercial air mail routes. The towers that were near these mail routes proved to be a hazard for the pilots. In particular, Old Towne, since it was a new 80-foot tower and was less than a ¼ mile from an emergency airfield. Because of this, the Department temporarily lit the tower and worked with the Us Department of Commerce, to install a rotating beacon on the tower by May 1929 and course lights that would flash a code that indicated bearing from the airport, 49 for 490 degrees east of Chicago in Old Towne's case. Airway numbers were also marked on the sides and tops of tower cabins. Old Towne never had a ground cabin for the towerman, probably due to its proximity to town. However, it almost functioned like a community park for the locals. Towermen were encouraged to beautify tower sites when the weather wasn't conducive to fires. Later, when the Department removed the tower, it became a park for Lawrence Township. At the suggestions of the Lighthouse Service of the U.S. Department of Commerce, towers were to be painted alternating chrome yellow and black.

The Forest Fire Observation Stations (fire towers, cabins, etc) were discussed in great detail at a 1929 Forester's Conference. At that time the system consisted of 117 Observation Stations as follows: 111 State Owned Steel Towers, 4 Cooperator Towers, 2 Bare Knobs, 1 USFS Tower and 7 Additional Private Towers (Coal, H2O Co.). They also felt that we needed 15 more primary towers that are 80 feet in height and 2 secondary towers.

In 1931, the 60-foot Grass Flat tower was ordered to be dismantled and shipped to Black Moshannon.

By 1932, there were 122 fire towers and 850 miles of phone line. The first reported use of an airplane to detect a fire also occurred in 1932. The only mention of Loleta Tower is in 1932. This tower was on private land adjacent to the Allegheny National Forest's where the CCC would soon turn a former lumber town dam into a recreation area.

Starting in 1933, The boys from the CCC also played a role in developing and maintaining most aspects of the fire protection system, including fire towers. They built roads, trails and firebreaks. They helped build, rebuild and maintain telephone lines. They erected new towers and helped move old towers to new locations. They also built new cabins at new tower sites and replaced old shanties with new cabins based on standardized plans.

By June 20, 1933, the original Rattlesnake Tower, which was 80 feet in height, was built by the CCC. Records are inconclusive, but one might wonder if a 20-foot extension was added to the 60-foot Grass Flat Tower and then re-erected at the Rattlesnake Tower site? One of the local CCC camps built the original Rattlesnake Tower. The local CCC camps also built a stone cabin at Rattlesnake Tower for the towerman.

By the end of 1934, there were 144 fire towers, 138 of which were under Department control. These towers covered 90% of State Forest lands.

A log cabin was built at Knobs tower in 1935. At least one source indicates that the current log cabin replaced an earlier wood framed cabin built circa 1921.

In 1934, portable radios were tested.

In 1935-36, the CCC also helped build additional towers on the Allegheny National Forest at Marshburg,

Muzette, and Zimmerman Hill. In addition, a cab was added on top of a water tower at Owls Nest and manned according to an interpretive kiosk at the site. The kiosk lists the date of the addition as the late 1930's, but a 1936 issue of Forest Leaves has it listed as a manned tower. This unique structure was later removed in the late 1940's, according to the kiosk at the former site.

In 1935 radio tests occurred between two towers in the Weiser State Forest and the Department's Central Office in Harrisburg. These models were bulky and portable, but they worked.

Part of the duties the Department had during its existence as the Department of Forests and Waters included improving waterways, protecting the Commonwealth's water supply, and supervising flood control projects. Since the Department's name and some its duties have changed twice since then, the aspect of flood control and some of the history of the Department relating to flood control isn't always discussed unless you happen to be at one of DCNR's State Parks that has a flood control dam. It isn't hard to imagine why the flooding that occurred following the cutting of the virgin forests caused concerns and was one of the reason the Department of Forestry was founded and why the Department of Forests and Waters would want to take action following the Saint Patricks' Day flood, of March 1936. The Department of Forests and Waters continued to keep abreast of new radio technology and started installing radios in their towers.

By the Fall of 1937, there were 10 radios in towers and four in office. The 145 Observation Stations consisted of 138 steel towers with heights ranging from 22 to 80 ft., 2 Private towers-manned and operated by DFW, 2 ground stations with Cupolas, and 2 Additional Secondary towers, in addition there were 5 additional USFS towers. 900 miles of telephone lines connected our system. As the number of subscribers continued to increase on commercial and rural lines, it often became difficult to make emergency calls from the tower. Add to this, the constant maintenance of forested Department lines, and it comes as no surprise that some hoped that radio might become an alternative to phones in our towers. By 1939, radios were installed in 100 fire towers, Harrisburg, and all but five district offices.

In 1939, the CCC constructed a stone cabin at Smith Place Tower to replace the earlier wooden framed cabin and the CCC built a stone cabin at Three Runs Tower site. In 1939, the CCC also built stone, radio relay station buildings at select fire tower sites. One of those sites included Rattlesnake tower in the Moshannon State Forest. These relay station building would hold a generator and radio equipment that would become the backbone of a Federal State Flood Forecasting Service. This forecasting system operated as a cooperative project between the U.S. Weather Bureau, U.S. Geological Survey, and PA Department of Forests and Waters. Reporting station in the Susquehanna River Basin would use low-powered radios to transmit river data, precipitation and weather reports to the high-powered relay stations at the fire tower, which in turn would transmit the data to Harrisburg. The reports would be sent between 7:00-8:00 A.M. each day, with special reports on heavy rainfall or rapid river rise occurring at 1:00 or 7:00 P.M. This system required more of the Department than just the construction of the radio relay buildings and equipping them with equipment. For the first time, the Department had to figure out how to fund salaried towerman positions, as this system required year-round staff. In the end, fire protection funds would be used for the normal fire seasons and Federal funds would cover the other portions of the year. By 1940, with the buildings constructed and funding issues solved, the network went into operation. According to a 1942 list, the system included a variety of 32 sites ranging from river gauges to private dwellings to flood control office and other State buildings. The Department's sites included the District Foresters Office at Mifflinburg and seven forest fire observation towers, which were Big Knob, Kellogg Mountain, Loop, Pump Station, Rattlesnake, Shaffer's Path and Tamarack.

Another accomplishment of the CCC in 1939 included extensions for three fire towers.

In 1940, the CCC built a new stone cabin at Boone Mountain Tower to replace the former wooden framed tower cabin built in 1921. A 1940 inspection report indicated that the former wooden framed cabin would be

converted into a garage at the site.

The July 1940 issue of Wardens News provides the first published list of our 151 forest fire observation stations, included for each tower are details on ownership, elevation, height, manufacturer, airway number, and year built. This up-to-date list included Round Top, a wooden tower, established on the Allegheny National Forest in 1940.

In 1941, George Wirt sent advice to the Secretary that legislation was needed that would allow the Department to sell telephone lines that were constructed by the Department. Issues with the number of subscribers and the burden of line maintenance probably prompted this.

On July 18, 1942, record rainfall of 30.8 inches in 4.75 hours affected the neighboring Elk and Moshannon State Forests causing devastating floods in Cameron, Elk, McKean and Potter Counties. This event demonstrated the usefulness of the newly established communication network. According to a historical radio handbook, "all wire communications with Emporium were disrupted, and only one road into town was open. Upon receipt of this information a Forester from the Sproul Forestry District and the Radio Service Engineer were sent to Emporium to establish radio communication. They placed the Emporium District office and Whittimore Tower radio sets into operation and contacted the Tamarack Tower radio station from Whittimore. Since Tamarack is the location of one of the reporting stations on the flood forecasting network, it was then possible to send emergency messages from Emporium through Whittimore Tower to Tamarack where they were relayed to Harrisburg. This procedure can be arranged just as well by any radio equipped Forestry District in the event any town in this district is isolated due to the disruption of ordinary communication system."

The fire towers and the radio network were pressed into action for another reason with World War II occurring. The towers and towermen would observe and report on aircraft passing by in the event that an enemy attack was occurring. Per a November 1943 memo George Wirt asked that the radios remain in the towers despite the chance of vandalism, because "it is expected that when we are notified to close down our radio equipment due to approaching enemy planes, we will have the relay station operators in our Flood Forecasting Radio system turn on their receivers, so they may receive emergency messages if an actual attack occurs. However, it is pointed out that the First Fighter Command, U. S. Army requires our stations to be silent just before or during an air raid since our signals may help enemy planes locate objectives. However, the main value of our radio facilities will be in providing a means to get messages through after damage has been done and help is needed. Practically all of the radio equipped districts can tie into our Flood Forecasting Radio system, since our fire tower stations can generally contact other towers 60 to 70 miles away." A list of the towers and radio sites that would do the reporting included Peters Mountain (radio site), Big Knob, Kellogg Mountain, Loop, Pump Station, Rattlesnake, Shaffer's Path and Tamarack. In an edit, Knobs Tower was substituted for Rattlesnake Tower.

Per the Jan 1948 issue of Wardens News, "the Pennsylvania Aeronautical Commission, Department of Commerce requested that all of the 151 forest fire towers in Pennsylvania have been given new airway markings. The old markings which were located on the sides and tops of the tower cabins were removed and the new ones painted either on the roof of the top enclosure or ground cabin whichever was most practical. This project was a part of the state-wide program of standard airway marking of towns and communities throughout the Commonwealth.

This program was deemed necessary by the Commission due to the increased use of airplanes for both business and pleasure. The markings provide a navigational aid to all types of pilots and enables them to fly cross-country with less chance of becoming lost. The numbers assigned to the tower sites start with P-1, Victory Tower which is located south of Franklin, PA in the most westerly portion of Pennsylvania. The numbers progress across the state to P-164, Hopewell Tower, southeast of Reading, Pa. which is in the most easterly portion of the State. The numbers run from P-1 to P-88 omitting 13 numbers thence from P-101 to P-164. The

background of the numbers are painted black with the numbers, five feet in height, painted chrome yellow.

Recently (1/1948), the Aeronautical Commission published a new aeronautical map of Pennsylvania. On this map each of our 151 towers are located and numbered."

Also, in 1948, the statewide radio system was completed under new State Forester, Oliver Benjamin Gipple, linking the department's 150 forest fire observation towers, the headquarters, and the district forest offices.

According to an article in the Lock Haven Express, a new radio network and advance flood forecasting network was unveiled in April 1958. This network had Motorola radios and per the Lock Haven Express, "Wagner and Son, a local radio concern, completed work this week on their part in the radio network. The local firm was the low bidder for much of the electric wiring. They wired equipment at the Harrisburg Airport, Peters Mountain, Hemingway, Shaffer Path, Brooks Tower, and Tamarack. Among equipment wired were stand-by power plants, commercial wiring circuits for the radio gear, antennae on the towers, photo electric cell units to control lights on the towers and other electric work at each site." At this same time, plans to construct several flood control dams were waiting on funding from Congress.

An air attack program to suppress wildfires started in 1960. According to a 5/11/1966 memo found in a Loyalsock Tower file there was $20,000 of Oil and Gas granted on 9/17/1964 for the construction of heliports. Site selection was based on three criteria 1. SFL requiring intensive protection not now afforded by existing air program 2. Topo locations offering optimal operating possibilities for helicopters including vital servicing logistics 3. Cover gaps in water bomber and helicopter coverage. These sites were to have standard patterns used for the heliports and the Neighborhood Youth Corps involved in construction where possible. According to the report, the Department was able to construct 10 heliports and improve Big Pocono and Coffin Rock. All but one of the heliports were checked and approved by State Aeronautics Commission, as personal use heliports. A map with a key was included that showed the following heliport sites: Big Flat at the prison camp, Sideling Hill at Sideling Hill north of US30, Big Knob at Big Knob Tower, Little Flat and Little Flat Tower, Hartley at the former tower site, Masten near the village, Whittimore at the tower, Greenland south of Lykens, Tarburner at the Tarburner tract, Buckhorn Tower(FD19), and Rickets at State Park tower site. These heliports are operational at short notice, equipped with water and retardant tank and operations building consisting of surplus van type portable shacks. A balance of $3,635.09 was unused and Wirt would like to commit that after July 1 to portable pumps, weather instruments and other accessories for these units; otherwise, he will return it to the Oil and Gas fund as soon as the final bills and payroll comes. As rapidly as division funds permit, fire protection wanted to extend the network to include additional sites as follows: 1. FD1-one north of old Buck Ridge tower and one in South Mountain 2. FD#4 - one on SFL east of Uniontown and one at either Kooser or Bald Knob Tower 3. FD#8 - one in Clear Creek\Cook Forest Area 4. FD#15 - one in southern Potter Co., and 5. FD10,12,15 - one at Pump Station. It is unclear whether or not these heliports were ever constructed.

A popular 1965 Higbee stream map has 133 Department Towers displayed on it.

Detection of fires using aerial reconnaissance planes by the Department started as early as the 1940's. Some local pilots even reported fires to towers prior to this. However, their true effect on fire towers would only be felt later. By 1970, there were 23 light aircraft in use for detection, surveillance and control of wildfires. And, by 1972, 19 of 20 Forest Districts had contracts for airplane service. The use of airplanes for detection would play a role in changing our fire tower system from this point on.

A December 1972 tower evaluation reports lists 128 towers with 31 of the towers either crossed out or listed as being processed for removal. This leaves some degree of uncertainty how many towers existed, since a revised list was not included if they were removed.

In 1974, the Moshannon State Forest removed Smith Place and Boone Mountain Towers. In May of 1974, the Department solicited bids to replace five fire towers. Included in this bid package was a new site meant to

replace Boone Mountain tower, known as Rockton Tower. Construction occurred during 1974-75. Carns Brothers, a local firm, obtained the bid for the construction of Rockton. The four other towers, Bear Cave, Lower Yoder, Port Clinton, and Boyers Knob, went to other construction firms. The towers differed slightly from other towers built in the past, in that their constructions followed the Aermotor LS 40-K design where entrance to the tower was from an outside platform instead of through the traditional trap door in the floor. They differed from the towers built by Caldwell, in that, the platform was only on one of the four sides, not all four. A final inspection occurred in February 1976. Not long after the construction finished, the district removed the Old Towne Tower in June 1976. Rockton Tower's location enabled it to cover the same areas formerly covered by Boone Mountain, Old Towne, and Smith Place Towers.

In February of 1976, the Division of Forest Fire Protection distributed a list of ground cabins to the districts and asked them to update any incorrect information. At the same time, the districts were directed to evaluate the need for their ground cabins and those that served no useful purpose for the Department were to be scheduled for demolition.

By 1980, the number of towers had declined to 107 with 23 scheduled to be processed for removal. A 1982 list shows 85 towers remaining.

In 1985, the same tornado that devastated the Moshannon State Forest continued into the Sproul State Forest and toppled the Coffin Rock tornado. This tower was rebuilt as a 99-ft Aermotor with a catwalk around all four sides.

A January 1989 response to a citizen concerned with the removal of Elk Hill Tower noted that, "Over the years, the number of towers has been reduced to approximately 75 (list enclosed). Towers have been removed for various reasons, including deterioration due to age, vandalism, shifting fire problem areas, and the rising cost of operating a large number of towers. We now use light aircraft and a network of local detection cooperators to supplement the fire tower system."

In 1999, the number of towers administered by the Department dwindled to 50. A more thorough list of all surviving towers was collected in March 2007. It showed that the Bureau of Forestry owned 46 towers and that 16 additional towers still survived. Adjusting the list to account for those either maintained by DCNR or on DCNR lands, the total still numbered 49, as two of the 16 are on State Parks and one on the USFS property.

For at least three decades, Coffin Rock would remain the tallest and newest tower in the State Forest Tower system. During this same time frame, many questions started to arise concerning what we planned to do with our aging towers.

In 2006, an engineering intern from the USFS performed inspections on some of the towers. In June 2007, DCNR formed a task force to discuss various issues related to the Bureau of Forestry's historic fire observation towers. Issues discussed included inspections, standards, maintenance, historic significance, use, rating scale of value if aerial surveillance wasn't an option, public access, and protocols for removal. Based on the 2006 inspections, the recommendations of the task force, input from the districts on the need for the towers, and the availability of capital funding, DCNR had the Department of General Services solicit bids in November 2013 to evaluate the towers and develop plans/specifications and cost estimates to restore or demolish the 49 existing towers throughout the state and add four new towers for a total of 53 sites.

The successful bidder E2PM LLC, evaluated the towers in August and September of 2014. In the end, DCNR and DGS decided to replace, not refurbish the old towers. The funding available will suffice for demolition and construction of 16 new towers.

Eighteen forest fire observation towers in PA have been nominated and accepted on the National Historic Lookout Register, which is often a first step for listing on the National Register of Historic Places. In February

2015, DCNR met with PHMC to discuss historic impact mitigation for the sites that they found were eligible for the National Register. As part of the historic impact mitigation, DCNR will edit, design, fabricate and install 20 - 24"X36" interpretive waysides where new towers will replace the old towers in the current DGS project. Additional plans for mitigating the historic impacts include the construction of an interactive map that will show historic tower locations and provide links to additional web pages that contain interpretive information that exceeded what could fit on the panels.

A second phase to the interpretive mitigations for the DGS fire tower project would involve interpretation for towers scheduled to be razed and reconstructed as mini-towers in the near future. The original plan identified eight of these sites, but at least one other sites is in consideration to be razed. As part of the historic impact mitigation, the Department proposed to salvage the cabs and a short section of the tower. The plan is to reconstruct these as mini-towers and equip them so that the public can access them for interpretive purposes. Interpretive panels will be created as part of the interpretation, which will either be installed at the original site or the new mini-tower site. Districts that expressed interest in one of these mini-towers were assigned one of these eight (8) structures, as the DGS project was said to be too far along to save the 16 towers that were part of that project, some of which were in better shape than the towers to be razed. In total, 6 of the 8 structures scheduled to be razed will be reconstructed as mini-towers. One of the eight might be transferred to the Pa Game Commission. Also, Keffers, which was already taken down, will be added as a mini-tower. Later, as work on the DGS fire tower project started, one of the cabs from the 16 towers being replaced was saved (Mauch Chunk), which added to the number of mini-towers to be re-erected, by virtue of change orders at the district's requests. The revised total now includes eight mini-towers.

The Moshannon State Forest will not receive any of the razed towers to be re-erected as mini-towers. However, they plan to leave Knobs tower intact due to its historical significance, as its replacement is at a higher elevation on Chestnut Ridge, which is about 1.5 miles from Knobs.

Advertisement for bids on the DGS fire tower project went out in December 2016 with a bid date of 1/23/17. Several of the bidders incorrectly filled out their bid forms and after a consultation with Legal, the DGS fire tower projects was rebid. A second bid opening occurred on 2/21/17. A Notice of Award went out to Lycoming Supply on 3/15/17. Upon submission of the contract, an initial job conference would occur, and the project was to start within 10 days of this conference.

Due to issues with DGS submittal software, the construction of Big Pocono, first new tower, only occurred on 9/18/17. Lycoming supply continued working on tower in eastern PA.

The first DGS tower site to be worked on in western PA was Black Hills, which was the first totally new tower site in PA, since Grandview in the late 1970's. The Black Hills site is on a recent acquisition by the PA Game Commission in southern Clearfield County between McGees Mills and Troutville. Preparation of the site and construction of the footer started around 6/11/2018. A footer for the new tower was poured on June 18, 2018. By June 28, 2018 work on the foundation was completed and a fence installed around Black Hills.

The demolition crew started moving supplies and equipment to Rockton on 6/25/2018. They removed Rockton tower by cutting the front legs, attaching a cable, and pulling the tower down with the excavator on 6/27/18.

Lycoming Supply's construction crew had finished the eastern towers by the beginning of July. Starting on July 2, 2018, this crew's efforts would focus on the construction of the Black Hills tower. At the same time, the demolition crew prepared the new footer for Rockton. By July 9, 2018, the demolition crew began pouring the footer for the new Rockton Tower.

The construction crew completed the erection of Black Hills by 7/16/18 with the exception of a missing handrail and toe-plate. That same day, the demolition crew moved equipment and prepared the new site at Chestnut Ridge for excavation.

On July 18, 2018, the construction crew started to build Rockton Tower.

By July 23, the demolition crew set the forms and poured the foundation for Chestnut Ridge. Work continued, and the foundation was completed by July 26, 2018.

By this time, the construction crew had set the second section on Rockton Tower and were working on constructing the third section on the ground. The fencing contractor also started to put up a fence around the tower on July 26, 2018.

The demolition crew moved out of the Moshannon State Forest after placing some stone on the access road at Chestnut Ridge. On 7/30/18, they took Brooks Tower down in the Elk State Forest and began working on the footer there. They removed the fence first. Then, they positioned the excavator with its bucket up on one of the upper platforms. Next, they cut the back legs entirely through. Then, they cut the front legs halfway through leaving the side facing the direction of fall intact. As they went to push the tower over with the boom, the left front leg snapped, the back legs came off the stubs that remained and fell off the pier. This caused the top of the tower to tip back toward the excavator. With the tower stable, they reached higher with the excavator and used the hydraulics of the boom and forward motion of the tracks until the tower reached its tipping point. Since the left front leg broke, the tower veered off to the right of its intended target. It managed to miss the only tree that it could have possibly reached.

Meanwhile, the construction crew continued working on Rockton Tower. By August 2, 2018 they had finished all four sections of Rockton Tower and set the cab.

The demolition crew continued to work on removing the remains of Brooks Run and preparing the forms for its footer. During the week of August 6, the demolition crew finished the foundation work at Brooks Run. The construction crew started on Chestnut Ridge the same week.

Next, the demolition crew moved to Snow Shoe Tower on August 13, 2018, in the Sproul State Forest, and prepared the new site there. They took Snow Shoe tower down on August 15, 2018, using the same method described above for Rockton. They removed the old tower's piers the next day.

The construction crew finished setting the cab on Chestnut Ridge that same day, and moved to Brooks Run, in the Elk State Forest. On August 16, the construction crew received a load of steel from Cameron Bridge and started construction on Brooks Run Tower.

By August 20, 2018, Lycoming Supply finished placing the timbers, grading and seeding to complete Rockton Tower. That same day, the demolition crew finished the concrete pour for the steps and piers at Snow Shoe.

The next three days, a crew worked to install the timbers and fence to finish Chestnut Ridge by August 23rd. The construction crew continued working on Brooks Run at the same time.

The demolition crew moved their equipment to Rattlesnake on August 22, 2018. They removed Rattlesnake Tower using the same method described above for Rockton Tower on August 23, 2018. That same day, DGS, DCNR and Lycoming Supply met at Summit Tower to discuss some issues with the new access road.

During the week of August 27th, the demolition crew removed the remnants of Rattlesnake Tower and set the forms to pour the foundation for Rattlesnake on August 30, 2018.

The construction crew placed the final section and cab on Brooks Run by August 28, 2018. The next day, they placed the final pieces on Brooks tower and moved the crane to Snow Shoe Tower. On August 30, 2018, the construction crew started erecting Snow Show Tower.

The demolition crew poured the concrete for the steps and pier and backfilled the site, completing the foundation work by September 5, 2018. They began moving materials and equipment to Summit Tower.

The construction crew continued working on Snow Shoe Tower. By September 6, 2018, they set the second section and had the third completed.

The demolition crew removed Summit Tower on September 11, 2018. The next day, they dug the foundation in a slightly different location than the old tower.

The construction crew finished setting the final section and cab on Snow Show on September 12, 2018. The following day, they completed the tower and moved the materials and crane to Rattlesnake Tower. Craig Fencing completed the security fence around the site of the new tower that same day, September 13th.

The demolition crew continued work on the forms at Summit. On September 19, 2018, they poured the footer. The next day, they poured the step and piers, and they also backfilled the footer. By September 20, the foundation work at Summit was complete.

The construction crew started building Rattlesnake Tower on September 18, 2018. Work on Rattlesnake Tower continued throughout the week. They expected to complete the tower by September 21, 2018.

The fencing contractor completed the fence around Snow Shoe Tower by September 19, 2018 and Lycoming Supply worked on installing conduit for the radio the next day.

The demolition crew moved their excavator to Tamarack Tower, in the Sproul State Forest, on September 21, 2018. They took down Tamarack Tower on September 24th. By September 27, 2018 the old Tamarack tower was placed in dumpsters, and the footers dug for the new tower.

Meanwhile, the construction crew finished Rattlesnake Tower on September 24, 2018 and moved to Summit and set up the crane. The steel for Summit was off-loaded the following day. Construction started on Summit Tower on September 26, 2018.

The site work at Rattlesnake Tower was finished on September 27,2018.

The demolition crew continued preparing the new foundation for Tamarack and poured the concrete on October 3-4, 2018.

The construction continued at Summit and completed the tower on October 3,2018. Craig Fencing installed the new fence on October 8, 2018. They also prepared the new road at Summit for a stone delivery on October 9, 2018.

Stone was also delivered to Tamarack on October 8, 2018 for the new section of road and tower foundation.

A crane was moved to Bootjack on October 8,2018. The plan to remove the top section was cancelled on October 9, 2018 due to high winds.

The grounding wire at Rattlesnake Tower was connected by Lecce Electric on October 9, 2018, while the L&I

inspector was on site.

On October 10, 2018, the demolition crew lowered the top section of Bootjack Tower onto the Elk State Forest's low boy to save it for future interpretive work. The remainder of the tower was cut and lowered in sections using the crane. By October 11, 2018, the demolition crew had places Boot Jack in a dumpster.

The crane was loaded and taken to Tamarack tower that same day.

Additional stone was delivered for the Summit Road on October 10-11, 2018.

The demolition crew began digging the foundation for Boot Jack on October 15, 2018 and encountered large stones. In the weeks that followed, the demolition crew reconfigured the forms for the taller 100-foot tower and prepared the tight site at Boot Jack to pour the concrete for the foundation and piers on October 23-24, 2018, respectively. They finished backfilling the foundation and placed the grounding cables the following day.

Meanwhile, the construction crew began building Tamarack Tower on October 15, 2018. They continued working on Tamarack until October 22, 2018. The construction crew finished the tower steel on October 29 and attached the cab on Tamarack on October 30, 2018.

The demolition crew spread stone on the foundation at Boot Jack and started moving the forms from Bootjack to Coffin Rock on October 29, 2018. The crane and other materials was moved to Coffin Rock the following day. The demolition crew unloaded the crane and removed the fence surrounding the tower. On October 31, 2018, the demolition crew lowered the top section of Coffin Rock to the ground and set picks to lower the next section. Some of the new steel for Coffin Rock was also delivered. The removal of the lower sections on Coffin Rock continued on November 1, 2018.

A final inspection of Summit, Rattlesnake, and Snow Shoe occurred on November 1, 2018. Occupancy permits for Big Pocono, Dryland Hill, Bear Springs, Mauch Chunk, Bears Head, Black Hills and Chestnut Ridge were received.

Clearfield Tree Nursery

A major development in the Moshannon State Forest was the beginning of the Clearfield Forest Tree Nursery in 1911 by District Forester William F. Dague. This forest tree nursery, which began in a mountain pasture, developed into the largest State Forest Tree Nursery in Pennsylvania. During the early 1960s the name of the Clearfield Forest Tree Nursery was changed, in memory of its founder, to the William F. Dague Nursery. It was finally closed in 1979 and in 1980 was converted to the district forester's office.

Civilian Conservation Corps (CCC) Activities

The next major era of forest development came with the establishment of the Civilian Conservation Corps (CCC) in 1933. Camps were constructed in the following areas:

1. Camp 71 - Present Black Moshannon Superintendent headquarters.
2. Camp 72 - Huntley
3. Camp 73 - Intersection of the Mud Run and Tyler Roads
4. Camp 74 - Intersection of Knobs and Chestnut Ridge Roads
5. Camp 116 - Crystal Springs Road
6. Camp 118 - Intersection of the McGeorge Road and Caledonia Pike

7. Camp 119 - Dayton Dam on the Six Mile Run Road (removed) – Many of the state forest lease camps are former CCC camp buildings. Stone walkways, portions of the entrance, and other remnants8. Camp 143 - Old Sinnemahoning Road - now Reservoir Road

9. Camp 158 - Near Dry Hollow on the old Lincoln Road

The major activities of the CCC included road construction and improvement, trail and bridge construction, development of recreation areas, and a large scale tree planting. Other duties in State Forests and Parks included dam building, phone line construction and maintenance, boundary line maintenance, wildlife and fish habitat improvements, fire tower and ground cabin construction, fire fighting, insect and disease control, and seed collection. With the exception of the buildings listed above, little evidence of the CCC Camps themselves remain. However, their legacy still exists in the roads, trails, bridges, and other improvements that have stood the test of time.

Natural Gas Development

During the early 1950s, large gas fields (Boone Mountain and Benezette) were discovered within the limits of the Moshannon State Forest. As a result, many remote areas were made accessible by new roads built by the gas companies to transport well drilling equipment.

Two gas fields were discovered and developed during the 1980s; one in the Knobs area by Adobe Resources Corporation and a second in the Black Moshannon area by Eastern States Exploration Company. The gas from the Adobe field is being marketed to the carbon industries at St. Mary's, while Eastern States' gas is sold through Columbia Gas Transmission Corporation to the State College area.

Forest Management Activities

Also during the early 1950s, the first Forest Management Plan was initiated for the forest. The objective of this management plan was not only to create an all-age forest but also to accomplish the multiple-use concept through the uneven-age management system. Consequently, timber was marked for removal by single stems and by group selection. During 1955, the Forest Management Program had its beginning in the form of several pulpwood sales.

In accordance with Secretary Goddard's letter of January 5, 1965, as amended by Supplement 1 dated February 23, 1965, the then current management plans were revised by changing the basic silvicultural system from one of uneven-age management to even-age management. Consequently, the Forest Management Program incorporated the various intermediate cutting methods as well as reproduction cutting methods.

[Insert Management Activities from 1965-present]

Young Adult Conservation Corps

During the 1970s, the demand for forest tree seedlings continued to decline. The seedling production from the four state nurseries exceeded the demand. Accordingly, a review was made to determine how many and which of the nurseries to continue operating. It was decided in 1978 to close the Dague Nursery. The nursery facilities were turned over to the district to use and maintain. The district office was rented and it was felt an opportunity existed to save rental costs by repurposing the old nursery facilities. This idea came at an opportune time with the Young Adult Conservation Corps in place to provide labor and funds to renovate and expand the nursery office and packing shed into a district office. This work was accomplished almost entirely by the Y.A.C.C. and the new office was ready to occupy in November 1980.

Quehanna – Curtiss Wright Era

- Dwight D. Eisenhower started the initiative of "Atoms for Peace" in 1953. The initiative promoted the testing and development of products using nuclear technology.
- The plan for the Quehanna Reactor was first introduced by president and CEO of Curtiss-Wright, Roy Hurley. Roy was called a genius at the early stage of the project to later be ousted from the company for a string of business failures.
- The main objective of the Quehanna Project was to be a testing facility of nuclear powered jet engines, develop non-military products and to provide jobs to rural Pennsylvania.
- Opposition to the project was downplayed because the plan was proposed as a matter of national security.
- 51,162 acres transferred from the Commonwealth to Curtiss-Wright Corporation (CWC). 8,600 acres were sold outright and 45,562 acres leased.
- The land was sold for $192,000 from PA to CWC in 1955 and bought back in 1967 for $992,500.
- There were 3 levels of the perimeter of CWC land. The outer most perimeter is now the current Quehanna Wild boundary which is a 16-sided shape. The 8-sided inner core of 8,600 acres was fenced with 3 wires approximately 18 inches apart. The 8 corners were 3 miles apart so the total fence was 24 miles long constructed by Ralph Harrison and crew.
- Early estimates were projected 10,000 jobs to the region within 2 years. Roughly 1,000 employees worked there at the peak of operation.
- 216 camp lessees were forced to relocate outside the proposed perimeter. Human safety and security were the cited reasons.
- Quehanna Highway was built by the state from Karthaus to the edge of the southeast perimeter ($1.6 million). The rest of the highway was constructed by CWC. The road was protected with armed guards at 3 gated checkpoints at the bottom of Wykoff Run Road and at either end of the Quehanna Wild Area.
- The community of Pine Glen, Centre County boomed with new houses and apartments to house scientists, engineers and other workers and their families.
- Governor: George M. Leader (1955-1959)
  DCNR Secretary: Maurice K. Goddard
  District Forester: John Wilson (FD09)
- Encompasses 3 counties: Clearfield, Elk and Cameron
- CWC announced the end of the project in 1960.
- Cost of cleanup was estimated at $40,000,000.
- Cleanup started in the mid-1960s and the last effort was pretty recent. In 2007, the reactor site soil was graded and received run-off rehab.
- Several former employees of Curtiss-Wright came forward claiming they took part in illegal dumping in 1985. This caused a local and regional uproar demanding the cleanup of the sites. Additional funding, research projects and rehab of sites were initiated.
- A helicopter with a ground penetrating radiation monitor flew grids over the area roughly 100 feet above the surface to identify contaminated areas.
- In 1985, a "Save the Quehanna Wild Area" rally was held at the Marion Brooks Memorial with over 1000 people in attendance.

- There are currently 5 sites that are noted to test positive for nuclear waste. One site is fenced because the level of strontium 90 and cobalt 60. The level of radiation received is explained as equal to a chest x-ray if you sleep on the ground there overnight.
- Quehanna Wild Area (est. 1966) is the first and largest Wild Area in the state of 50,000 total acres.
- Conspiracy theory - Some believe Israel received 200 pounds of weapons grade enriched uranium from the Nuclear Material and Equipment Corporation (NUMEC) when the company occupied the Quehanna site in 1967.

Dates:

- Pres. Eisenhower "Atoms for Peace" - 1953
- Land Transfer PA to CWC - 1955
- Curtiss-Wright Day – 1956
- Curtiss-Wright pulls plug on the project – 1960
- Leased land transfer back to PA – 1963, (Inner Core sold back 1967).
- Quehanna Wild Area was created in 1966 (formerly in 1970 as one of 13 Wild Areas statewide).
- Rally to "Save the Quehanna Wild Area" at Marion Brooks Monument - 1985

Results/Products Developed:

- Curon plastic foam material
- Lighthouse reactor powering light
- Irradiation of Food – extends shelf life of a product
- Plastic infused wooden flooring - Nydree Flooring today

6) Ecoregions, Physiography, and Land Cover

The Moshannon State Forest lies primarily in the Pittsburgh Low Plateau Eco-region (DCNR, Bureau of Forestry), as well as in the Deep Valleys and Allegheny Front Eco-regions. The Pittsburgh Low Plateau can be characterized as having a smooth to irregular, undulating surface; with narrow and relatively shallow valleys. Local relief in the Pittsburg Low Plateau Region ranges from 301 to 600 feet and elevations range from approximately 660 feet to 2,340 feet. Underlying rock types include shale, siltstone, sandstone, limestone, and coal. This region has a dendritic drainage pattern.

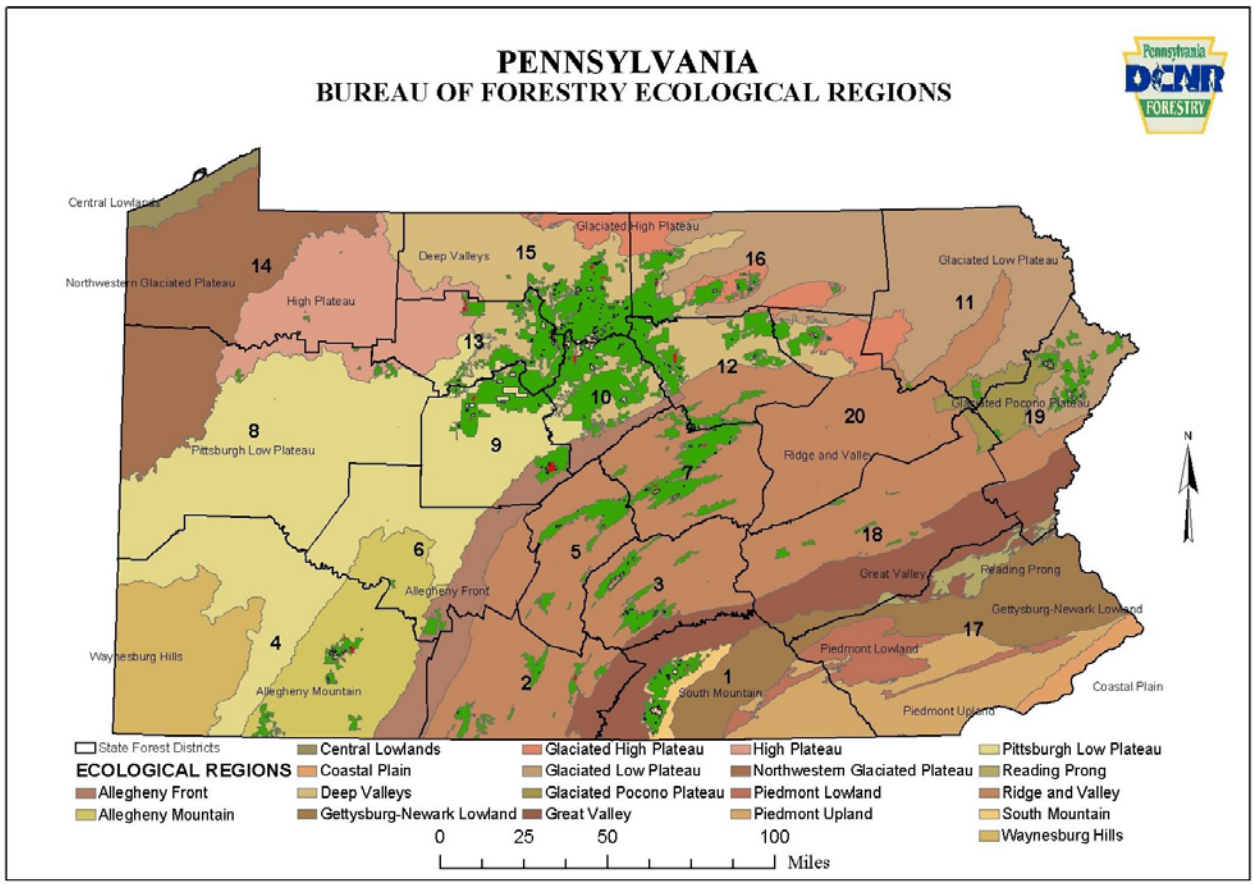


Figure 6-1. Ecoregions of Pennsylvania, with state forest land shown in green.

The topography of the Deep Valleys Section is rugged and irregular and characterized by high, broad-topped plateaus that have been deeply dissected by dendritic stream patterns. The stream-cut valleys are v-shaped with steep sides and narrow valley floors. Most of the ridges reach an average elevation of 1,700 to 2,000 feet, with a few exceeding 2,300 feet. The highest point in the forest district is found within this physiographic section at a tower on the crest of Chestnut Ridge about 1½ miles northwest of the Knob Fire Tower, Clearfield County, where the elevation is 2,405 feet above sea level. The lowest elevation is also found within the Allegheny High Plateaus Section at the point where the West Branch, Susquehanna River leaves Clearfield County. Here the elevation is less than 800 feet.

The topography of the Pittsburgh Low Plateaus Section is made up of relatively gently rolling hills with maximum elevations of 1,600 to 1,900 feet. The minimum elevations average about 1,300 feet with lower elevations of 900 to 1,000 feet occurring along channels of the major streams. The average relief is 600 to 1,000 feet.

The Allegheny Front Section is characterized by angular, steep-sided hills with maximum elevations of 2,200 to 2,400 feet. The lowest points are along Moshannon Creek, where elevations of 1,200 to 1,300 feet are noted. The average relief ranges from 600 to 1,200 feet. The drainage systems here, like other parts of the Plateau, are dendritic patterns.

The Appalachian Front Section consists of successions of narrow ridges and broad or narrow valleys whose trends are generally northeast. The more erosion resistant rocks were left as ridges while the softer rocks have been eroded to form valleys. Some of the ridges have elevations, which exceed 2,300 feet while adjacent valleys lie as much as 1,000 feet below.

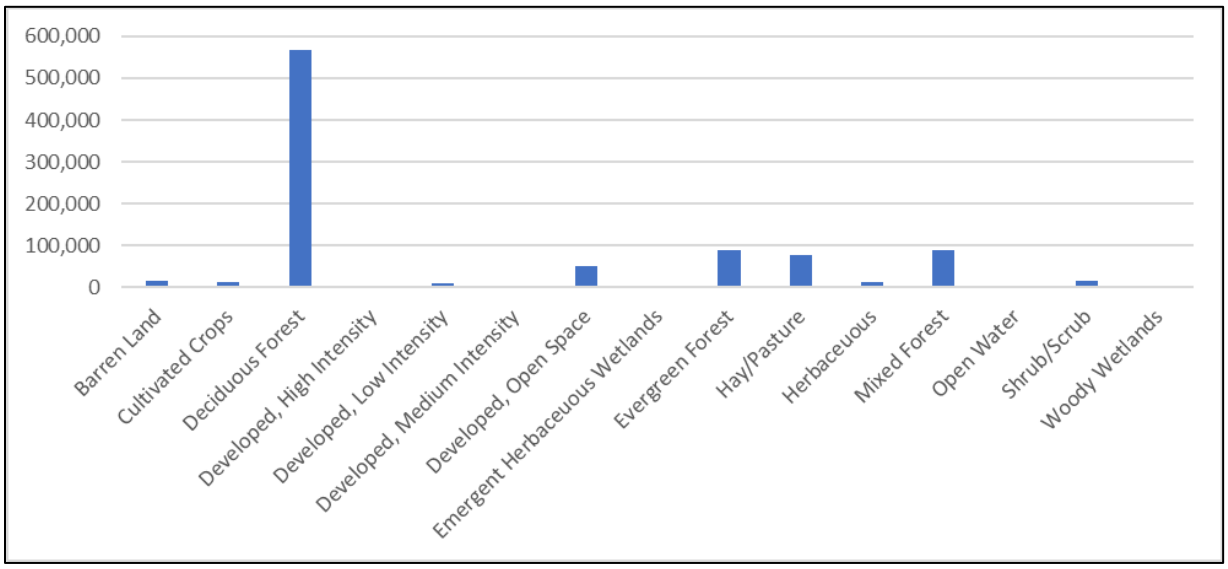


Figure 6-2. Acres of land cover types from National Land Cover Database for entire district.

The Moshannon State Forest District is in north-central Pennsylvania. State Forest land is located mainly in Clearfield, Centre and Elk Counties, with minor holdings in Cameron and Clinton Counties The graph above includes State Forest land as well as private land within the District boundary. State Forest land totals 190,362 acres and is located mainly across the northern tier of Clearfield County and a portion of western Centre County. State Forest land is mostly contiguous. The southern part of the District consists of agricultural land, land formerly mined and residential areas.

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

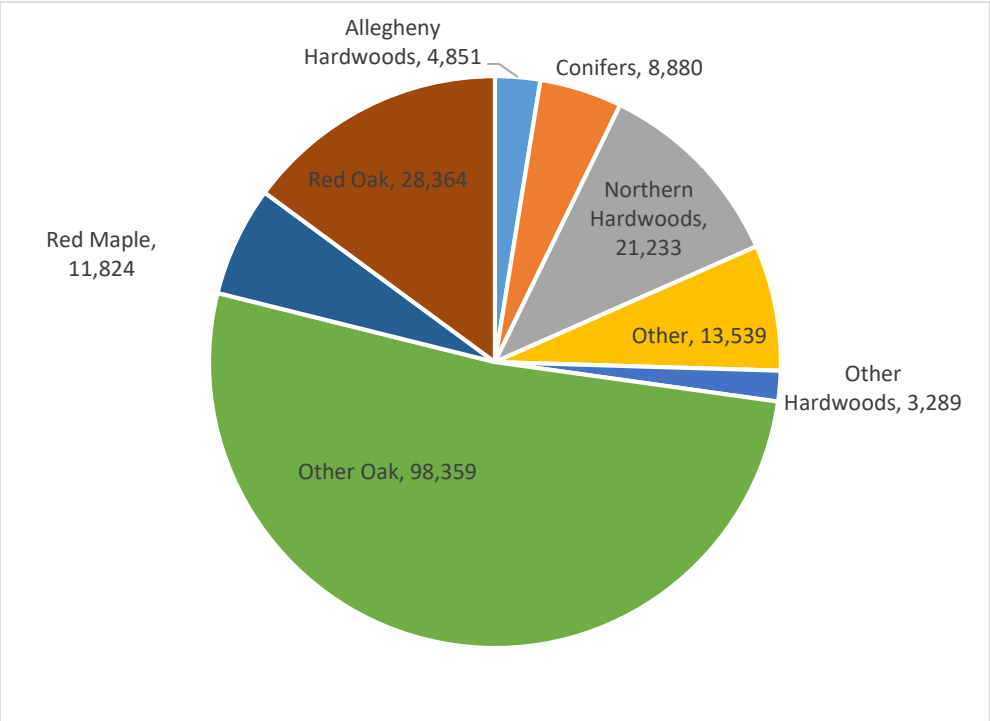


Figure 7-1. Acreage of state forest land in this district by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

AD 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 White oak (*Quercus alba*) and/or chestnut oak (*Quercus montana*), which either alone or in combination account for a greater percentage of overstory basal area than northern red oak (*Quercus rubra*). Common trees typically include sweet birch (*Betula lenta*), shellbark hickory (*Carya cordiformis*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), black oak (*Quercus velutina*), pignut hickory (*Carya glabra*), white ash (*Fraxinus americana*), and basswood (*Tilia americana*). Total cover by conifers does not typically exceed 25% of the overstory.

Often Eastern white pine (*Pinus strobus*) seedlings are present in the understory, as well as a variety of shrubs and mid-story trees including: flowering dogwood (*Cornus florida*), hornbeam (*Carpinus caroliniana*), beaked hazelnut (*Corylus cornuta*) and hop- hornbeam (*Ostrya virginiana*). Ericaceous shrubs are sparse, accounting for less than 30% of relative cover in the understory. When present, they may include lowbush blueberry (*Vaccinium pallidum*), low sweet blueberry (*Vaccinium angustifolium*), black huckleberry (*Gaylussacia baccata*) and mountain laurel (*Kalmia latifolia*). Herbaceous species may include false Solomon's-seal (*Smilacina racemosa*), sessile-leaved bellwort (*Uvularia sessilifolia*), ebony spleenwort (*Asplenium platyneuron*), tick-trefoils (*Desmodium* spp.), rattlesnake weed (*Hieracium venosum*), wild sarsaparilla (*Aralia nudicaulis*), Pennsylvania sedge (*Carex pensylvanica*), fibrous-root sedge (*Carex communis*), bigleaf aster (*Eurybia macrophylla*) and whorled loosestrife (*Lysimachia quadrifolia*).

AH 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 chestnut oak (*Quercus montana*), usually occurring with a mix of black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), and/or white oak (*Quercus alba*). In the northern range, red oak (*Quercus rubra*) replaces scarlet oak (*Quercus coccinea*). Other tree species often include sassafras (*Sassafras albidum*), black-gum (*Nyssa sylvatica*), sweet birch (*Betula lenta*), red maple (*Acer rubrum*), pignut hickory (*Carya glabra*), pitch pine (*Pinus rigida*), Virginia pine (*Pinus virginiana*), and eastern white pine (*Pinus strobus*). Total cover by conifers does not exceed 25% of the overstory. American chestnut (*Castanea dentata*) stump sprouts are occasionally present.

The shrub layer is dominated by ericaceous species — common species typically include: mountain laurel (*Kalmia latifolia*), sheep laurel (*Kalmia angustifolia*), black huckleberry (*Gaylussacia baccata*), lowbush blueberry (*Vaccinium pallidum*), low sweet blueberry (*Vaccinium angustifolium*), and in more open areas, sweet fern (*Comptonia perigrina*).

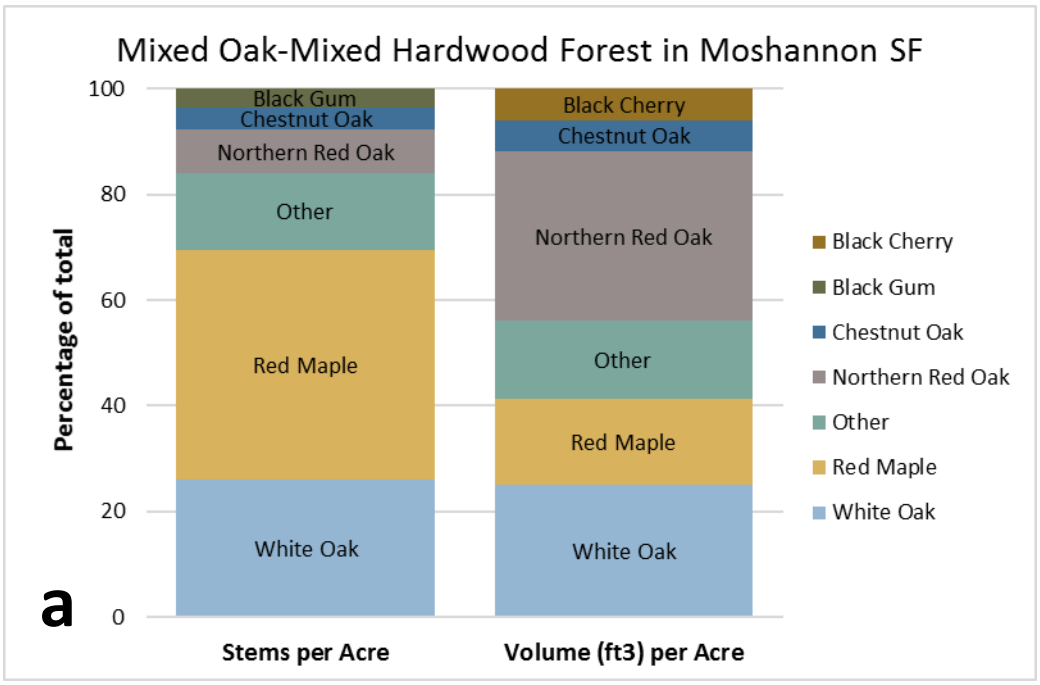
Owing largely to the thick oak/ericaceous leaf litter, the herbaceous layer is generally sparse. Common constituents often include teaberry (*Gaultheria procumbens*), Pennsylvania sedge (*Carex pensylvanica*), fibrous-root sedge (*Carex communis*), trailing arbutus (*Epigaea repens*), wild sarsaparilla (*Aralia nudicaulis*), bracken fern (*Pteridium aquilinum*), Indian cucumber-root (*Medeola virginiana*), cow-wheat (*Melampyrum lineare*) and pink lady's-slipper (*Cypripedium acaule*).

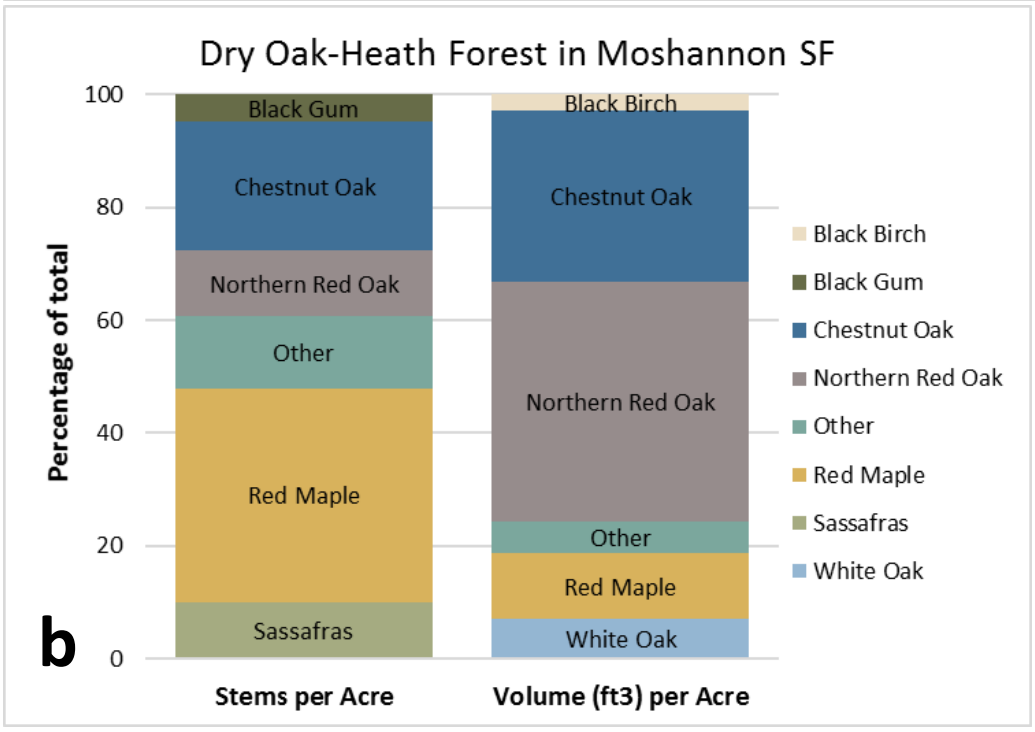
Unique Plants and Plant Communities

There are some unique plant communities found in the many wetland complexes found on Moshannon state forest. The wetlands associated with the tributaries of Twelvemile Run include hemlock palustrine forest which are dominated or co-dominated by eastern hemlock (*Tsuga canadensis*). The canopy may also contain a mixture of other conifers, including red spruce (*Picea rubens*), tamarack (*Larix laricina*), and eastern white pine (*Pinus strobus*). Hardwoods are less common in the canopy and can include red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), and black ash (*Fraxinus nigra*). These wetlands provide habitat for two plant species of concern, creeping snowberry (*Gaultheria hispidula*), and a population of screwstem (*Bartonia paniculata*).

Other wetlands associated with these tributaries have resulted from beaver activity or previously dammed areas that that now contain mud flats, meadows, and shrub thickets in various degrees of succession. Steeblebush (*Spiraea tomentosa*), lowbush blueberry (*Vaccinium angustifolium*), cranberry (*Vaccinium macrocarpon*) make up the shrub component with sedges (*Carex* spp.), burreed (*Sparganium chlorocarpum*), St. Johns'-wort (*Triadenum* sp.), rushes (*Juncus* spp.), asters (*Aster* spp.) and goldenrods (*Solidago* spp.) in the herbaceous layer. There is one wild plant sanctuary in the Moshannon state forest.

The Moshannon State Forest is dominated by oak forest community types, which dominate primarily upland sites. However, there are significant amounts of Northern Hardwoods and conifer forest types located along stream drainages.


Mixed Oak-Mixed Hardwood Forest in Moshannon SF
Percentage of total
100
80
60
40
20
0
Black Gum
Chestnut Oak
Northern Red Oak
Other
Red Maple
White Oak
Black Cherry
Chestnut Oak
Northern Red Oak
Other
Red Maple
White Oak
a
Stems per Acre
Volume (ft3) per Acre
Black Cherry
Black Gum
Chestnut Oak
Northern Red Oak
Other
Red Maple
White Oak


Dry Oak-Heath Forest in Moshannon SF
Percentage of total
100
80
60
40
20
0
Black Gum
Chestnut Oak
Northern Red Oak
Other
Red Maple
Sassafras
Black Birch
Chestnut Oak
Northern Red Oak
Other
Red Maple
White Oak
b
Stems per Acre
Volume (ft3) per Acre
Black Birch
Black Gum
Chestnut Oak
Northern Red Oak
Other
Red Maple
Sassafras
White Oak

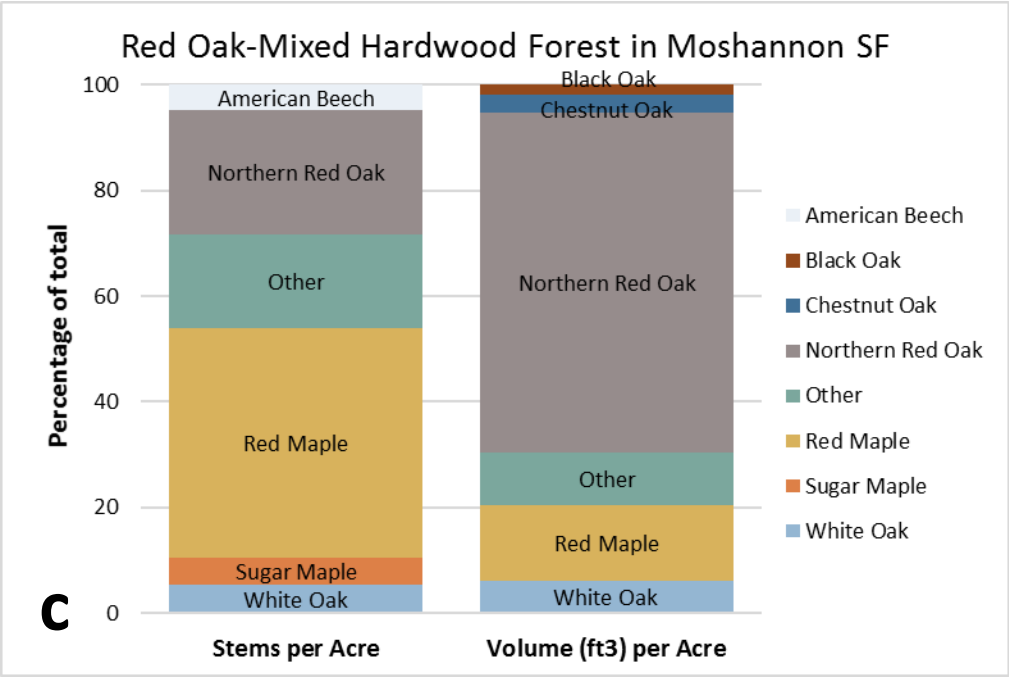


Figure 7-2: a-c. Species composition (top 5 species) of all stems over 4.5 inches dbh in the forest communities that have over 15 Continuous Forest Inventory (CFI) plots in a district. For more information and summaries of the Bureau's CFI data, see the online interactive tool here: https://pa-forestry.shinyapps.io/cfi_explorer/ .

a) Moshannon State Forest has over 49,000 acres of mixed oak-mixed hardwood forest, which comprises about 26% of total state forest acreage in this district.

b) Moshannon State Forest has over 49,000 acres of dry oak-heath forest, which comprises about 26% of total state forest acreage in this district.

c) Moshannon State Forest has over 28,000 acres of red oak-mixed hardwood forest, which comprises about 15% of total state forest acreage in this district.

Moshannon State Forest consists primarily of oak dominated forest types. Northern Red Oak accounts for the most volume of any tree species in these forest types. Northern Red Oak, along with the other oak species are valuable to a variety of wildlife communities, as well as the forest product industry.

8) Forest Health

CLIMATIC-RELATED ENVIRONMENTAL CONCERNS

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 Moshannon 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 INSECTS

Invasive insects are one of the major forest health issues impacting Pennsylvania's forests. Insects such as gypsy moth, emerald ash borer, and hemlock woolly adelgid have been devastating forest stands throughout the commonwealth.

Gypsy Moth

When a Gypsy moth releases her eggs, mass populations hatch often overwhelming forest stands with millions of caterpillars. They often seek out oak trees but gypsy moth will also eat maple, apple, crabapple, aspen, willow, birch, mountain ash, larch, pine, spruce, and witch hazel. These moths tend to have boom and bust cycles (roughly every 10 years provided environmental conditions don't cause a population crash) in their populations. Today, the Gypsy moth population and damage is less severe than in the past, but they still require management and control during years their populations are high.

The summer insect and disease flights of 1980 detected the first noticeable defoliation caused by gypsy moth on the district. It only amounted to 64-acres. The next summer saw this explode to 173,914-acres. The gypsy moth peaked in 1982 at 318,670-acres and collapsed to 73,433-acres in 1983. Heavy to moderate mortality became evident in 1983 on an estimated 30,000-acres of forest land throughout the district. Beginning with 1983, an aggressive salvage operation was initiated by the district staff and culminated at 4,410-acres of salvage sales on state forest land during 1984. In 2007 gypsy moth invaded the Black Moshannon tract in Centre County. Two to three thousand acres were sprayed but 20,000 acres were heavily defoliated for three successive years. This led to large scale mortality. Since 2007 the district has salvaged over 18,000 acres of timber harvesting due to the gypsy moth mortality. Some of the areas have regenerated with desirable seedlings. The other area have been planted with conifers.

The Bureau of Forestry will continue to suppress gypsy moth populations in oak stands in forest districts and state parks.

Emerald Ash Borer

Emerald ash borer has had devastating effects on forest stands containing ash trees. Native to northeastern Asia, the Emerald ash borer was found in Pennsylvania in 2007, and since then has been responsible for killing many of Pennsylvania's Ash tree populations. Signs and symptoms of an emerald ash borer (EAB) infestation include, upper crown dieback, epicormic branching, bark splitting, D-shaped exit holes in the bark, S-shaped feeding galleries inside the bark. There are three control options for the emerald ash borer such as tree removal, chemical control, and biological control.

Districts will work with the Division of Forest Health to identify lingering ash. A lingering ash is defined as an ash tree that is still alive after 95% ash mortality has been present for at least two years. Locations will be georeferenced and samples of the lingering ash will be collected by Division of Forest Health staff for study by the USDA Forest Service Northern Research Station. Districts will continue to treat selected ash with a systemic insecticide according to the Bureau's Ash Management Plan.

Hemlock woolly adelgid

Hemlock woolly adelgid is another invasive insect that is a serious forest health issue of Pennsylvania's trees. This non-native invasive insect has caused significant hemlock defoliation and mortality in Pennsylvania forests. The hemlock woolly adelgid was accidentally introduced to Virginia from Japan in the 1950s, and by the late 1960s was reported in southeastern Pennsylvania. To manage hemlock woolly adelgid in Pennsylvania's forests, the DCNR Bureau of Forestry uses integrated pest management principles that rely on surveying and monitoring of the insect and the tree, including the following methods, biological control, insecticides, silvicultural, and tree breeding for host resistance.

High value hemlock sites will be identified and protected using systemic insecticides and predatory beetle releases. Districts will work with the Division of Forest Health to conduct the suppression and biocontrol programs. Openings in the hemlock canopy will be examined to determine the amount of hemlock regeneration. If needed, hemlock will be planted to keep the site as hemlock habitat. Restoration research is being conducted by USDA Forest Service Research. In addition, silvicultural practices are also being studied by the USDA Forest Service. The Division of Forest Health will work with the Districts and USDA Forest Service Research to identify potential treatment sites.

Spotted Lanternfly

A new and dangerous invasive insect that has recently shown up in Pennsylvania forests is the Spotted Lanternfly. Although only found in southeastern PA this insect can spread rapidly throughout the commonwealth. The Spotted Lanternfly is native to China and was first detected in Pennsylvania in September 2014. It feeds on a wide range of fruit, ornamental and woody trees, with tree-of-heaven being one of the preferred hosts. Spotted Lanternflies are invasive and can be spread long distances by moving infested material or items containing egg masses. If these insects spread it could seriously impact the country's grape, orchard, and logging industries. Reporting of this insect to DEP or SFL is crucial to help slow the spread of this newly found invasive insect.

Oak Scale

From the 1920's until the 1960s, the Moshannon State Forest had been spared from the invasion of forest insects and diseases on an epidemic scale. During the early 1960s, the pit-making oak scale became established in the extreme eastern portion of the forest. This insect and the associated branch dieback fungus seriously affected chestnut and white oak on poor sites.

By 1966, the scale fungus complex had spread over approximately 2,000-acres of land in the forest. Most of this area was limited to ridge tops and poor sites where chestnut and white oaks were prevalent. By the late summer, dying trees and serious decline were quite evident.

In 1967, the pit-making oak scale spread to the central portion of Clearfield County. An infested area of nearly 500-acres was detected about two miles northwest of Clearfield during the spring aerial patrol survey. Ground checking revealed that dieback and mortality was apparent in a good portion of the chestnut oak on the ridges and poor sites in the northeastern part of the district. The overall condition in the district remained stable until the spring of 1969.

The spring survey flights of 1969 picked up approximately 10,000-acres of pit- making oak scale infestation.

Practically every ridge in the central and eastern portions of the district, as well as the Black Moshannon Division in Centre County, was affected.

Oak Leaf Rollers

Along with the scale, approximately 8,200-acres of oak leaf roller defoliation was found in the Quehanna section of Clearfield County. This proved to be the western edge of a huge infestation of leaf rollers that had been moving westward for several years. Ground checks throughout the spring and summer showed that tremendous numbers of egg masses were present throughout the northeastern and eastern parts of the Moshannon State Forest, indicating epidemic conditions for the following year.

The 1970 spring surveillance flights showed the previous year's predictions were true. A total of 191,000-acres in the Moshannon State Forest was defoliated by several species of the oak leaf roller group. The degree of defoliation varied from about 10% to 100%. Ground checks and data from plots taken in the fall of 1970 showed that tree mortality was becoming evident in all stands that were moderately or heavily defoliated. Some of the stands had mortality as high as 30% to 40% of the oak volume. The ground checks also showed that the forest tent caterpillar had moved into the extreme southwestern portion of the district and had completely defoliated about 750-acres of forest land.

The oak leaf rollers continued to build and peaked in 1971 with 234,700-acres defoliated throughout the district. Clearfield County suffered the most with 131,000-acres. 1972 saw a slight decline to 176,900-acres, which set the trend, and by 1975 no detectable defoliation was present in the district. However, the aftermath of this six-year infestation was 760,000-acres of moderate to heavy mortality throughout the forest.

FUNGAL DISEASES

The first major influence from insects and diseases on the forest was the invasion of the chestnut blight. This disease was first observed in the New York Zoological Park in 1904. The fungus is native to Asia and was probably introduced into the United States on nursery stock. The disease progressed rapidly through Pennsylvania and reached the Moshannon State Forest in 1922. One historian remembers the abundance of chestnut timber in the forest. During 1923 a record-breaking crop of chestnuts were obtained. By 1924 however, only a few scattered chestnut trees remained alive, and before the end of 1925 not a single live tree remained. In many of the heavily stocked oak-chestnut stands, the death of the chestnut was actually a natural thinning. Consequently, the residual oak responded greatly in growth. However, in other oak-chestnut stands the death of the chestnut left the remaining oak timber grossly under stocked.

Beech bark disease is a fungal pathogen spread from the invasive beech scale insect. Beech scale transmits two funguses when feeding on the trees, leading to cankers and eventually death. The disease has killed large numbers of beech trees in North America.

Oak Wilt is a fungal pathogen that is spread through the oaks in the red oak group. From the moment that symptoms are observed trees can succumb and die rapidly. Tree leaves turn brown and fall, working from the top of the tree downward. The pathogen can be spread by feeding insects, transmission from root to root, and mechanically from improperly cleaned pruning tools or chainsaws.

INVASIVE PLANTS

Invasive plant is a name for a species 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 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.

WHITETAIL DEER

The second growth forest that became established provided ideal food and cover for the expending deer herd. The "buck law" passed in 1907 protected the doe and enabled the deer herd to increase to a point where, between 1920 and into the late 1930s, deer were doing considerable damage to the developing forest. Even though the deer herd has been controlled some through the harvesting of antlerless deer, over browsing of reproduction and coniferous plantings still continues to be a problem while trying to grow new forests.

The introduction of the regeneration fund in 1995 has more adequately prepared the district to meet challenges posed by deer. Since this time, funding has consistently been available for practices such as fencing to keep deer from browsing newly developed regeneration. Broadcast herbicide spraying eliminates heavy fern, beech brush, and striped maple interference that replaced the herbaceous plants, shrubs, seedlings, and saplings which would normally occur in a balanced herd to habitat situation, and allows for young forests of a more desirable and diverse species mix to become established. Nearly two full decades of regeneration fund treatments has resulted in a much higher rate of successful sylvicultural treatments, essential towards forest health and sustainability.

WEATHER

Drought

Drought years occurred in 1930 and in the period from 1962-1966. The latter years were the driest ever recorded for this area. In fact, during these years several reproduction clear cuts did not respond successfully.

Frost Damage

Due to elevations of 1,500 to over 2,200-feet and narrow mountain valleys, late spring frosts occur after leaf emergence, frequently into the latter part of May and early June. Consequently, growth is retarded, as the trees must use reserve food for re-foliation.

Wind Damage

On the evening of May 31, 1985, severe thunderstorms occurred throughout much of Pennsylvania. A tremendous tornado was spawned in northern Clearfield County. It first touched the earth on the hilltops northwest of Winterburn. Traveling in an easterly direction, it came down into the valley destroying a home located on the southeast side of PA Route 255. It continued across the Bark Camp Road headed for Lady Jane Mine. As the tornado roared up the hillside behind Lady Jane, its swath of complete destruction broadened to at least 1½-miles in width. This area was bordered by a ½-mile-wide swath on either side where the forest was heavily damaged, reducing the stocking by approximately 30-percent. The storm, with winds estimated at 300-miles per hour and traveling at approximately 60-mph, continued easterly across the state forest for 34-miles where it entered Districts 10 and 13. Along the path of destruction, a few of the victims were Parker Dam State Park and its famed "Trail of the Giants" where an original stand of huge white pine, white ash, and sugar maples

were flattened. To the east and just off the center of the path are the PermaGrain reactor facilities, which suffered heavy damage to its roof and sheet metal siding. A house trailer used as office space completely disintegrated, and a doublewide mobile home endured the winds with no damage while the plant manager and his wife and child clung to the living room floor. Numerous power line rights-of-way lay across the path and were destroyed. It is estimated that between 6,000 and 7,000-acres of state forest land were completely destroyed, and an equal area affected by the wind damage. Approximately 25 state forest campsite leases were damaged to some degree with two being totally destroyed. No injuries or loss of life resulted from this storm event.

Since 1985 there have been no weather events that have approached the May 31, 1985 tornado. All events since then have been localized and affected relatively few trees in the forest. Most have been of the "Micro Burst" or "Down Burst" type that topple or damage a small group of trees, leaving the surrounding area untouched. Some of these were of sufficient size to conduct salvage timber sales, but the majority did not warrant this degree of response.

Winter weather has brought occasional Ice Storms to the plateau area. These, while a spectacular sight, seldom do much damage in this forest. An occasional tree will end up falling across roadways, but generally the damages are in the form of broken tops and limbs. January 6, 2005 brought a severe ice damage event to the forest. An estimated 60,000 acres was affected. Many of the state forest roads were closed, taking weeks to get re-opened. The ice snapped off many tree tops with the oaks and maples being affected most. Some trees became uprooted with the weight of up to 1.25 inches of ice clinging to them. This ice storm damage will be evident for many years to come.

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.

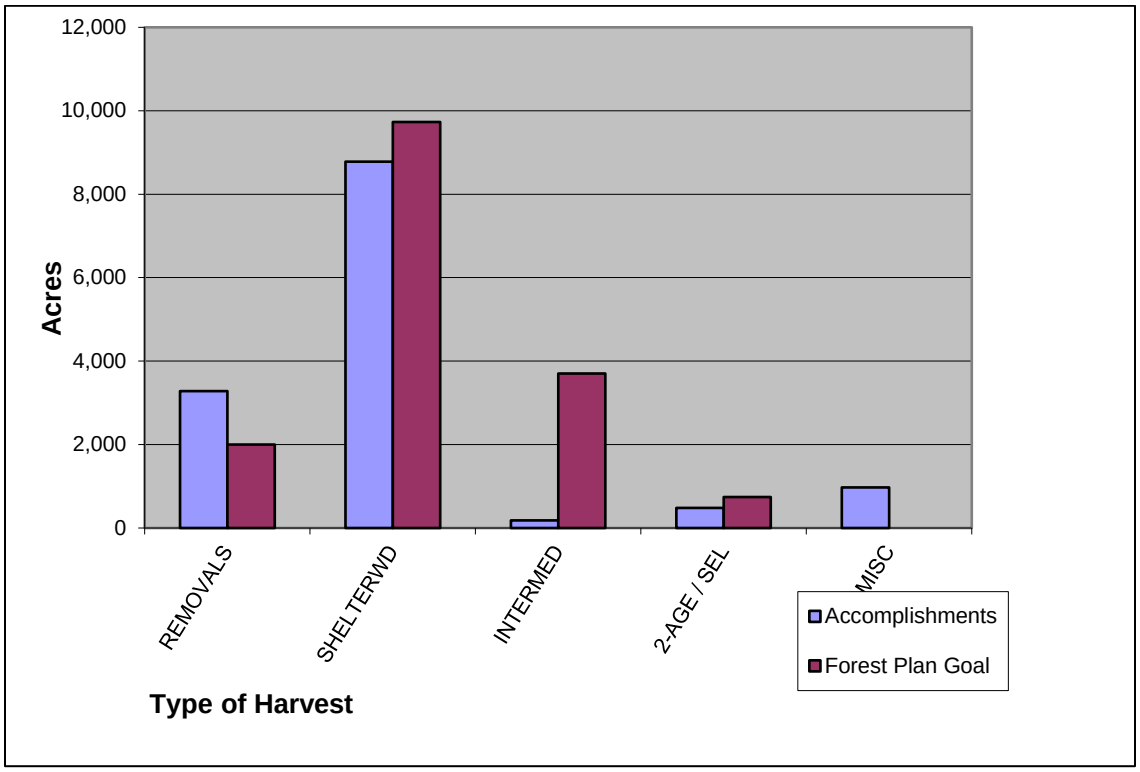


Figure 9-1. Decade 1 harvest allocation model goals vs. actual harvests for Moshannon State Forest.

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	908	0	377	18	0	**18**	**1,286**	**3,700**	**740**
Allegheny Hardwoods	0	0	0	0	0	0	**0**	**0**		
Red Oak	60	2,132	183	1,553	0	0	**244**	**3,686**		
Other Oaks	0	1,411	3,208	3,350	1,884	0	**5,092**	**4,761**		
Red Maple	0	0	0	3	0	0	**0**	**3**		
Other Hardwoods	0	0	0	7	0	54	**0**	**62**		
Conifers	0	0	0	78	0	24	**0**	**102**		
Totals	**60**	**4,452**	**3,391**	**5,369**	**1,902**	**79**	**5,353**	**9,900**	**3,700**	**740**

10) Wildlife

Moshannon state forest is home to a wide variety of both big game and small game. The most common big game animal on the Moshannon is the white tail deer but also contains bear, elk and turkey. There are many types of small game that live on the Moshannon such as grouse, rabbits, squirrel, woodcock, ducks, geese, fox, coyote, beaver, muskrat, fisher, bobcat, mink, weasel, raccoon, skunk, opossum, porcupine, wood pecker, songbirds, reptiles and amphibians. Wildlife habitat is carefully managed with different methods, such as hunting or various habitat projects. Some of our habitat projects include aspen regeneration cuts, browse cuts, food plots, duck boxes, and fish structure.

DEER

The white-tailed deer is perhaps the most influential wildlife species in PA's forested ecosystems. When their population is out of balance with habitat, they impact state forests by browsing tree seedlings, shrubs, and wildflowers beyond their capacity to reproduce, impacting the ability to sustain a healthy, fully functioning forest ecosystem. The white tail deer population is closely monitored in several ways. Plots are conducted to help gather information about the amount of deer in a specific area. Hunting is the most common form of deer management. The Pennsylvania Game Commission administers controls license sales for both buck and doe, but DCNR does have the ability to focus hunting pressure in areas using the DMAP program. This is done in a scientific manner by taking VIP plots to assess the health of the habitat.

Chronic wasting disease (CWD) is a contagious, progressive neurological disease that affects, and always proves fatal to the members of the deer family. In the Moshannon State Forest this disease would impact white-tailed deer and elk. CWD is transmitted both directly through animal to animal contact and indirectly through food and soil contaminated with bodily excretions including feces, urine, and saliva.

CWD was first detected in Pennsylvania on a captive deer farm in Adams County in 2012. Unfortunately, multiple free- ranging deer in Bedford, Blair, Cambria, Fulton, and Clearfield counties have tested positive from 2012-2017.

With the expanding Chronic Wasting Disease area in Clearfield county, the Moshannon State Forest will support the Department of Agriculture, Department of Health , Department of Environmental Protection, US Department of Agriculture, and PA Game Commission in the prevention, surveillance, and response designed to manage CWD.

ELK

Elk once roamed most of Pennsylvania's woods in abundance until being over hunted leading to the demise of the population. 50 elk were reintroduced into PA from different western states' herds in 1923. One of the reintroduction locations was Kennedy Wildlife Preserve which is part of Moshannon State Forest. The first hunting season following the 1913 was in 1923 with 23 bull elk being harvested. Elk hunting seasons have been on a limited basis since the inaugural season, including years of no elk hunting altogether. Today, elk hunting licenses are awarded based on a lottery system resulting in the annual harvest of roughly 100 elk. Moshannon State Forest and the Bureau of Forestry have fostered partnerships with the Pennsylvania Game Commission, Rocky Mountain Elk Foundation and Keystone Elk Country Alliance. Together these organizations have developed an Elk Management Plan to provide goals, objective and strategies on how to best manage the PA elk herd. After decades of research, protection and state land acquisition's, the elk again flourish in Penns Woods.

BEAR

Black bears are found across Moshannon State Forest. Black bears are omnivores, meaning they eat both vegetation as well as meat. Bears in Penn's woods will often feed on acorns, hickory nuts, beechnuts, berries, fruits, roots, bulbs, pine cones, grubs, rodents and will prey on deer fawns. Bears have a very large home range and can cover a large area.

TURKEY

Turkey were present in low numbers during the 1800s but completely disappeared from the forest in the early 1900s due to over-harvesting and the complete removal of mast-producing trees during the lumbering days. The wild turkey became re-established in the 1940s after stocking by the Game Commission. The population peaked in the early 1960s and today the population is good throughout the forest.

SMALL GAME

The Moshannon State Forest was one of the best grouse and snowshoe hare areas in Pennsylvania in the early 1900s. The ideal habitat, created by the lumbering operations, was gradually lost as the second growth forest grew into pole and saw timber sizes; and the grouse and hare populations declined. The Clearfield County area was the excellent grouse habitat in 1940. Grouse and hare are still present but in small numbers.

FISH

There are 183.5 miles of trout streams (Table 10-1) in the forest, 39.5 of which are stocked by the Pennsylvania Fish and Boat Commission.

Table 10-1: Trout streams on the Moshannon State Forest

Stream	Miles Fishable	Miles Stocked
Benner Run	5.0	4.0
Black Bear Run	1.0	-
Black Moshannon Creek	4.5	4.5
Cole Run	10.0	-
Deer Creek	2.0	-
Jack Dent Branch	9.0	6.0
Lick Run	5.0	-
Little Medix Run	3.0	-
Lower Three Runs	5.0	-
Medix Run	9.0	7.0
Mix Run	8.0	7.0
Mountain Run	1.0	-
Pray Run	2.0	-
Red Run	6.0	5.0
Rock Run	6.0	-
Six Mile Run	6.0	5.0
Stone Run	3.0	-
Twelve Mile Run	7.0	-
Upper Three Runs	11.0	-
Total	**183.5**	**39.5**

In addition to the aforementioned trout streams, Parker Dam provides trout fishing in a lake setting and Black Moshannon Lake provides 237 acres of warm water fishing for black bass, muskie, northern pike, walleyes, crappies, pickerel, and panfish. Boating regulations are enforced by the Bureau of State Parks. Electric motors are permitted. There is a boat livery at lake. There are no warm water streams on the Moshannon State Forest.

11) Water

MAJOR WATERSHEDS

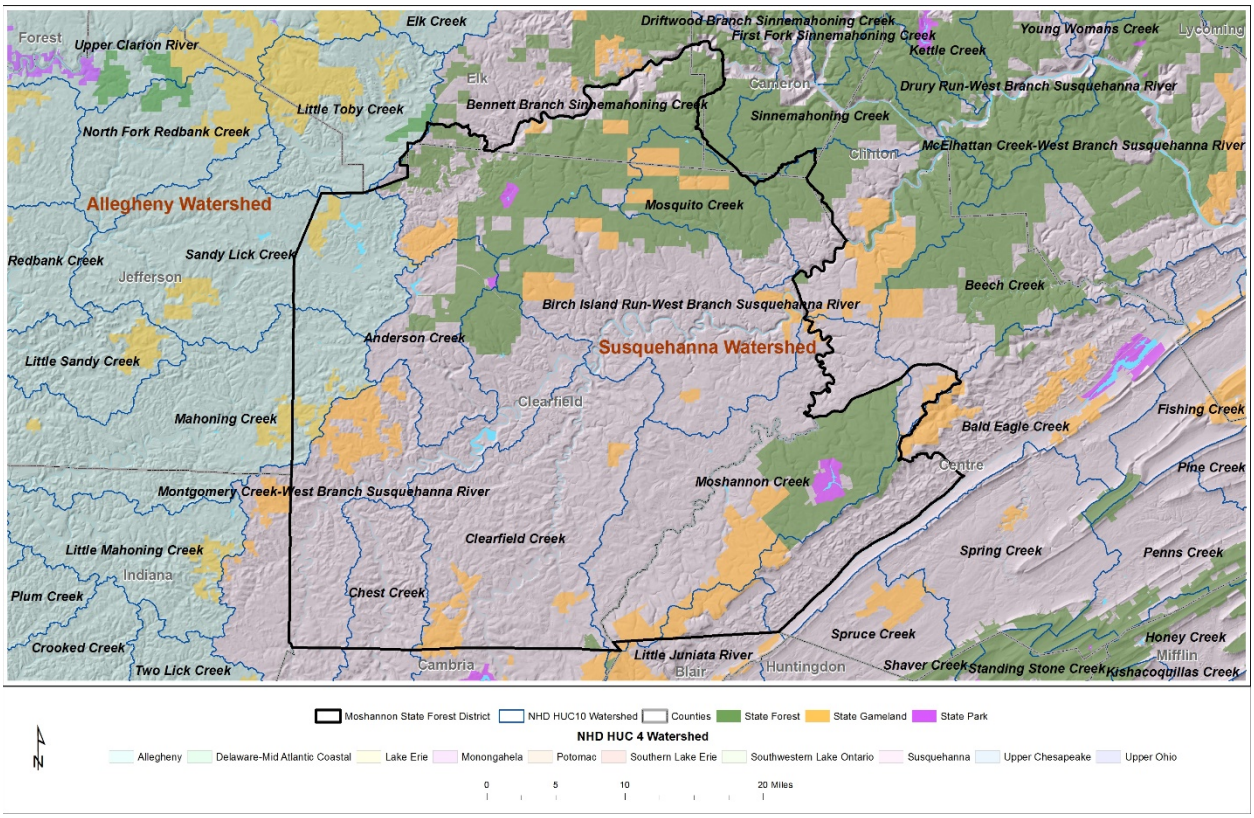


Figure 11-1. Map of major (Hydrologic Unit Code 4) and minor (Hydrologic Unit Code 8) watersheds within entire district.

The Moshannon Forest District contains two large watersheds. The Susquehanna Watershed makes up most of the district and flows southeast to the Chesapeake Bay which flows into the Atlantic Ocean. The forest district is drained by the West Branch, Susquehanna River and its tributaries, including Moshannon, Sinnemahoning, Clearfield, and Bald Eagle Creeks. A small portion of the northwest corner of the forest district, in the vicinity of DuBois, Clearfield County, is drained by Sandy Lick Creek, a tributary of the Allegheny-Ohio- Mississippi drainage system.

MAJOR MUNICIPAL SUPPLIES

Water is the life-blood of every individual and community. Many manufacturing processes depend on a steady supply of clean water. Clearfield County has over twenty water companies, six of which include large acreages of the Moshannon State Forest in their watersheds. Other substantial acreages of state forest land are potential municipal watershed.

Water Resources Inventory

Currently, there are 21,698 acres of the Moshannon State Forest in municipal watersheds serving five communities. This represents approximately 13% of the Moshannon State Forest. Potential, but undeveloped watersheds encompass an additional 9,197 acres.

Water Systems

Table 11-1 lists the one impoundment located on the Moshannon State Forest.

Table 11-1: Impoundment located on the Moshannon State Forest.

Municipality	Impoundment area (acres)	Capacity (gallons)	Watershed area (acres)	Annual supply (million gallons)
Piper (Quehanna)	0.25	600,000	2,378	Unknown

Table 11-2: Impoundments located on private lands, but with portions of the watershed within the Moshannon State Forest.

Municipality	Watershed Area on State Forest
Dubois	9,037
Clearfield (Montgomery)	5,658
Clearfield (Moose Creek)	4,137
Tyler	368
Winburne	135
Penfield	2,363

FISH AND BOAT COMMISSION STREAM HABITAT PRIORITIZATION

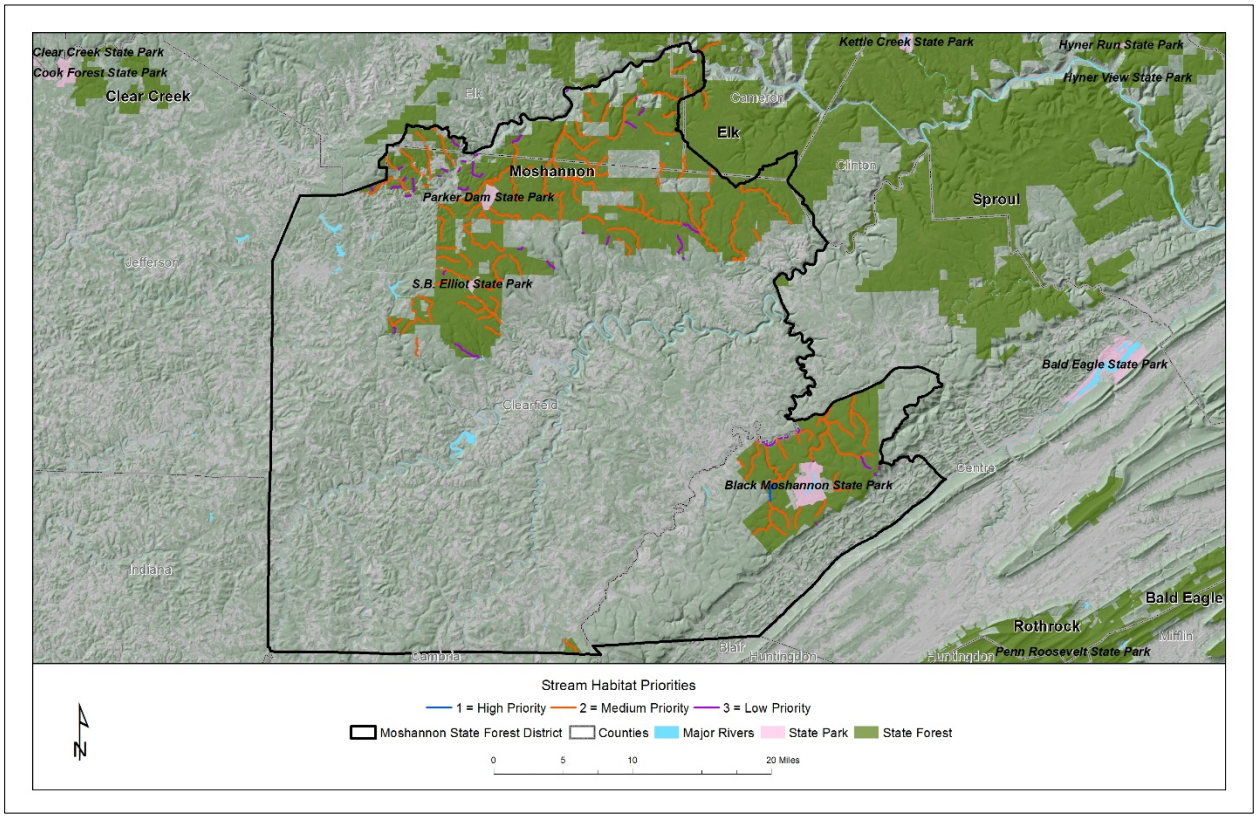


Figure 11-2. Streams within the district prioritized for aquatic habitat improvement projects based on PFBC Stream Habitat Improvement Prioritization Tool.

According to the FBC stream habitat prioritization, Sixmile Run in the Black Moshannon LMU is the only high-priority stream in Moshannon Forest District, but many streams are medium-priority. Several streams within Moshannon State Forest are also classified as exceptional value or high-quality using DEP criteria, and several streams are noted as exemplary for habitat for wild trout (Table 11-3). The district has paired with partners, such as Trout Unlimited, to implement several stream habitat improvement projects in recent years.

Table 11-3: Streams by classification based on criteria established by the DEP and the Pennsylvania Fish and Boat Commission.

Exceptional Value Waters (DEP) and Wilderness Trout Streams (PA F&BC)		
Stream	**County**	**Section Limits**
Benner Run	Centre	Headwaters to trib. Below pine Haven Camp
Rock Run	Centre	Headwaters to middle br. Rock run
Cole Run	Clearfield	Headwaters to Mouth
Twelve Mile Run	Clearfield	Headwaters to Mouth
Mix Run	Elk	Head waters to English Draft Run
High Quality Waters (DEP)		
Stream	**County**	**Section Limits**
Black Bear Run	Centre	Basin
Six Mile Run	Centre	Basin
Black Moshannon Creek	Centre	Main Stem
Shirks Run	Centre	Basin
Smays Run	Centre	Basin
North Run	Centre	Basin
Benner Run	Centre	Basin
Halls Run	Centre	Pine Haven Camp to Mouth
Meyers Run	Centre	Basin
Pine Run	Centre	Basin
Anderson Creek	Centre	Basin
Montgomery Creek	Centre	Basin, source to Dubois dam
Moose Creek	Clearfield	Basin, source to Montgomery dam
Lick Run	Clearfield	Basin, source to dam
Trout Run	Clearfield	Basin
Mosquito Creek	Clearfield	Basin
McNerney Run	Elk & Clearfield	Basin
Panther Run	Elk & Clearfield	Basin
Gifford Run	Clearfield	Basin
Upper Three Runs	Clearfield	Basin
Lower Three Runs	Clearfield	Basin
East Branch Wilson Run	Clearfield	Basin
Laurel Run	Clearfield	Basin
Medix Run	Elk & Clearfield	Basin
Beaver Run	Elk & Clearfield	Basin
English Draft Run	Elk & Clearfield	Basin
Meeker Run	Elk	Basin

ACID MINE DRAINAGE

Many of the existing water companies have had, or are in danger of having, their watersheds degraded by coal mining activities. Others have been degraded by giardia cyst pollution. There is much interest in upgrading many of these systems and in developing new ones where the water quality or quantity has been degraded. State forest land is an increasingly important source of clean water. For example, the Bennett Branch is being worked on to improve stream quality and habitat.

Table 11-4: lists the polluted waters within the Moshannon State Forest.

Stream	Length in Miles	Pollutant	Pollution Source
Wilson Run	2.0	Acid	Strip and/or deep mines
Bell Run	2.0	Acid	Strip and/or deep mines
Mill Run	2.0	Acid	Strip and/or deep mines
Moose Creek	5.0	Silt	Interstate 80

Laurel Run is a natural low pH stream. Laurel Run Watershed Association is being formed to work on solutions to the acid conditions.

12) Oil, Gas, and Mineral Resources

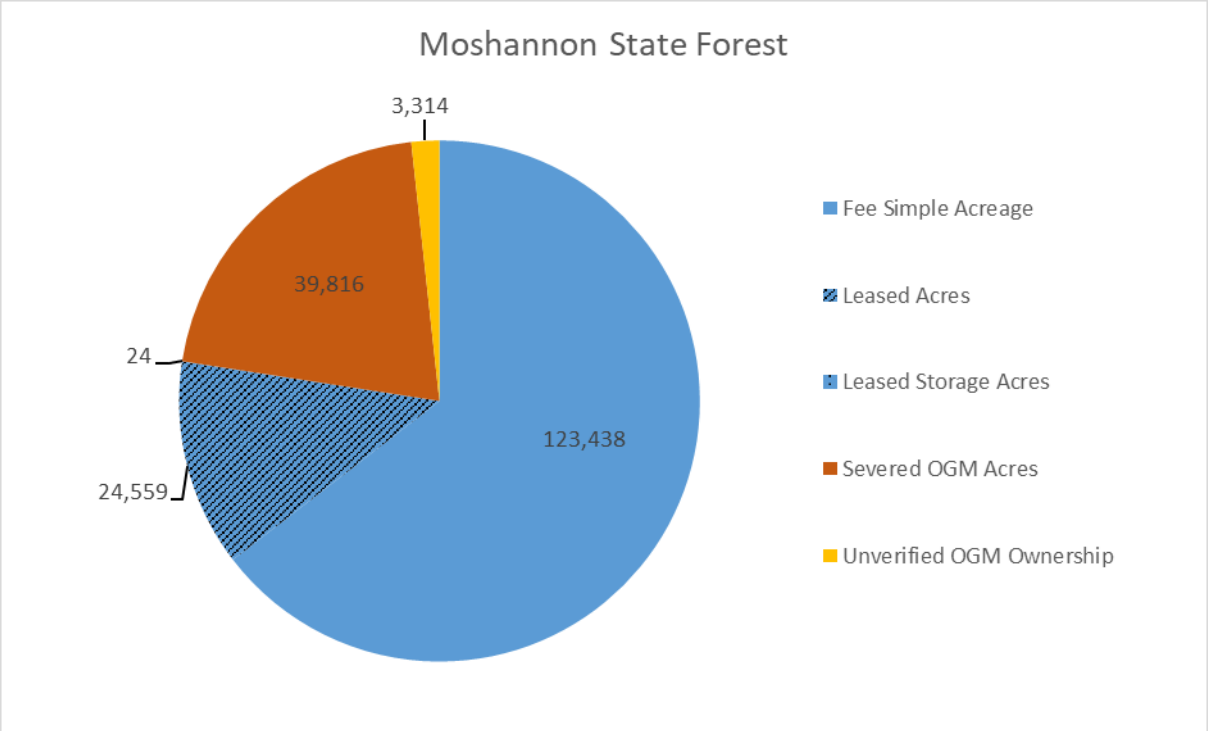


Figure 12-1. Acres of subsurface ownership/status on state forest land within the district. Acreage figures are derived from bureau GIS data, not acreages specified in lease or subsurface agreements. Severed Gas Rights Acres include only severed rights lands where the subsurface ownership has been verified. 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.

NATURAL GAS

Natural gas production on state forest land in this district has been chiefly from the conventional shallow plays in the Oriskany formation in the Driftwood-Benezette, Rockton and Boone Mountain gas fields. Some Shallow Upper Devonian gas has been produced from the Hollywood and Boone Mountain shallow gas fields. Gas production in these fields has declined over the last few years and operators have begun to plug some of these wells.

Marcellus Shale development has slowed since the initial boom period from 2010 to 2013, and operators have shown interest in the Utica formation. A Utica well was recently completed on private land on Boone Mountain, but there has yet to be any development on state forest land.

On Tract 119 in Moshannon State Forest in Huston Township, Clearfield County, Department personnel operate and maintain six Oriskanny gas wells in the Rockton gas field and one shallow Upper Devonian gas well in the Hollywood gas field. The state owns 100% of the gas produced from these wells and hence receives 100% of the income from the gas sales. By virtue of this operation, the Department is considered a small gas producer-operator in Pennsylvania. Plans to plug three underproducing wells are moving forward. Gas from these wells is used locally to heat buildings at the Moshannon main office, as well as buildings and cabins at Parker Dam State Park.

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

ABANDONED MINE LANDS

Since 1980, coal mining has been declining in the area. This is a result of lower oil prices and the declining steel industries. Many operations have completely closed, while those larger companies who supply utility contracts continue to operate at reduced capacity. A few strip-mined areas remain on the state forest. To some degree, these areas have been reclaimed in the past, but reforestation has been lacking. Efforts to reforest these areas

has begun. Techniques developed by the Appalachian Regional Reforestation Initiative to mechanically improve the sites, by reducing compaction and increasing water infiltration, before planting trees will be used.

13) Wildland Fire

WILDFIRE SUPPRESSION

Staffing and Resources

The Moshannon Forest District carries out the mission and legal mandates of the DCNR Bureau of Forestry by managing wildland fire within the district to effectively protect life, property and natural resources. This effort is supported by a diverse array of resources that are dedicated to fire suppression. These include but are not limited to varied types of wildland fire engines, heavy equipment, portable water supply systems, specialized tools and a well-trained staff.

A Fire Forester is responsible for administering the district fire program and coordinating with local resources and staff to suppress and investigate all wildfire in the Moshannon District. During the primary fire season, staffing needs vary depending on a multitude of environmental conditions. To determine and properly meet staffing needs, a formal process for fire staffing has been implemented by the District Forester. A fire readiness code is established based on fire weather which corresponds to a pre-determined staffing level. This is then applied to ensure that the Moshannon District is properly prepared to meet the daily potential fire suppression needs.

The Moshannon Forest District is now home to 6 fire towers (Black Hills, Chestnut Ridge, Knobs, Rattlesnake, and Summit) , which are generally staffed during conditions of increased wildfire danger. These fire towers have proven to be such an asset in early detection and locating of wildland fires that a capital project has just finished replacing five of the six towers listed above. Fire Towers are preferred over reconnaissance flights in the Moshannon Forest District as they have yielded a much higher detection success rate at an exponentially lower cost. For additional details on the importance these fire towers played in today's forest, see Section 4.

Without the support of local volunteer fire companies and Forest Fire Wardens, the Moshannon State Forest would be incapable of handling the entirety of wildland fire suppression needs within the district. As a result, the district strives to maintain good cooperative relations with these volunteer companies and provides support to them through various means. Additionally, the Moshannon State Forest is home to a Pennsylvania Wildfire Support Crew. These skilled individuals compliment the local and statewide fire community by providing a higher level of specialization in wildland fire. They are an invaluable asset to have within the district as there are only 11 such crews in the entire state.

2007 – 2017 Fire Suppression Efforts

Between 2007 and 2017 there were a high volume of wildland fire suppression efforts within the Moshannon State Forest District (see Table 13-1.). The total number of fires for this period was 740 fires that burned a total of approximately 1753 acres. There was an average of 67 fires per year with an average fire size of 2.4 acres. Overall, 68% of fires were contained between 0 and 13 acres in size. During this 10-year period the largest wildland fire was the Wilson Switch Fire that burned 233 acres and occurred on April 19, 2008. This fire was caused by an unattended camp fire and resulted in a $7,699.27 claim that was charged to the party responsible.

Table 13-1: 2007-20017 Acres Burned by Size Class

Size Class (in acres)	Number of Fires	Total Acres
0 - 0.25	412	33.85
0.26 - 9.9	290	571.49
10 - 99.9	37	913.98
100 - 299.9	1	233
300 -999.9	0	0
1,000 - 4,999.9	0	0
>5,000	0	0
Total	**740**	**1752.32**

Over the entire 2007-2017 period, a total suppression cost of $151,148.50 was accrued for all fires. Of this amount $48,062.92 were claims (party responsible for fire is known and held accountable for incurred costs), $96,417.96 were bills (party unknown or natural caused fires) and $6,667.62 were non-billed costs (see table 13-2).

Table 13-2: Total Fire Costs by Year

Year	Claims	Bills	Non-Bill Costs	Total Yearly Costs
2007	$688.02	$16,906.48	$2,638.67	**$20,233.17**
2008	$7,984.68	$11,853.62	$584.10	**$20,422.40**
2009	$13,641.29	$11,680.20	$906.86	**$26,228.35**
2010	$6,626.69	$4,428.87	$876.80	**$11,932.36**
2011	$1,056.93	$2,128.54	$109.38	**$3,294.85**
2012	$107.10	$6,123.13	$0.00	**$6,230.23**
2013	$373.80	$1,802.76	$10.66	**$2,187.22**
2014	$2,381.67	$7,584.24	$0.00	**$9,965.91**
2015	$13,710.40	$1,366.79	$761.58	**$15,838.77**
2016	$1,002.23	$24,199.91	$73.50	**$25,275.64**
2017	$490.11	$8,343.42	$706.07	**$9,539.60**
Total	**$48,062.92**	**$96,417.96**	**$6,667.62**	**$151,148.50**

PRESCRIBED FIRE

Historic Prescribed Fire Use

Throughout its history, the Moshannon Forest District has utilized prescribed fire in many ways. In its earliest form, prescribed fire was used as a method of wildland fire mitigation. Certain areas would be prepared and burned off with the goal to reduce fuels and prevent future fire potential in high danger areas such as railroad grades. This use of prescribed fire is still one of the many ways which fire can be used responsibility. However, in more modern times and after extensive research and new legislation, prescribed fire has expanded into much broader applications.

Modern Prescribed Fire

With the onset of the Prescribed Burning Practices Act (2009), which declared that prescribed fire was an effective land management tool that could be used to benefit the environment, public safety and even the economy. In addition to this, it enacted immunities to practitioners of prescribed fire. These immunities provide

that, if a proper burn plan is in place that meets legislative standards, as well as a properly qualified staff conducting burns; no civil or criminal penalty can be charged if a burn escapes and incurs damages. This being contingent that no gross negligence can be proven. This change in law allowed the Bureau of Forestry to effectively use prescribed fire more freely as a management tool.

Since this change, the Moshannon State Forest has worked to develop both their equipment resources and employee qualifications through training and experience. This has allowed the district to develop a safe and functional ability to apply prescribed fire as one of the many land management tools available. Prescribed fire is now used frequently to conduct burns that promote such things as silviculture, wildlife habitat improvement and fuel reductions. There is also future potential for other applications, such as invasive species management where applicable.

There is no set acreage quota or goal annually for prescribed fire. This is because the Bureau of Forestry is focused on firefighter safety first along with best management practices. Projects are carefully planned and thought out among foresters at the district level. Often, other management tools are considered before the decision is made to introduce fire into the landscape. A full gamut of public safety, air quality and impact to sensitive species is considered when planning a prescribed fire. Another consideration is project cost, which generally is much lower for prescribed fires when compared to other types of vegetation management tools.

Overall, the Moshannon Forest District is constantly striving to improve its use of prescribed fire in the landscape. It will continue in the future to carry out these project fires with safety and the mission of Bureau of Forestry's Prescribed Fire Program Goals at the forefront.

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 of these tasks possible.

The Moshannon State Forest District manages a massive infrastructure system comprised of a mixture of dirt and gravel roads (along with their corresponding water crossing structures), rights-of-way, buildings, equipment and tower and communication systems.

ROADS AND BRIDGES

The largest amount of infrastructure management occurs within the realm of the state forest road system. Divided within three maintenance work groups, nearly 300 miles of dirt and gravel road is maintained and improved for the betterment of state forest access for both users and daily operations. This road system is the backbone of the district and provides access for everything from timber operations, natural gas exploration and fire suppression to general recreation. Without this system in place and properly maintained, access to the forest would be virtually non-existent. These dirt and gravel roads traverse the varied terrain of the district and provide spectacular views for forest users. State forest dirt and gravel roads are a combination of mainly natural surface roads, with asphalt being an extremely uncommon driving surface. Most roads are either natural dirt and stone material from the site, improved limestone or sandstone gravel, or driving surface aggregate (DSA). DSA is the preferred driving surface as it is the most durable form of limestone surfacing while also providing

impeccable environmental degradation control. The road system is impacted greatly by water and water crossings. Much state forest road maintenance is focused on the proper management of water to ensure limited erosion and sedimentation issues, while providing for an adequate running surface. Some water management projects can be completed in house, however larger structures (including bridges and box culverts) are frequently contracted outside for construction.

Much of the overall road structure existing today is a result of the placement of logging railroads and hand formed roads through the Civilian Conservation Corps (CCC). These roads were placed at a time when the focus was to utilize the road structure to access a resource, with little to no regards for long term placement and ease of maintenance. This road assignment is often not in the most ideal of locations and therefore, extensive and continual maintenance is required to limit the degradation concerns caused by water. Due to the placement of roads near many high-quality waterways, ensuring a nature/human balance within the waterway and road impact zone is imperative. This creates a unique management dynamic for ensuring that the water quality of the mountain streams remain high, while also creating a sufficient road system. Efforts are currently underway to inventory and classify the needs of water crossing infrastructure. This is a never-ending process as there are more and more water crossing replacement needs as time passes. Each year many projects are identified and contracted to replace aging culverts and bridges. While the current water structures are nearing the end of their life, it is important to ensure that any replacement structure is not only able to handle the increased stream flows that are becoming more and more common, but also to allow for adequate aquatic organism passage.

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 235 culverts, which will be assessed over time using the NAACC protocol.

It is extremely important for some roads to be open to public access only seasonally. This allows for access to be limited during times when environmental concerns and corresponding damage can occur more easily. This access control is achieved through various methods but most commonly through steel gates and/or strategically placed natural barriers in the form of rocks and/or stumps. Roads are classified into three categories, Z1, Z2 and Z3. These classifications are based upon the access of the roads to open travel, as well as the maintenance that is regularly scheduled. Z1 are the highest classified roads with Z3 being the least. Z1 roads are maintained with the highest standards and are continually open for public travel. Z2 roads are the second priority roads and are also open without access period restrictions, however they may not be maintained on the same cycle and

standard as Z1 roads. The Z3 roads are gated roads that may or may not be opened seasonally for various access reasons and have limited maintenance.

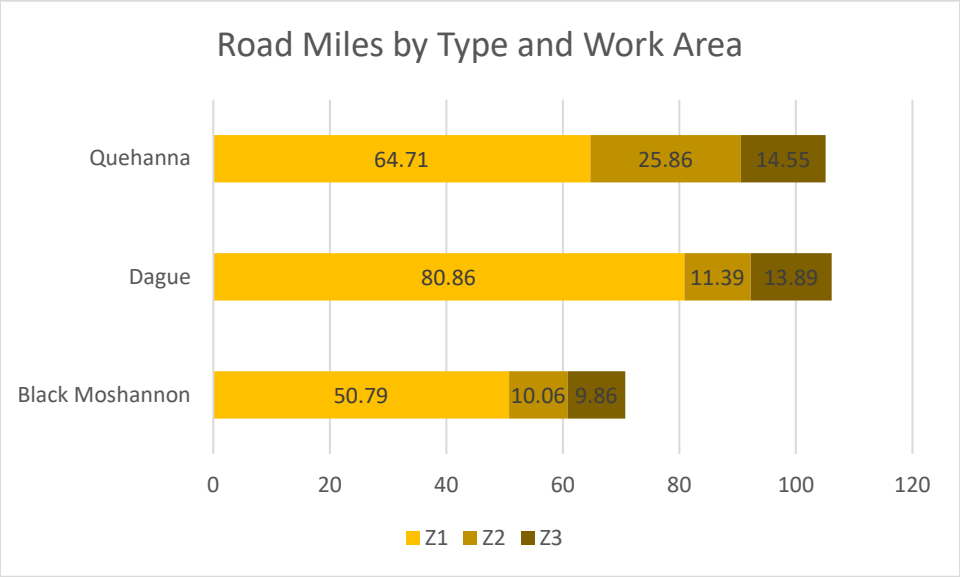


Figure 14-1. Road miles by type and work area

BUILDINGS, DAMS AND DISTRICT OPERATED INFRASTRUCTURE

The district owns over 40 buildings and structures spanning three counties. Many of these are utilized for district operations to include office space, equipment storage and maintenance, recreational facilities and legacy storage facilities. Some of the buildings are state owned and maintained, whilst others are operated and maintained by private entities as part of the state forest camp lease system. These facilities once provided a useful purpose to state forest operations but were relinquished to private use when they we deemed not necessary for district day to day functionality. Some of the legacy infrastructure includes wooden storage barns which were once part of the Clearfield State Tree Nursery. These building contain some historical significance as the Clearfield Nursery was once the largest in state tree nursery and operated through the early 1900's. This facility also utilized the former district office (now office annex) as the seedling packaging facility and storage. Some of the buildings are still useful to daily operations and are maintained as such. Other buildings however were not properly utilized and maintained and are therefore slated for removal.

The most unique building ownership situation of state forest districts state wide occurs here. The DCNR Bureau of Forestry owns the ground and buildings of which the current Pennsylvania Department of Corrections maintains and operates the "Quehanna Motivational Boot Camp." This facility is comprised of mostly remnant facilities of bygone industrial usages by the Curtiss Wright Corporation and Piper Aircraft. These buildings have been transformed to house the boot camp facility. This correctional institution intakes non-violent criminals and rehabilitates them to contributing members of society with lower recidivism rates than those of the Department of Corrections general populations.

The district also has two wildlife viewing structures at Beaver Run and Hoover Farm to afford visitors the opportunity of viewing the various wildlife that is abundant in the Moshannon. The Hoover Farm viewing area also has the only operated public restroom facility in the district. This building is a pre-formed and placed restroom facility that provides vital service in this remote part of the forest. Due to the proximity of the Hoover Farm to the elk herd, this facility sees an extremely high use rate during the late summer and early fall each year.

Five dams are operated and maintained on the forest for both wildlife and public uses. The Beaver Run impoundment (mentioned previously) is a shallow water impoundment with minimal fishing and boating opportunities. This dam is largely a wildlife habitat improvement project that is very successful, as evidenced by the frequent osprey usage at the site. In 2017 the dam was discovered to have structural issues and was subsequently drained. Due to the importance of the structure however, reconstruction is slated for 2019 with the hopes of restoring this vital water habitat to preconstruction conditions by 2020. The former Camp Wopsononock Tract is also the location of a second "dam" although formally classified as an off-water impoundment. This structure once provided fishing, boating and swimming opportunities to the local Boy Scouts who once operated a summer camp at this location. The current location is open to public water recreation with fishing and swimming being the most popular uses. Two smaller dams, also remnants of the former tree nursery, are currently maintained for wildfire suppression water sources. They are both located near the district office and are only minimally important to wildlife and outdoor recreation in comparison to the other structures.

The largest of the district operated dams is Shaggers Inn. This dam is in the northernmost part of Clearfield County and is an excellent shallow water fishery. This location has a pull-up boat launch location where non-motorized boats can be launched and utilized during certain portions of the year. This area also has a location for handicapped fishing access to allow adequate recreational opportunities for all. This project was originally built by in house staff and was stocked with various warm water pan fish. In 2019, the Pennsylvania Fish and Boat Commission will begin stocking this location with trout for the first time. This location is a highly utilized and prized location of many forest users for multiple recreational reasons. This is the only high hazard classified dam on the state forest. This dam holds back headwaters that eventually lead to the Little Medix Road corridor and subsequently nine leased camp sites which would become inundated in the event of a breach.

LEASES AND RIGHTS OF WAY

Outside of the mostly district managed facilities, there are numerous private entity facilities throughout the forest. This infrastructure is comprised primarily of gas/oil pipelines, communication towers and electric utility rights-of-way. This infrastructure has created some segmentation throughout the forest and so any new construction or upgrades to these types of facilities is done with the utmost scrutiny and oversight by district staff. Individual tower sites across the forest currently number in the low forties, but currently evaluations are being made as to whether all sites are needed. Upon inspections of substandard sites, district personnel are systematically contacting operators to ensure compliance or begin the process of removal. Attention is given to make certain that existing corridors are used whenever possible, to eliminate unnecessary forest conversion and further segmentation of the resource. Currently, there is infrastructure throughout the state forest as represented in the bar chart below. The notable item in the table is the utilization, maintenance and management of district owned gas wells and their corresponding pipelines. This system provides natural gas to Parker Dam and SB Elliot State Parks, as well as to the Moshannon district office complex of facilities. This is done with only minimal input and impact on the forest staff while also providing heating fuel at a negligible overall cost, thus saving the department thousands of dollars annually.

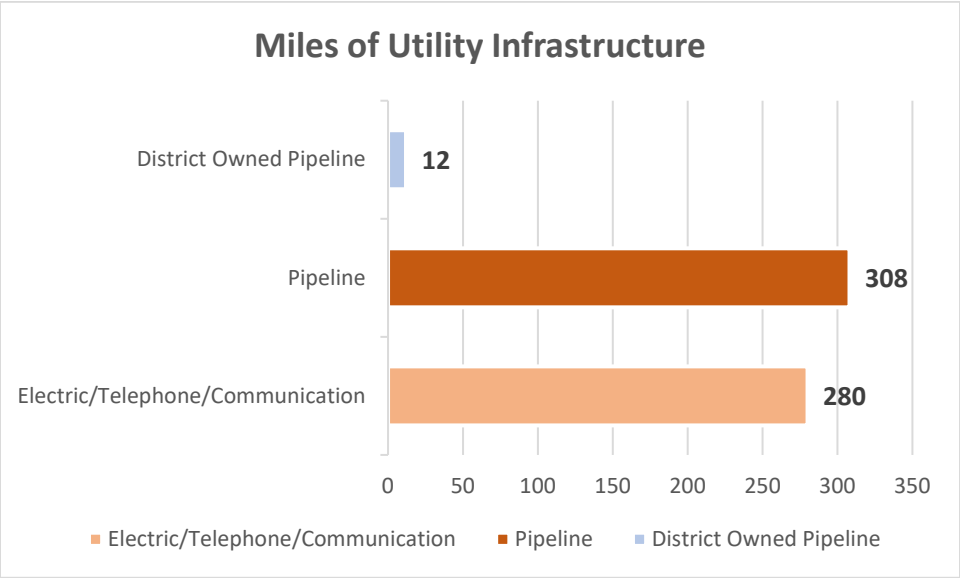


Figure 14-2. Miles of utility infrastructure on Moshannon State Forest.

INFRASTRUCTURE MAINTENANCE

The various district infrastructure mentioned herein is maintained and evaluated largely in house by department staff. As such, staff periodically inspect and evaluate the current and future needs of the district to ensure usability, cost effectiveness and longevity of the infrastructure. To ensure well signed and maintained property boundary lines, each year on rotational schedule, portions of the entire forest boundary are re-marked to ensure survey lines are not lost. This involves staff physically walking the perimeter of the state forest and remarking the previously identified property boundaries. This maintenance is crucial in ensuring that encroachment and theft are not occurring in remote locations while coincidentally providing for definitive recreational forest bounds for users. Outside of the standard building maintenance and construction principles, much of the infrastructure maintenance work is completed using heavy equipment. Due to the constant need to repair, regrade, dig, mow and haul to manage the resources, the district operates a substantial heavy equipment fleet. This fleet consists of multiple tandem and single axle dump trucks, motor graders, farm tractors with various implements, large boom and rotary mowers, bulldozers of various sizes, backhoes, skid steers, trail groomers, wheeled/track loaders and a host of heavy hauling trucks and trailers, just to name a few. This is by far the largest investment in the maintenance of infrastructure, and one that takes continually upkeep and planning to maintain. On average, the district operates a heavy equipment fleet in excess of $3 million dollars. Heavy equipment is crucial in maintaining the infrastructure for the usage of both the department and forest users. This fleet requires constant upkeep, and knowledgeable operators, to ensure the projects completed with them are done so with a positive outcome.

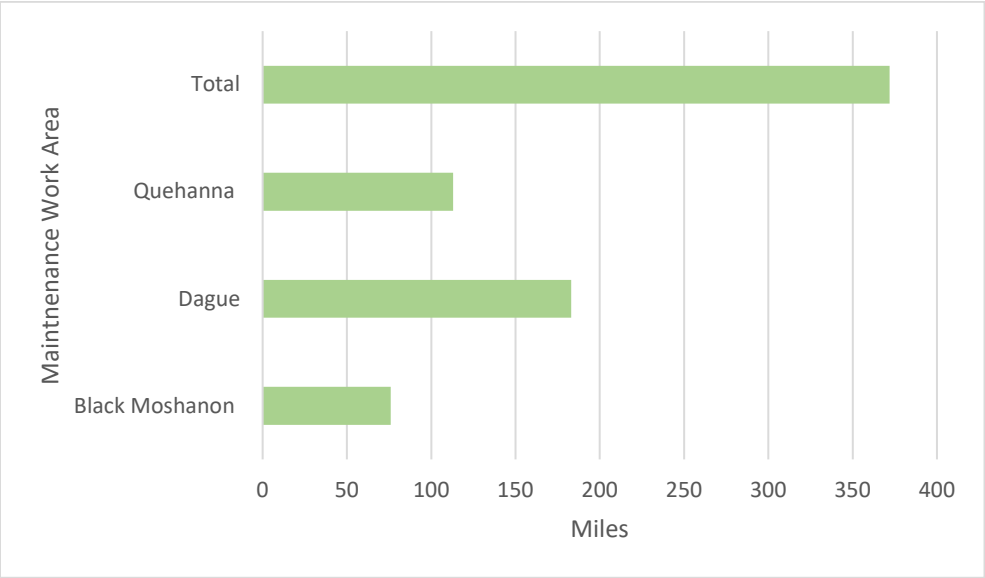


Figure 14-3. Miles of state forest boundary by maintenance division.

15) Special Designations

CONSERVATION LANDSCAPES

Driven by the values of conservation, sustainability, and community revitalization, DCNR's Conservation Landscapes are built on several ingredients:

- Presence of DCNR-owned lands -- Large blocks of state parks and forests provide the foundation for the landscape and a staffing presence
- Sense of place -- Regions with a sense of place and identity in many cases are based on shared landscape not political boundaries
- Readiness -- Often driven by opportunity or threats such as changes in the economic base, depopulation, or sprawl
- Engagement -- Civic engagement process that brings people of the region together to identify common values and concerns
- Strategic investments -- State agencies with regional and statewide partners provide high-level leadership, financial support, and technical assistance to build better communities, to conserve identified values and to invest in "sustainable" economic development

There are currently seven conservation landscape partnerships within Pennsylvania and the Moshannon State Forest is within the Pennsylvania Wilds Conservation Landscape (Figure 15-1)**.** There are 12 counties in the PA Wilds, and Moshannon State Forest is situated at the southern edge of the PA Wilds with the largest elk herd in the eastern United States. The elk is the icon of the Wilds and the draw to the region along with the vast forestland to explore.

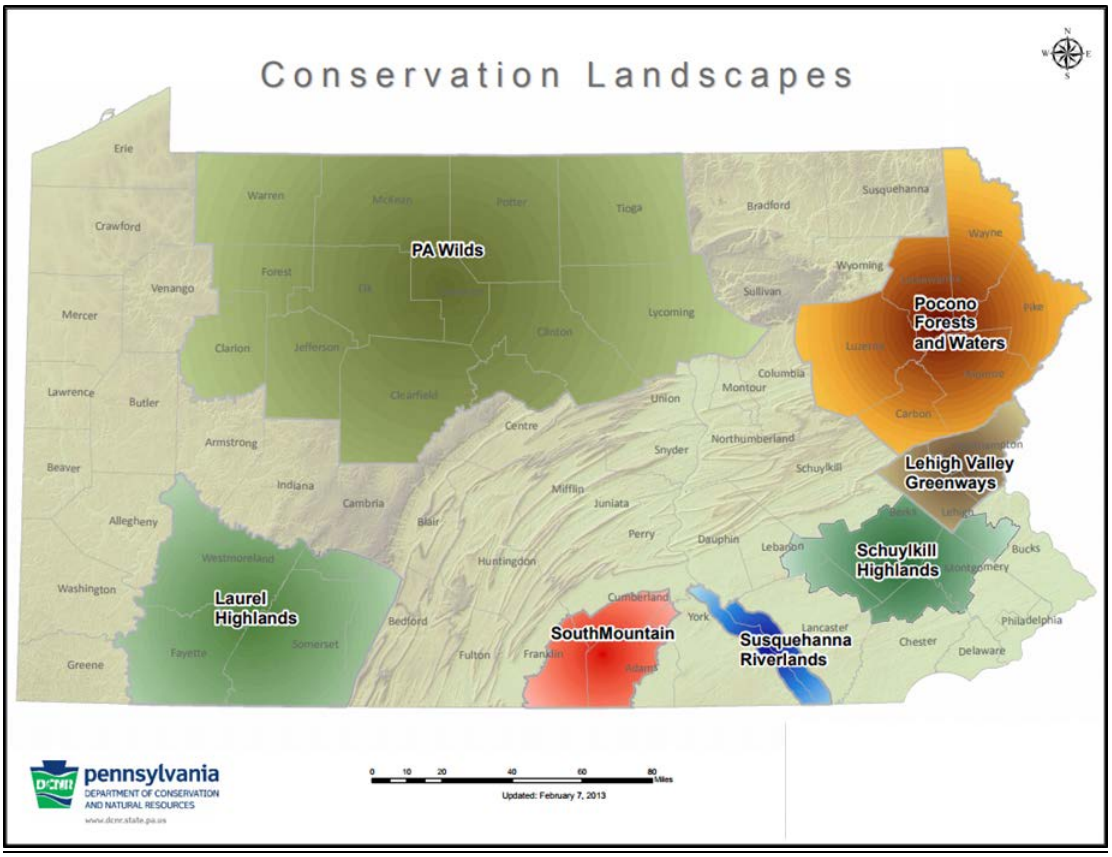


Figure 15-1: The seven Conservation Landscapes in Pennsylvania.

The Moshannon State Forest works with local and state leaders in the area, along with business owners and other state agencies including the Pennsylvania Department of Transportation, DCNR – Bureau of Recreation and Conservation (grants), Pennsylvania Game Commission, and DCNR – Bureau of State Parks. Other primary district partners in the PA Wilds include the Elk County Visitors Center, volunteer trail groups, the Lumber Heritage Region, tourist promotion agencies and the PA Wilds Center. These collaborations began in 2003 and continue to today with planning done at the field level but using the large PA Wilds theme to draw visitors to the area to explore this vast forested area in northern Pennsylvania and portray conservation messages.

http://www.dcnr.pa.gov/Communities/ConservationLandscapes/Pages/default.aspx

SUPRA AREAS

Elk Management Area

Part of the Pennsylvania Elk Management Area falls within the Moshannon Forest District. Native Eastern Elk once populated the entire state of Pennsylvania. However, they became extirpated in PA by the 1870s. This was due to the lack of conservation efforts in those times. In the early 1900s the Elk were re-introduced to Pennsylvania with animals from western herds. Once again, the elk became over-hunted, and by the 1930's, the only elk left were in Cameron and Elk counties. These few elk that remained had ups and downs in herd size over the years, and eventually became what is now Pennsylvania's native elk herd. The area they currently range falls on the Moshannon, Elk, Moshannon, and Sproul State Forests.

In the Moshannon State Forest the current Elk Management area spans a large area along Interstate 80 (near the district office) and State Route 879. It stretches North beyond State Route 555 and to the east all the way to State Route 144. This covers a large percentage of the Moshannon Forest District and includes the Quehanna Wild Area (50,000 acres).

Currently, the Moshannon State Forest works in different ways to make positive contributions to elk management in Pennsylvania and improve the Elk Management Area. To improve habitat, wildlife openings have been planted in different areas across the entire district. In addition to this, native aspen stands have been cut on rotations to provide browse and early successional habitat. As a recreational opportunity, the district has constructed a designated elk viewing area known as the Hoover Farm within the Elk Management Area. This viewing area is within the Quehanna Wild Area and one of the stops on the Elk Scenic Drive. The viewing area and other sites on the Elk Scenic Drive allows the public to have a place to view wild elk and learn more about Pennsylvania Wildlife.

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 15-1. Acres of High Conservation Value Forest by category.

HCVF SubCategory	LMU Name	Acres
1.1	Dague	56
1.1 Total		56
1.2	Pottersdale	20,953
1.2 Total		20,953
2.1	Pottersdale	11,604
	Quehanna North	3,427
2.1 Total		15,031
2.2	Pottersdale	11,604
	Quehanna North	3,427
2.2 Total		15,031
3.2	Pottersdale	857
	Quehanna North	857
3.2 Total		1,713
4.1	Black Moshannon	82
	Dague	146
	Pottersdale	23
	Quehanna North	11
4.1 Total		262
6.2	Black Moshannon	2
	Dague	1
	Jack Dent	2
	Pottersdale	1
6.2 Total		6

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 15-2. Total acreage of Wild and Natural Areas on state forest land within Moshannon State Forest.

	Name	Acreage
Natural Areas	Marion Brooks Natural Area	900
	Natural Area Total	**900**
Wild Areas	Quehanna Wild Area	24,240
	Quehanna Wild Area - Proposed	4,378
	Wild Area Total	**28,618**
Total		**29,518**

The Marion Brooks Natural Area contains a unique feature that is an almost a pure White Birch (*Betula papyrifera*) stand. This area is significant because it is located near the southern part of the range for white birch.

The Quehanna Wild Area has 28,617 acres that are within the Moshannon State Forest. This wild area is within the Pennsylvania elk range and is home to the Quehanna Trail, 75-mile loop trail that extends partially into the Elk State Forest.

The State Forest Commission designated the 48,186-acre Quehanna Wild Area in December 1970, 23,460 acres of which are within the Moshannon State Forest. The remaining area is part of the Elk State Forest. The Quehanna Area, formerly leased to the Curtiss-Wright Corporation, was set aside by the Legislature in 1966 following cancellation of the lease. Act 576 of January 1966 as amended by Act 368, 1968, excludes the area from new land-use agreements, and use as campsites. Act 55, 1967, as amended by Acts 401, 1967 and Act 366, 1968, permits leasing the 10-acre "core" area for industrial or economic development purposes. The balance of the Quehanna Wild Area will be managed according to the specifications set forth in the Quehanna Wild Area Management Plan found in the Ecological Considerations Section.

The Quehanna Area is generally flat, rolling terrain bisected on the fringes by steep-sided narrow valleys that radiate out in all directions. A wide variety of vegetative cover is present on the area, ranging from high-quality oak and northern hardwoods forest stands to open sod and huckleberry glades.

CORE FOREST INDEX

As described in the 2016 State Forest Resource Management Plan, 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.

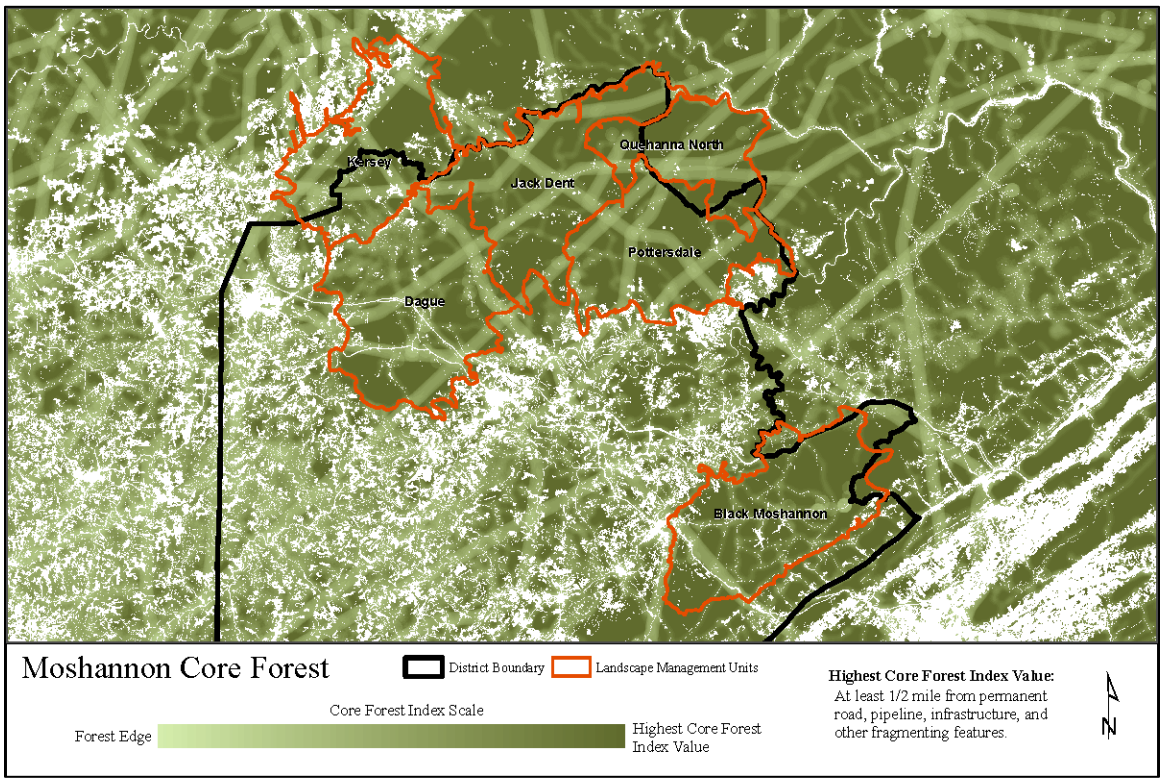


Figure 15-2. Map of core forest index in the region of Moshannon Forest District.

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
Pottersdale	76%	96.79
Keating Mountain	73%	96.63
Hicks Run	66%	96.24
Quehanna North	63%	95.97
Black Moshannon	51%	94.93
Jack Dent	45%	94.76
Kersey	45%	94.68
Dague	23%	92.54

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.

16) Ownership and Population Centers

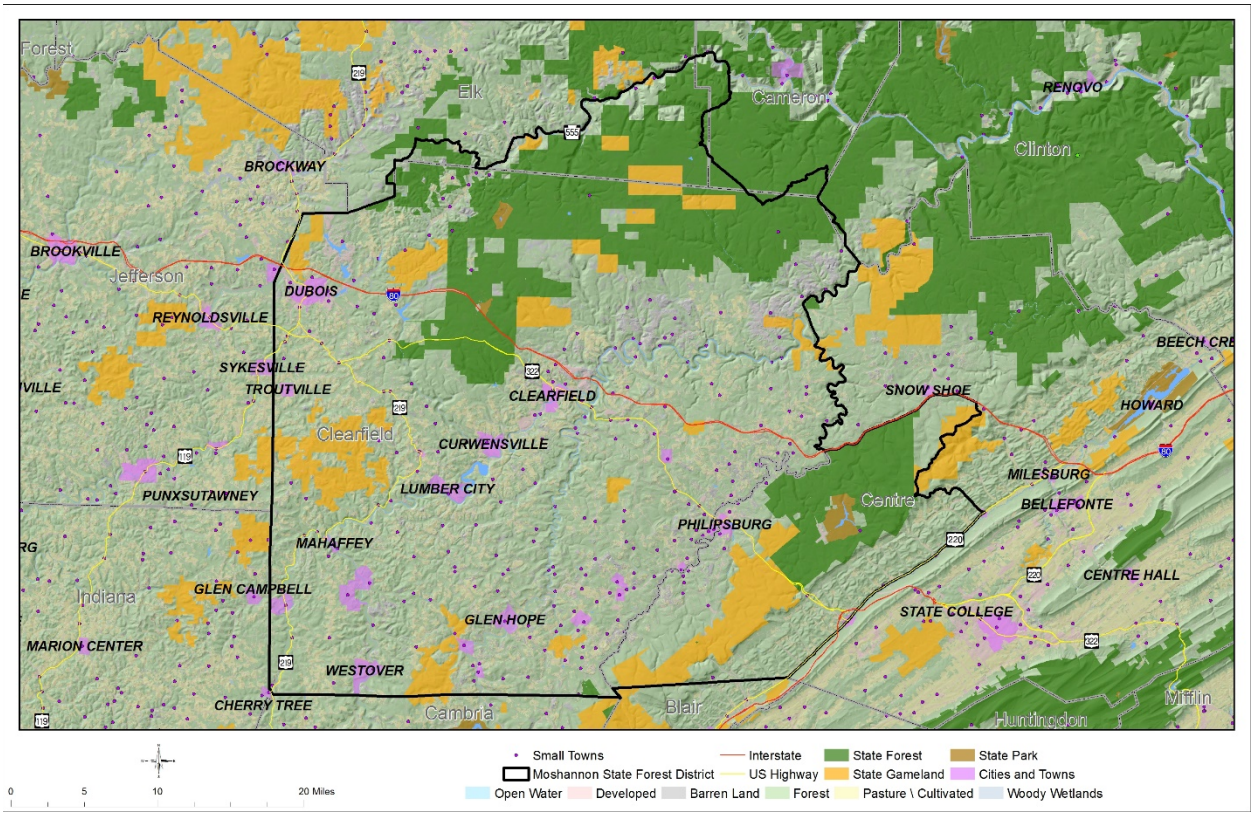


Figure 16-1. Map of public lands, population centers, and land use types (aggregated from National Land Cover Database).

The largest portion of the Moshannon State Forest lies in Clearfield County. Other counties that make up the rest of the state forest include Elk County, Centre County, Cameron County, and a small section of Clinton County. According to the 2017 US Bureau of the Census Data, as of July 1, 2017, Clearfield County was home to 79,685 residents. The population of Clearfield County has dropped 2.3% since April 1, 2010. This information can be found at the link below.

Most the Moshannon State Forest is located in the northern section of this map. The other section is roughly a 40,000-acre tract to the East, just south of I-80.

https://www.census.gov/quickfacts/fact/table/clearfieldcountypennsylvania

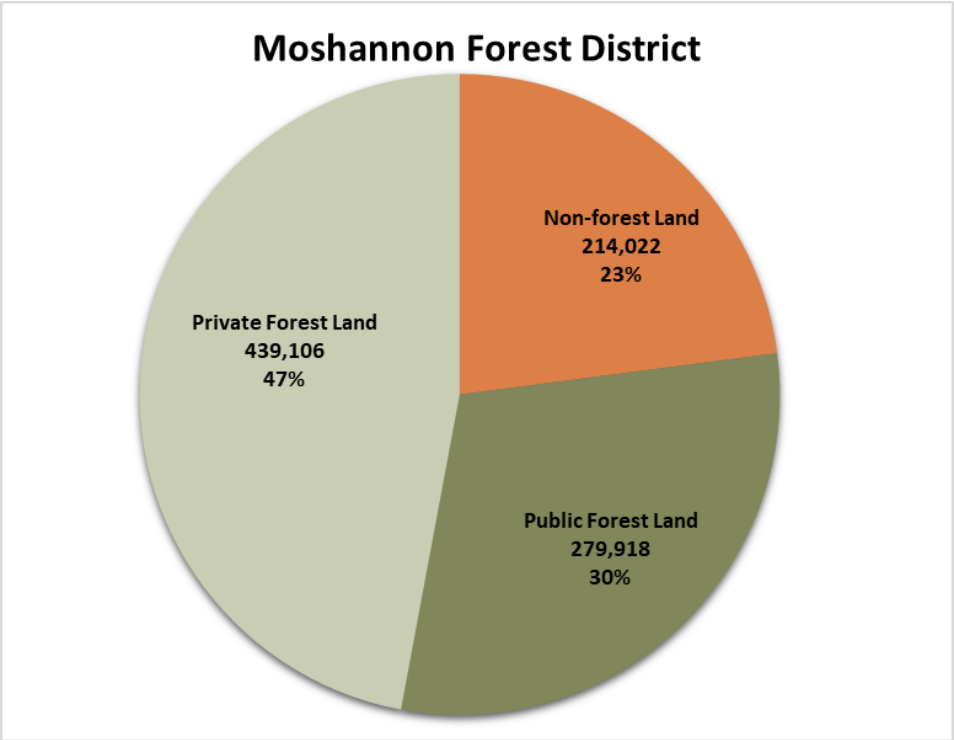


Figure 16-2. Percentage of total acreage within Moshannon Forest District that is forested vs. non-forested and the ownership breakdown of the forestland (public vs. private), (based on US Forest Service FIA plot data: https://www.fia.fs.fed.us/).

It is fairly unique that 77% of the forest district is forested, compared with the other districts across the state. Most of this land is privately owned. While the abundance of forest in this district indicates a relatively intact and unfragmented forest landscape, there is potential for parcellizaiton and fragmentation with so much forest land in private ownership.

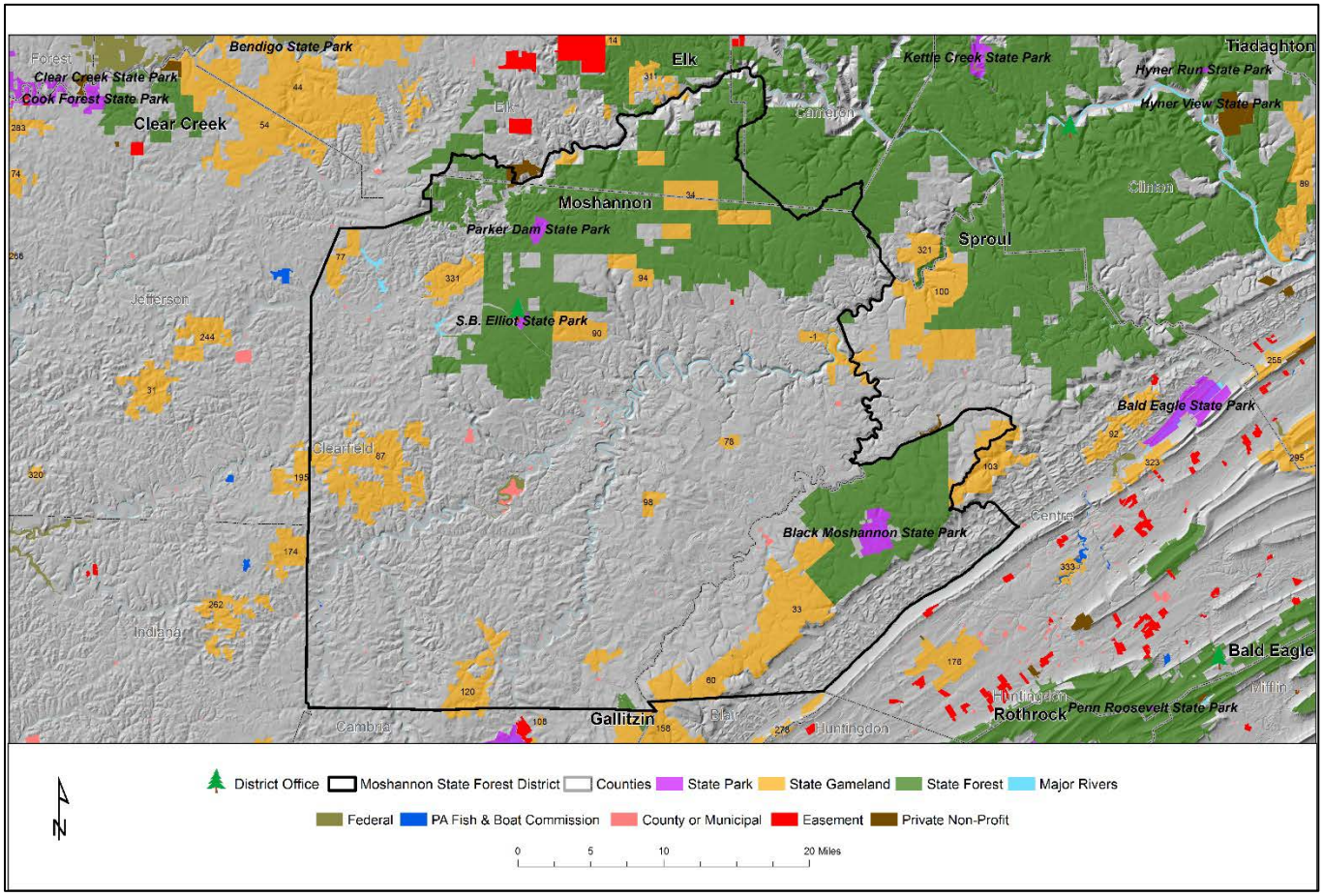


Figure 16-3. Public/conserved lands within entire district.

Table 16-1. Acreage of conserved lands by ownership type within the Moshannon Forest District.

Moshannon District	
Land Ownership Type	**Acres**
State Forest	190,363
State Parks	4,702
State Gamelands	84,309
Federal	773
Local/Municipal	-
Conservation Easements	62
Total Acres	280,208

Numerous State Game Lands are scattered across the District. Three State Parks are in the District. Parker Dam State Park and S.B. Elliott State Park are in Clearfield County and are surrounded by State Forest. Black Moshannon State Park is in Centre County and most of it is surrounded by State Forest. The City of DuBois, Pine Township and Borough of Clearfield all own and manage land surrounding municipal drinking water reservoirs. Some of the streams entering these reservoirs have headwaters in the Moshannon State Forest.

17) Economy and Forest Products

In 2013, the Bureau of Forestry conducted a Timber Product Output Survey among Pennsylvania's primary wood processing facilities, collecting information from the 2012 production year which reflected the current characteristics of the wood products industry in the State. The last survey of this type was done in the 1990's. More than four hundred facilities were identified to be surveyed across the 62 of the 67 counties. Here in the Northcentral Region, including Clearfield and Elk Counties and the Southcentral Region, including Centre County, 83% of the facilities participated. Here are some of the findings:

- 66% of the respondents were here in the Northcentral and Southcentral regions.
- 50% of the facilities have been in business between 11-40 years.
- 75% of the facilities employ 1-15 workers, but 9 facilities (4%) have more than 75 employees. A total of 4,394 employees were working at 211 facilities.
- 59% of the wood volume was from forestland in the Northcentral and Southcentral regions.
- 35% of the wood volume was from forestland in the Northcentral region.
- 24% of the wood volume was from forestland in the Southcentral region.

Statewide distribution of operations by function is as follows (total exceeds 100% due to some facilities performing more than one function.):

- Sawmill-78%
- Exporting-22%
- Miscellaneous-21% Includes pulp and paper mills, planning mills, firewood processors, handle blank mills, cooperages, pallet mills, scragg mills, dimension/component mills, mulch manufacturers and shaving mills.
- 4%-whole-tree chipping
- 3%-biomass fuel supply
- 2%-log brokering
- 1% composite/panelboard manufacturing
- 1% veneer milling
- 1% house/log home and post/pole/piling manufacturing

Looking at total volume of all wood products harvested by county of origin, counties in the Moshannon Forest District are major suppliers:

- Clearfield County ranks #1 at 13.1 million cubic feet harvested
- Centre County ranks #6 at 5.7 million cubic feet harvested
- Elk County ranks #15 at 2.6 million cubic feet harvested

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

As one of the Bureau's goals is to provide economic and social benefits through a sustained yield of forest products, we truly believe we are not only achieving our goals but aspiring to develop new innovative approaches to manage, strengthen and empower those in this industry to move into the future.
Other major industries in the Moshannon Forest District are mining, natural gas development, tourism, manufacturing and retail.

The PA Wilds Region of Pennsylvania is big in area but small in population with only 4% of the state's population. Tourism makes up about 11% of the economy and visitors annually spend $1.7 billion in the PA Wilds. Recreational pursuits are increasing more than ever contributing $29.1 billion in consumer spending resulting in $1.9 billion in local and state tax revenue. Outdoor recreation in Pennsylvania supports 251,000 jobs. In a 2017 study by Outdoor Industry Association, 54% of all Pennsylvanians participate in some form of outdoor recreation.

18) Recreation

The Moshannon State Forest in Clearfield County is the southern edge of Pennsylvania's Elk herd, which is anticipated to increase tourism and recreation activities in the region. The Moshannon State Forest offers many recreational opportunities. There are over 590 leased campsites scattered throughout the state forest. These camps are used year around, but especially during hunting season. The wildlife resources are usually abundant and are a major tourist attraction.

Recreation Opportunity Spectrum - ROS

ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. These experiences occupy a range progressing from Developed to Semi-Developed to Semi-Primitive to Semi Primitive Non-Motorized to Primitive. ROS is further described on p. 42 of the 2016 SFRMP.

Figure 18-1. ROS categories described.

The Department has gone through the initial steps of determining ROS zoning for state forests based on proximity to roads. Additional work was done to assess trail density. Adcompletditional steps by the Department will further refine the ROS zoning. ROS when fully completed takes into account both physical

aspects, such as proximity to roads, trail density, pipelines, etc., but it also accounts for social impacts, such as number of users encountered in a particular zone.

ROS data provides a tool for managers to use while planning new trails, facilities, signage, policy, etc. The managers can use the ROS criteria to see if the trail, sign, building, etc. is consistent with what one would expect to experience within the particular ROS zone. This can be done for all ROS zones.

For example, a manager would want to place short loop trails in close proximity to the trailhead, road or visitor center which would place them in either a Developed or Semi Developed ROS zone. Users expect to see other people and not have a remote experience when they are close to man made features. Beginners are not afraid because they can look back to their cars or the building. Conversely, placing a tight trail loop in a Primitive Zone would be inconsistent with its ROS Zone, even though it might be miles from the trailhead or car. Just being able to see the trail loop itself may ruin a Primitive experience for some, and seeing someone else on a trail in a Primitive zone would be even worse.

With that said, and the Department's desire to provide low density dispersed opportunities, most managers gravitate toward thinking of how they can retain the Semi-Primitive Non-Motorized and Primitive Opportunities and they forget that its acceptable to create higher densities of trails or users in Semi Developed or Semi Primitive zones. This is understandable since it is way more difficult, if not impossible to take away a road, trail, pipeline, reduce the number of users, etc. that have cause inconsistencies in the experience one might expect in any given zone.

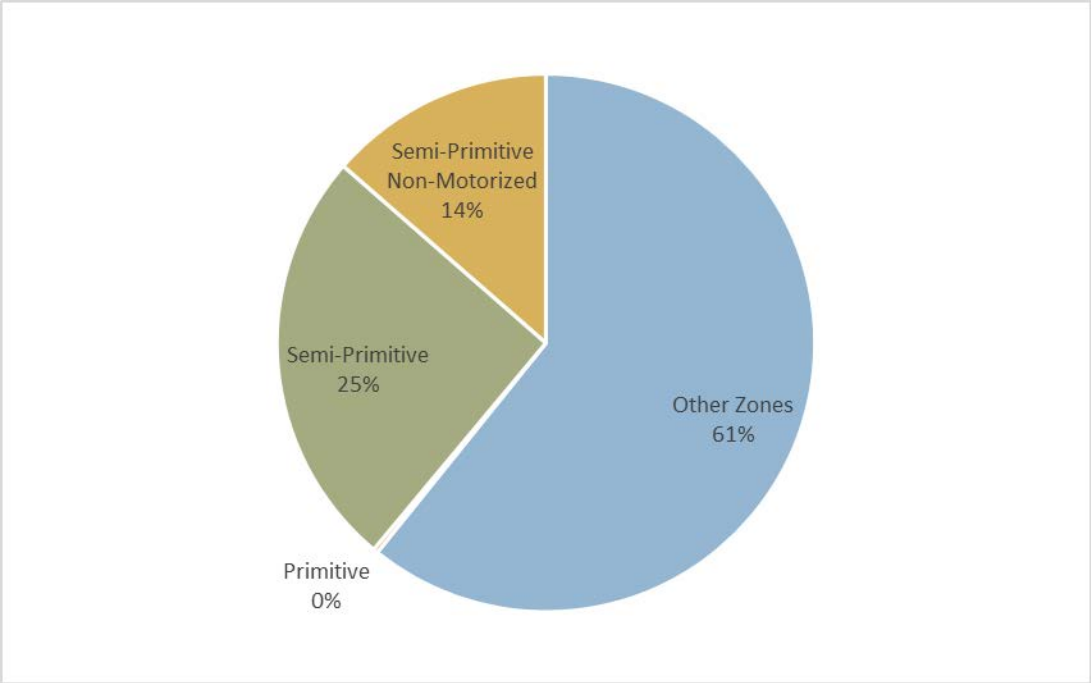


Figure 18-2. Acres of state forest land in this district by Recreation Opportunity Spectrum (ROS) classifications. "Other Zones" refers to Semi-Developed and Developed zones.

NON-MOTORIZED RECREATIONAL USE ON THE MOSHANNON STATE FOREST

Picnicking

Picnicking is permitted anywhere on state forest land, although the Moshannon State Forest does not have any designated picnic areas.

Hunting and Trapping

Deer

Deer were relatively scarce in the mid-1800s. As a result of uncontrolled harvest in the late 1800s the herd was almost exterminated. The "Buck Law," stocking of Michigan Deer, and the overwhelming supply of browse resulting from the original timber harvest caused a tremendous increase in the herd size; and by the late 1930s, the peak population was attained. Through the 1950s and 1960s, the herd size has stabilized providing an annual harvest in Clearfield County of approximately 4,000 animals.

Bear

Cleafield County did not become a good bear area until after 1950. In that year a food failure in the north central counties caused the bear to migrate into Clearfield County. Since 1960 this County has ranked in the top counties in bear killed. A good percentage of these bears are harvested from the Moshannon State Forest.

Turkey

Turkey were present in low numbers during the 1800s but completely disappeared from the forest in the early 1900s due to over-harvesting and the complete removal of mast-producing trees during the lumbering days. The wild turkey became re-established in the 1940s after stocking by the Game Commission. The population peaked in the early 1960's, and today, the population is good throughout the forest.

Small Game

The Moshannon State Forest was one of the best grouse and snowshoe hare areas in Pennsylvania in the early 1900s. The ideal habitat, created by the lumbering operations, was gradually lost as the second growth forest grew into pole and sawtimber sizes; and the grouse and hare populations declined. The Clearfield County area was the best grouse area in the State in 1940. Grouse and hare are still present but in small numbers.

Other small game present in the forest are cottontail rabbits, squirrel, woodcock, fox, beaver, muskrat, mink, weasel, raccoon, skunk, and opossum. Occasionally, a bobcat may be seen in the forest.

Fishing

There are 183.5 miles of trout streams in the forest, 39.5 of which are stocked by the Pennsylvania Fish and Boat Commission.

In addition to the aforementioned trout streams, Shaggers Inn Shallow Water Impoundment, Beaver Run Shallow Water impoundment and Parker Dam provides trout fishing in a lake setting and Black Moshannon Lake provides 237 acres of warmwater fishing for black bass, muskie, northern pike, walleyes, crappies, pickerel, and panfish. Boating regulations for Parker Dam and Black Moshannon Lake are enforced by the Bureau of State Parks. Electric motors are permitted. There are no warmwater streams on the Moshannon State Forest.

Hiking

Hiking trails have been developed in all 20 Forest Districts. Hiking trails may be divided into at least five categories: National Scenic, National Recreation Trails, Designated State Forest Hiking Trails, local district trails and interpretive trails.

Table 18-2: Moshannon State Forest Recreational Use Trail Lengths

Trail Type	Designated (miles)	Open (miles)
Special Trails		
Designated for Disabled Access	-	-
Designated for disabled Sportsmen	3.18	3.18
Interpretative	-	-
Non-Motorized Trails		
Hiking/Foot Travel	172.61	551.48
Cross Country Skiing	77.06	427.29
Horse Riding	13.39	327.78
Mountain Biking	24.03	327.29
Motorized Trails		
Snowmobiling	42.5	317.89
All-terrain Vehicle Riding	-	-
Trail/Dirt Bike Riding	-	-
Four-Wheel Drive	-	-
Water Trails		
Water Trails	-	-
Scenic Drives		
Scenic Drives	-	217.69
Miscellaneous Trails		
Miscellaneous Trails	-	100.51
National Scenic Trails		
Appalachian Trail	-	-
North Country Trail	-	-
National Recreation Trails		
Laurel Highland Trail	-	-
Keystone Trail System		
Baker Trail		
Mid-State Trail		
Tuscarora Trail		
Total Miles	**334.04**	**2,273.11**

There are many miles of existing trails marked on the ground that do not meet the criteria established for recreation trails. These trails were laid out primarily as firebreaks without consideration for recreation and consequently provide little recreational value except perhaps for the occasional hunter. Therefore, the existing trail system was carefully analyzed and only those trails, which met the specifications for recreation trails, were included in the inventory. In addition to the existing trails, old woods roads and logging access roads were evaluated for their recreation potential. Some trails not considered suitable to be included in the inventory appear on the current Moshannon State Forest Public Use Map.

Many of the existing fire access trails have local historical significance and serve as landmarks for describing geographic locations within the Forest. They are signed at road crossings and appear on many maps. They are available to the public for use. Because they receive only sporadic maintenance, they are frequently difficult to discern on the ground and may be physically demanding to travel.

- ***Designated State Forest Hiking Trails***

Completed in 1977, The Quehanna Trail forms a 71-mile loop and is one of the 18 Designated State Forest Hiking Trails. Hiking is a growing interest as a result of the Quehanna Trail, as well as minor trails and old railroad grades that traverse the forest. Recent improvements, like adding new parking areas and interpretation to the Quehanna Hiking Trail, has improved the quality of the user's experience. The new parking areas also broadened the audience beyond the traditional backpacker, enabling day hikers to do the trail in sections.

The trail traverses the Quehanna plateau between Parker Dam State Park and Piper crossing Mosquito Creek, Wykoff Run, Red Run, Mix Run and Medix Run. There are two cross-over trails that provide shorter segments of a 17.4-mile loop on the west end at Parker Dam, a 43.4-mile loop in the center of the trail, and a 36.8-mile loop on the east end. Maps of the Quehanna Trail can be obtained at the Moshannon State Forest District Office, Central Office in Harrisburg.

- ***Moshannon State Forest- Local District Hiking Trails***

Many forest trails traverse the Moshannon State Forest, most noted of these is the Allegheny Front Trail. The AFT is about 41 miles long and roughly circumscribes the Black Moshannon State Park in the Black Moshannon Maintenance Division. . Many trails were constructed during the days of the CCC, primarily for fire access. Records of the 1930s show there were 600 miles of trails. At the present time, there are 53 District Hiking Trails in the Moshannon State Forest totaling 118.3 miles:

- ***Moshannon State Forest – Shared Use Trails***

Shared use trails are local district level trails that hikers, mountain bikers, and equestrian riders are permitted to use. Shared use trails are blazed in red paint. A relatively new example, several trails were improved in both the Elk and Moshannon State Forests to form the Quehanna Shared Use Trail System, which also included the development of a designated camping area with horse specific amenities, which is called Yellowsnake Camping Area.

Bicycling

In addition to shared use trails, all state forest roads, drivable trails, and administrative roads are open to bicycles. Because of the surface conditions of most of the roads, mountain bicycles, rather than touring bicycles, should be used. Bicycle riders will find some challenging slopes and riding surfaces, but relatively little single-track technical riding is available.

Horseback Riding

In addition to shared use trails, horses are free to use public use roads, drivable trails, administrative roads, many existing old woods roads, logging railroad grades and snowmobile trails. For the most part, riders shy away from the use of public use roads and drivable trails to avoid conflicts with vehicles. With the addition of the horse specific amenities at Yellowsnake, the trails that make up the Quehanna Shared Use Trail System are open and promoted for hikers, bikers, and horseback riders.

Moshannon State Forest Water Trails - Canoeing/Kayaking/Boating/Rafting

Pennsylvania is blessed with more miles of streams than any other state (except Alaska which is 5 times larger in size). This means 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.

Scenic Rivers

There are no designated Scenic Rivers on the Forest. However, Department of Environmental Protection is continually evaluating streams throughout the Commonwealth that have been suggested for study and possible designation. They maintain a listing of those under study and of candidate streams.

Sinnemahoning Water Trail

The Elk and Moshannon State Forest have been meeting with a group of stakeholders in the development of sites on the Bennett's Branch. In 2017, both districts utilized Pa Wilds Funds from Growing Greener II to start working on improving Benezette Beach (Moshannon) and Hick Run (Elk). In addition, Eli Long from the Western Pa Conservancy had worked on improvements along the Bennetts Branch for soft launches near Force and Medix Run. Preliminary work to develop interpretive panels for these site has started and the Elk State Forest is working with Paul Yatabe to develop a water trail map for the panels that would also serve those paddling the streams. During the development of the Bennetts Branch map, those involved found out that the Northwest Great Outdoors Visitors Bureau was already marketing both the Bennetts Branch and Sinnemahoning (Emporium to Sinnemahoning), as the Sinnemahoning Water Trail. To match the promotional entity, it was decided to cover both segments listed above by making a two sided map.

Cross Country Skiing

Skiing is permitted everywhere on the forest.Along with hiking, cross-country skiing is gaining popularity each year. With the advent of the PA Wilds, the district reassessed many historical trails listed as ski trails in the Quehanna Area. Many did not meet DCNR trail standards for ski trails and were falsely promoted as ski trails in the past. As a result, those trails are no longer shown as promoted ski trails so that users don't wind up there and have a negative experience. For example, many of these had wet sections or fords, which would ruin a cross country ski trip.

The Rock Run Trail in Black Moshannon makes a 13-mile loop from Tr. 505 via the Game Commission Road named Governor's Road. More than one-half of the trail is built on old narrow-gauge railroad grades, which were constructed for logging the original timber stands.

Birding/Nature Observation

Bird watching and nature observation are uses that can potentially 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 in cooperation with the Bureau of Forestry 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. A public use map of the roads and trails is available for each district. More information on important bird areas can be found at www.audubon.org/bird/iba.

Other Non-Motorized Uses

The Moshannon State Forest accommodates almost every activity suited to a rather large, publicly owned land base. Mushroom hunting is popular in parts of the forest where morels grow. Other uses not mentioned in the inventory include astronomy, dog sledding, geo-caching, gold panning (Policy on gold panning, can't be E.V. stream, Policy set by Minerals section), jogging, ice-skating, motorcycle riding, orienteering, photography, rock climbing, rappelling, sleigh riding, sledding, snowboarding, snowshoeing, spelunking, swimming, snorkeling and tubing. All these and more are permitted uses of state forest land. Many of these sports are not actively managed, but nonetheless they are enjoyed in the wild and peaceful setting of state forest land.

Camping

Camping is an activity that can occur in any given ROS zone, whether it is primitive backpack camping or motorized camping at a designated site.

The Bureau of Forestry manages camping in three distinct categories, primitive backpack camping, motorized camping and group camping. Some of these categories involved motorized aspects and other do not, so Camping provides a good transition from non-motorized to motorized forms of recreation. ROS also bridges this transition, as experiences spans both realms ranging from Developed to Primitive. With that said, let us look at the different categories:

1. Primitive backpack campers are those who camp at undeveloped sites and for not more than one-night. These camping opportunities are normally located along trails, but more than 100,000 acres are open to such use. Permits are not required for this type of camping unless the camper plans to spend more than one night at a campsite or desires staff to know their intended plans for emergency contact purposes.
2. Motorized camping is done roadside, and as the name implies, it is done in close association with a motorized vehicle. The vehicle continues to be used for storage or transportation during the camping experience. This is unlike backpack camping where the camper carries all his gear for a day or more away from his vehicle. Motorized camping requires a permit from the District Forester, and can be issued by contacting the local district office. As with primitive camping, additional rules can be found in the State Forest Rules and Regulations and some districts have additional requirements when the permit is issued.

   Districts also have different ways of administering motorized camping depending on local resource conditions or levels of use. Some district only allow motorized camping at designated sites. Other districts allow dispersed camping at user selected sites that meet all criteria established by our camping guidelines, and they have no designated sites. Some districts have both designated sites and issue Camping Permits for user selected, dispersed motorized sites. The Moshannon State Forest falls into the last example. They have designated sites along Medix Run and at Yellowsnake, with added amenities for horses, yet they still allow Camping Permits at permissible sites that the camper selects.
3. The third type of camping is group camping. It is defined as camping with ten or more people. Again, potentially 190,031 acres of state forest land is open to this use. However, forest managers typically restrict these activities to sites where there will be little or no environmental impact. This type of activity requires a special activities agreement available from the forest district office serving that area.

   The Moshannon State Forest had allowed group camping by equine users to occur at the North Run Camping Area.

MOTORIZED RECREATIONAL USES OF THE MOSHANNON STATE FOREST

Snowmobile Riding

Like most other State Forests, the Moshannon's Snowmobile System is made up of a combination of joint use roads and snowmobile trails. This system is part of the regional PA Wilds Snowmobile System, as shown on the maps produced by the Department annually. Designated state forest roads are opened annually, for joint use by snowmobiles and motor vehicles. In 2018-19, the Moshannon State Forest will open 158.6 miles of joint use roads. Additionally, snowmobile trails are also open each year providing 54.0 additional miles of riding opportunities for a total of 212.6 miles (FIMS 2018-19). This mileage varies each year depending on ongoing management areas in the district. At times, this may require plowing or closure of some roads or road segments. In these cases, the district works with those involved to minimize impacts to snowmobile riders. Anyone authorized to plow roads must follow plowing guidelines, leaving four inches of snow. The district also

works to minimize the length of closure on any impacted roads. For example, the district worked with a gas company to create the Dague and Tyler trail to minimize impacts by a Marcellus gas operator. Varying portions of this system are groomed depending on local conditions. Statewide, Forestry recently has purchased at least one new groomer each year out of Liquid Fuels funding.

ATV Trails

No ATV trails are presently designated on the Moshannon State Forest. In June 2018, the fiscal code passed mandating that an ATV Trail be built in Sproul State Forest by 2020 and that the Central Mountains Regional ATV Trail be built to New York by 2024. The original proposal for the latter branched out into several State Forests. What portions must be built have yet to be determined.

Motorcycle and Dual Sport Trails

The Moshannon State Forest does not have any motorcycle or dual sport trails. Licensed motorcycles and dual sports are permitted to use public use roads and drivable trails.

Off Highway Vehicle

The Moshannon State Forest does not have any off highway vehicle trails or areas. Licensed OHVs are permitted to use drivable trails that receive little maintenance and are suited to high clearance vehicles.

Scenic Driving

A large part of the public use of the forest is spent in driving forest roads. At almost any time of the year, and especially when the seasons change, many people drive these roads to enjoy the scenery, to look for wildlife, or just to experience the relative quiet and solitude of the forest environment. Some established auto tours and recommended routes are in place, such as the Elk Scenic Drive, Parker Dam Auto Tour, and West Branch River Scenic Byway.

Table 18-3: State Highways, County and Township Roads passing through the Moshannon State Forest.

Road Name	Miles
Route 153	9.06
Route 322	9.37
Route 504	8.87
Route 80	6.56
Mt. Run LR 17031	1.56
Quehanna LR 17069	14.93
Anderson Creek LR 17092	1.43
Five Points Area T--315, T-373, T-376, T-378	4.2
Boone Mt. Area T-323	1.0
Greenwood T-488	0.8
Mt. Pleasant T-524	0.5
Laurel Run T-527	0.5
Knobs T-636	2.68
Caledonia Pike T-873	15.83

POINTS OF INTEREST

The points of interest that follow all require a vehicle to reach the site, but some also require exploration by foot to reach the points of interest described below.

Vistas

Several vistas that are maintained on the Moshannon State Forest. Many of the vistas are located along district

hiking trails such as the Allegheny Front Trail and Quehanna State Forest Hiking Trail. There are currently 2 drivable vistas along state forest roads. There is one drivable vista along Lost Run Road in Clearfield County and one along Tram Road in Centre County.

Plumbe Forge

The site containing the remains of Plumbe Forge, which was built by Dr. John Plumbe in 1828, is located about 0.6 mile north of PA Rt. 504 on Six Mile Run Road. Here "blooms" were made from pig iron carried from the Bald Eagle Valley by mule. Costs of hauling products to the Pennsylvania Canal caused the forge to close in 1842.

Indian Mill

Located on Little Medix Road, this site contains remnants of stone used by Indians to grind corn and meal.

Stone Cave Camp

Located on Barr Hollow Road, 1.6 miles west of Grant Road this site is a cave hollowed from a ledge of rock and walled in the front. A campsite lease was granted August 1, 1914.

Kunes Camp

Located along Kunes Camp Trail, in Quehanna, this site was once a camp built between two house size boulders. The camp was likely removed when Curtiss Wright took over Quehanna, like hundreds of other camps in Quehanna. Enough block remains to tell where the camp was built between the boulders. [Add details on lease date if known]

Corporation Dam

Located along the most remoted section of the Quehanna Hiking Trail and Mosquito Creek, astute hikers can see the remnants of Corporation Dam. The Corporation Dam is a remnant of the River Logging Era built in 1871 by a Williamsport mill owner with a silent partner in Philadelphia to carry timber to the Susquehanna Boom at Williamsport.

Blackwell Splash Dam

Located at the intersection of Lost Run Road and Mosquito Creek, the remnants of the Blackwell Splash Dam can be seen. This splash dam was one of a series of nine splash dams along Mosquito Creek to splash\drive timber to the Williamsport boom.

Gifford Run Splash Dam

Located near mile marker 14.6, where the Quehanna Hiking Trail crosses Gifford Run, a hiker can see the remains of a splash dam once used to transport white pine down river to Williamsport.

Goodyear Logging Railroad

Evidence of this railroad exist in many areas in the forest, as described in Section 4. Obvious signs of this are seen on the Quehanna Hiking Trail in the Tyler Road area and along Trout Run stretching into SGL94.

CPL Logging Railroad

Evidence of this railroad exists in many ares in the forest, as described in Section 4. Obvious signs of their

railroad grades are seen on the Quehanna Trail in Mix Run and in Laurel Run; the CPL Trail between Laurel Ridge Road and Four Mile Road;

Other Logging Railroads and Lumber Camps
Evidence of other railroads exist scattered throughout the forest, as described in Section 4.

Panther Rocks
Located off Four Mile Road, Panther Rocks is a formation of large rocks left from the ice age.

Wolf Rocks
Located near intersection of Horse Hollow Road off Nason Road, Wolf Rocks is a formation of large rocks left from the ice age.

Forest Research Site
While still the Department of Forest and Waters, DCNR cooperated with the Pennsylvania State University, School of Forest Resources to develop a forest research demonstration area along the Hannah Furnace Road, in Centre County, approximately 0.5 miles north of PA Route 504.

Five separate areas have research plots on the following:

- Forest fertilization of pole and small timber size mixed oak.
- Pelleted herbicides and prescribed burning for site preparation in mixed oak stands.
- Pelleted herbicides for timber and wildlife production is mixed oak stands.
- Stand conversion by underplanting with Japanese larch in mixed oak stands and then clearcutting 100% of the basal area.
- Stand conversion by underplanting with Japanese larch in mixed oak stands and cutting 50% of basal area of overstory trees.

William F. Dague State Forest Tree Nursery
Located off PA Route 153, nine miles northwest of Clearfield, the nursery was established in 1911 under the direction of District Forester William F. Dague. The area at that time comprised one-tenth of an acre. The site selected was an old clearing made in the lumbering days and later used as a pasture field. In 1914 the nursery was increased to an area of one acre, and an overhead sprinkling system was installed. This was the first overhead sprinkling system used in Pennsylvania for forest tree nurseries.

The nursery area had expanded to 26 acres when operations ceased in July 1978. Along with producing poplar cuttings, the nursery produced about four million seedlings annually.

A forest tree seed orchard was established on 45 acres adjacent to the nursery in 1961. The purpose of the seed orchard is to provide genetically superior seed for use in the state nurseries. Tree species include Japanese larch, European larch, white pine, white ash, and European alder. The first clones were planted in 1961. While the nursery has been closed, the seed orchard is being used for seed production.

Bilgers Rocks
Although this site is not on the Moshannon State Forest, it is a developed area with unique rock formations found within the confines of the Moshannon Forest District.

MISCELLANEOUS RECREATIONAL USE

Organized Group Activities

Organized group events which include events with more than 10 or more participants are on the rise across the state forest system. Forest managers work with the event sponsors to draft an agreement to ensure a safe and successful event is conducted for both parties. The three types of agreements are: letter of authorization, special activities agreement and a commercial activities agreement. Each type of agreement has different requirements and the forest manager determines which agreement type is necessary after discussing the proposed event with the event sponsor. Common organized events held at Moshannon State Forest are: Ultramarathons, bicycle races, 5k/10ks, poker runs, dual sport motorbike rides etc.

Leased Campsite Users

An early recreational use of state forests was the leased campsite program, which began in 1913. From the very beginning of the administration of state forest lands there were numerous requests for campsite privileges. For the most part, these requests were for tenting in deer season, but with the passing of time the need for providing sites for extended periods of time became apparent. The 1913 legislature enacted a law permitting the leasing of small campsite areas for 10-year periods.

No new campsite leases have been granted since 1970 when a moratorium was established. In June 1974 all state forest land was closed to further leasing for campsites.

There are currently 586 leased campsites on the Moshannon State Forest. Many of the camps are now used almost every weekend throughout the year for hunting, snowmobiling, fishing and summer vacations.

In addition to the aforementioned camping activities on state forest land, an inventory of camping would not be complete without mentioning the former state forest lands that are now state parks. 3 state parks are internal to or border state forest land. These parks offer 213 camping sites and 42 cabin sites. Their proximity to state forest lands and many human amenities make them excellent starting points for recreational activities on state forest lands. Information on the state parks located within the Moshannon State Forest is located at the end of the Recreation Section.

State Parks and Environmental Education Centers

The Bureau of State Parks administers three state parks located within the Moshannon State Forest District. They were originally state forest lands that have since been set aside for park use. They are included in the inventory because of their impact on the surrounding state forest land.

Parker Dam State Park

Parker Dam State Park is located 15 miles north of Clearfield off PA Route 153. The park area comprises 895 acres of which 22 acres is water. The dam was constructed by the CCC in the middle 1930s. The dam washed out in the spring of 1936. Reconstruction of the dam was started in 1937 and completed in 1939. Other facilities were completed from 1935 to 1941 by the CCC and WPA. William Parker, for whom the dam is named, while working for the Laurel Run Improvement Company, Williamsport, constructed a logging dam at the present dam site. This dam was used from 1868 to 1910. The Company President was John J. Otto.

Park facilities consist of rental cabins, refreshment building, swimming area, picnic area, rest rooms and family-type tent and trailer campsites. Parking, picnic tables, fireplaces and drinking water are also provided. The 22-acre Parker Lake also provides fishing and boating.

Interesting features within the park include a system of restored logging railroad grades, a reconstructed log slide, a constant-flow spring originating from sandstone rock, and a stand of virgin hardwoods.

The park serves as a stop on the Elk Scenic Drive, the primary trailhead for the Quehanna Hiking Trail, and contains the Lou and Helen Adams CCC Museum.

S.B. Elliott State Park

S. B. Elliott State Park, originally carved from state forest lands in the 1920s, is located 10 miles northwest of Clearfield off PA Route 153 on Old Route 153. The first facilities were a shelter, fireplace, tables and benches, and pure drinking water. [Insert description of present amenities]

The park was named for the Honorable S.B. Elliott who was a member of both the Pennsylvania Legislature and the State Forest Reservation Commission.

Recently, portions of the park trails were used to create the Dague Trail for snowmobile riders. The park also provides access to the Dague Nursery and seed orchard and its former borders included the historical location of Smith Place fire tower along Old SR 153.

Black Moshannon State Park

Black Moshannon State Park is located in central Pennsylvania's Allegheny Mountains on PA Route 504, nine miles east of Philipsburg and is comprised of 3,394 acres.

Park facilities consist of fishing, swimming, boating, refreshment building, picnic area, rest rooms, family-type tent and trailer campsites, thirteen family-type rental cabins and cross- country ski area.

Park Trails also provide a connection to the Allegheny Front Trail and Mid State Airport.

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.

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.

INTERPRETIVE PLAN

The district is in the process of drafting a comprehensive interpretive plan. Moshannon State Forest uses various means of communication to educate and inform the public. In addition to road and trail signs, kiosks are strategically located throughout the district that educate the public on forestry topics and are also accompanied by literature boxes, such as those placed at the new parking areas on the Quehanna Hiking Trail and at Yellowsnake Camping Area. A public use map orients visitors to the entire forest. Local maps have been developed for promoted trail systems or areas with user specific amenities, such as the Quehanna Shared Use Map (for equestrian riding and camping in the Quehanna Wild Area) and the Rockton Mountain Trail System, etc. The district also has a brochure specific to flora and fauna of Moshannon State Forest. Less popular literature includes the Moshannon State Forest Tour and the Mountain Laurel Tour. The district has two (2) wildlife viewing areas on the Elk Scenic Drive that are popular during elk bugling season, Beaver Run and Hoover Farm Wildlife Viewing Areas. Information related to Moshannon State Forest can be requested via email or phone at the district office or at any of the 3 maintenance divisions.

Opportunities

- Develop additional kiosk and panels at strategic locations to educate and inform visitors.
- Create access/parking for fisherman/boaters/handicapped visitors to the water's edge
- Create access/parking for handicapped hunters in the latest acquisition
- Create access/parking for all visitors in the latest acquisition while interpreting the gas and other activities
- Maintain and upgrade our current infrastructure.

Evaluation Strategies

We will continue to evaluate with comment cards and personal interactions with visitors, phone contacts, etc. to assess our effectiveness and make changes as needed.

Implementation Plan

The Moshannon State Forest has been proactive and has planned for the implementation of kiosk with education and information panels to assist visitors in understanding the Central Themes.

Another possible plan would be to create a Moshannon State Forest Instagram account. Like Facebook it would promote not only the State Forest itself but also programs and activates hosted by the State Forest. Like Facebook an Instagram account would be another form of free advertisement and would bring a new generation of people into the forest.

Landscape Management Unit Plans

With the 2018 revision of the 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 2017-2018. 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 Moshannon District 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.

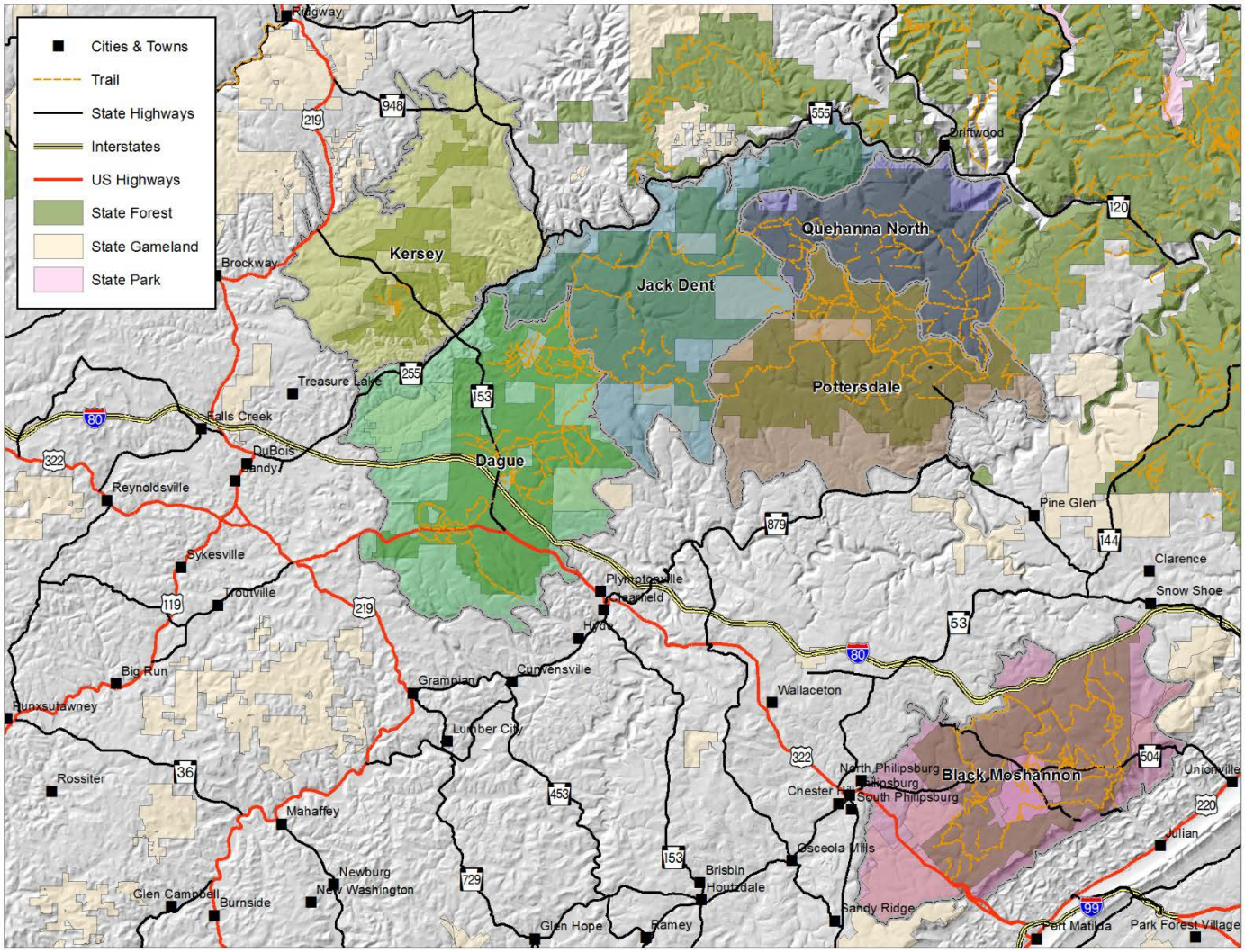
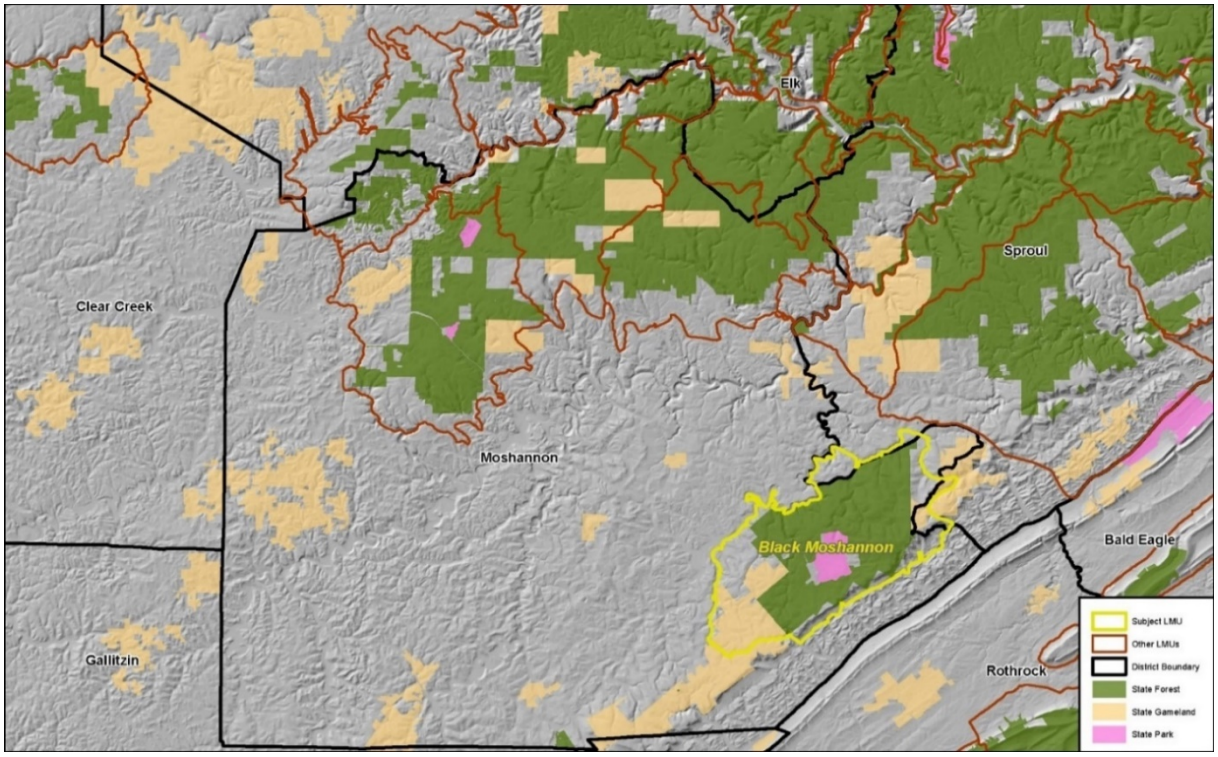


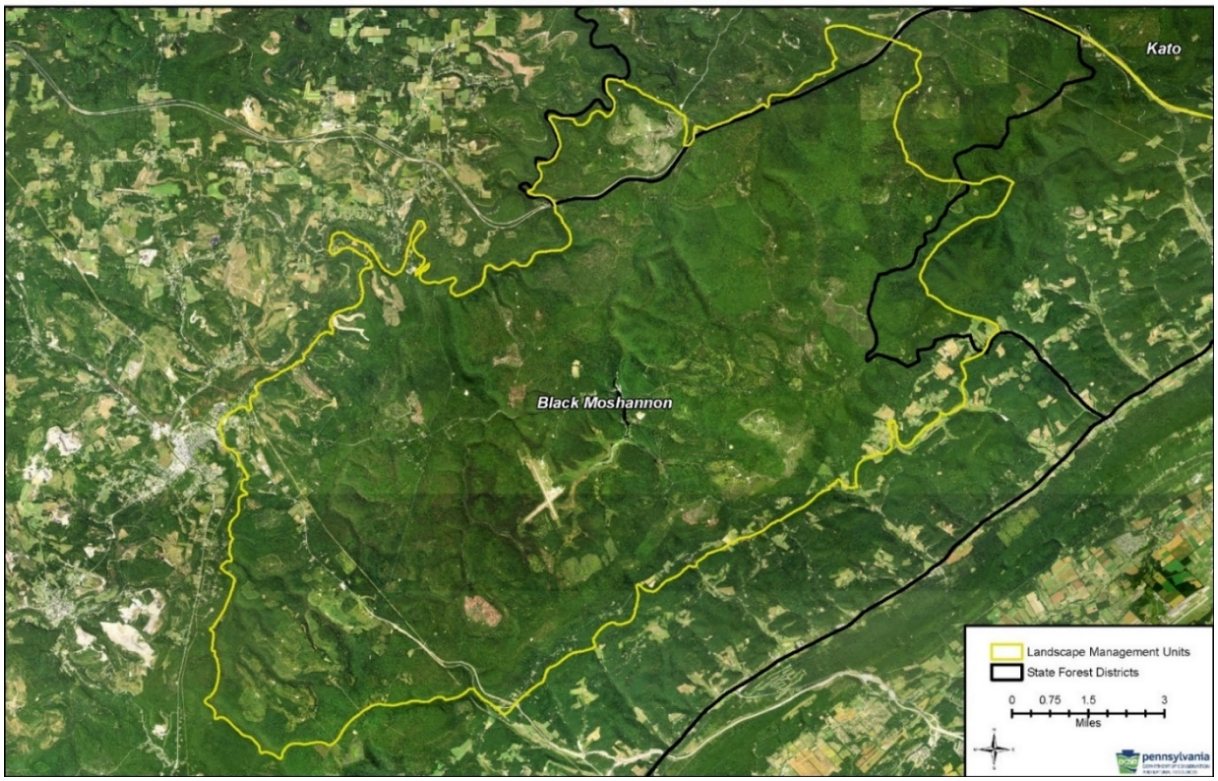
Figure 1. Map of entire district with all Landscape Management Units shown in varying colors.

Black Moshannon

Landscape Management Unit



Black Moshannon LMU



Overview

The Black Moshannon LMU is 76,984 acres in size, and consists predominately of state owned land. Moshannon State Forest accounts for 39,718 acres, Black Moshannon State Park 3,394 acres, and State Gamelands 103 and 33 account for over 11,000 acres within the LMU. The entire LMU is located within Centre County. This LMU is bisected by 3 major highways including Interstate 80, S.R. 504, and S.R. 322.

Most of the timber in this area was logged in the late 1800's and early 1900's. However, it has recovered and most of this LMU is now dominated by forests. There were several Civilian Conservation Corps (CCC) camps here in the 1930's, and one of their accomplishments is that there are over a thousand 1,000 acres of planted pine and spruce stands on state forestland. There has been significant shallow gas development on state forestland in the past few decades. However, most of these wells have been retired, and the leases are expiring. The state owns most of the subsurface rights in this LMU. There have only been several unconventional Marcellus wells drilled on state forestland and private land in this LMU. In the western section of the LMU, as well as the section north of Interstate 80 there are several thousand acres of both reclaimed and unreclaimed strip mines.

This LMU consists primarily of oak forest types, primarily mixed oak-mixed hardwood (AD) and dry oak-heath(AH) stands, with lesser amounts of red oak-mixed hardwood (AR) forests. In addition to the CCC Pine/Spruce Plantations, conifers, including white pine and hemlock, are found in the drainages. There are extensive wetlands within this LMU, primarily surrounding the 250-acre Black Moshannon Lake located in the center of the LMU and on the western side of the LMU near Philipsburg. There have been heavy amounts of oak mortality in this LMU during the past decade due to three years of Gypsy Moth defoliation from 2006 to 2008. On state forest land, approximately 20,000 acres experienced significant oak mortality.

Due to the amount of dead oak in this LMU, approximately 25% of the area has seen some sort of timber harvest operation, primarily on state forestland, but also on state gamelands and private property, in the last 10 years. Currently (2017), on state forest land, salvage operations are still ongoing and approximately 15,000 acres of forest will be treated in response to this wave of mortality. The result of the increased amount of light on the forest floor from defoliation and subsequent timber harvests has dramatically changed the character of this LMU. Prior to 2008, most of the forest was mature, but now there are thousands of acres of early successional habitat in the southern half of the LMU that regenerated naturally with seedlings. In the northern half, where sites were poorer quality and natural regeneration was lacking, we have planted thousands of acres with conifer seedlings that will result in two aged mixed oak conifer forest types.

This LMU has ample opportunities for recreational users including hunting, fishing, hiking, snowmobile riding, and horseback riding. There are 282 miles of trails and roads on state forestland in this LMU, including the Allegheny Front Trail which is a 40 mile hiking trail. In addition to Black Moshannon Lake there are also 93 miles of streams. Wildlife populations have increased and will continue to as a result of the salvage operations creating large amounts of early successional habitat as well as numerous herbaceous openings. Several rare vegetation community types exist in this LMU, as well as multiple species of endangered plant species, which are monitored regularly to ensure protection and persistence.

Priority Goals

a) Focus efforts on gypsy moth mortality areas for salvage harvest and promoting natural regeneration and creating early successional habitat.
b) Strategically acquire land bordering the state forest land within the LMU, especially large tracts as they become available.

c) Increase conifer cover in the LMU by using artificial regeneration in areas impacted by gypsy moth mortality and lacking in natural regeneration.
d) Maintain and establish herbaceous openings and food plots using openings established during timber sales or gas infrastructure reclamation, to provide habitat for wildlife species that may enjoyed sustainably by the public through viewing, hunting, trapping, and other opportunities. Native vegetation will be utilized wherever feasible following the Bureau of Forestry Planting and Seeding Guidelines.
e) Maintain and enhance fire dependent communities, such as pitch pine and scrub oak, through use of prescribed burning.
f) Improve accessibility for timber harvest and recreation by improving existing roads.
g) Work with gas operators to retire conventional gas wells and decommission infrastructure to improve aesthetics, wild character, and wildlife habitat.
h) Control unauthorized vehicle use in sensitive or restricted areas to ensure appropriate recreational use of state forest land.
i) Inventory invasive species and prioritize treatment if found with a focus on those species prioritized for the Early Detection-Rapid Response protocol for Moshannon State Forest, including glossy buckthorn, Japanese knotweed, *Phragmites spp.*, and poison hemlock.

PROFILE

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

	Acres
State Forest Land	39,718
LMU Total	77,057

Ecoregion: Allegheny Front (primarily); Pittsburgh Low Plateau

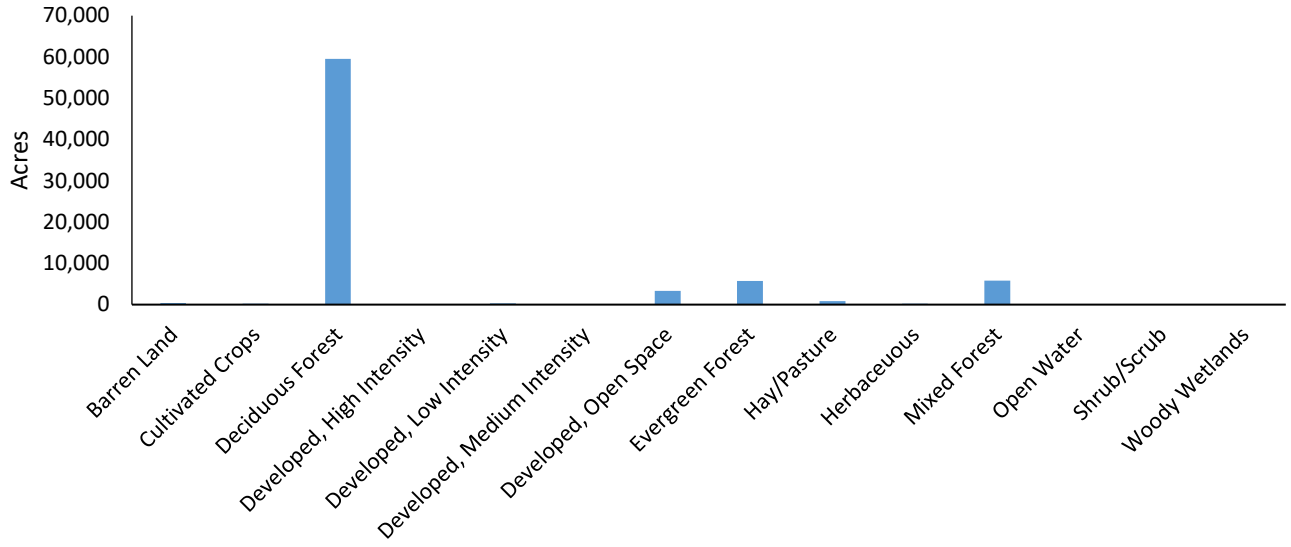


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

Due to most of the land in this LMU being classified as deciduous forest, an effort to maintain and increase other categories will be emphasized during forest management activities, for example planting conifer seedlings and maintaining scrub oak forest types through prescribed fire.

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
Public Use Road	70
Drivable Trail	7
Administrative (gated) Road	19
Total	**96**

The road access in Black Moshannon LMU is adequate. There is potential to improve several Z2 and Z3 roads to improve access to salvage timber resulting from Gypsy Moth mortality. A good portion of the major Z1 roads have been improved with DSA, including Hannah Furnace Road, Six Mile Road, and Horse Hollow Road, other Z1 roads that would benefit from DSA include Strawband Beaver Road, Benner Run Road, and Meyers Run Road.

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	78
Biking	36
Equestrian	37
X-Skiing	58
ATV I	0
ATV II	0
Snowmobile / Joint Use Road	73

The amount of trails in the Black Moshannon LMU is adequate, and focus should remain on maintaining the current complement of trails. The most unique hiking trail in this LMU is the Allegheny Front Trail, which totals 41.5 miles long.

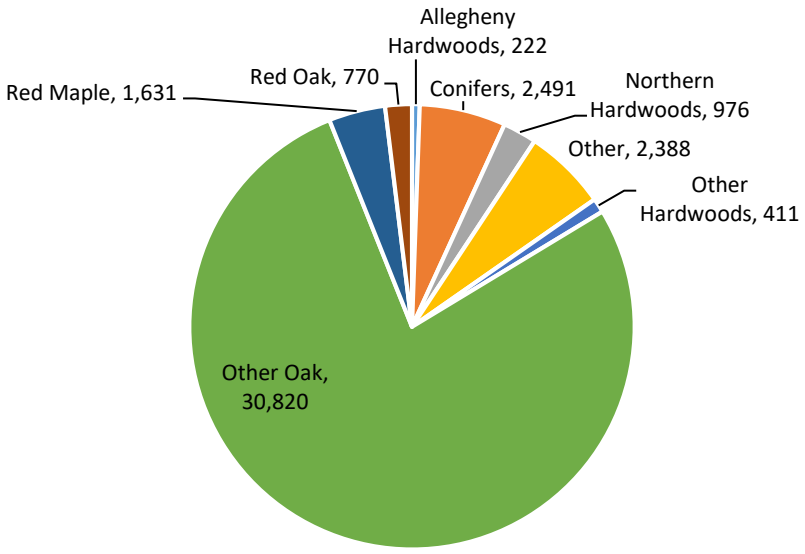


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

Due to the Black Moshannon LMU having a high percentage of oak forest types, an emphasis has and will be to maintain and enhance less common forest types through forest management activities. Species that are locally less abundant are favored as reserve trees on state forest timber sales. In addition to conifers already planted in conjunction with oak salvage efforts, there are more opportunities in this LMU to establish diverse forest types by planting conifers, aspen, and eventually American chestnut in understocked stands.

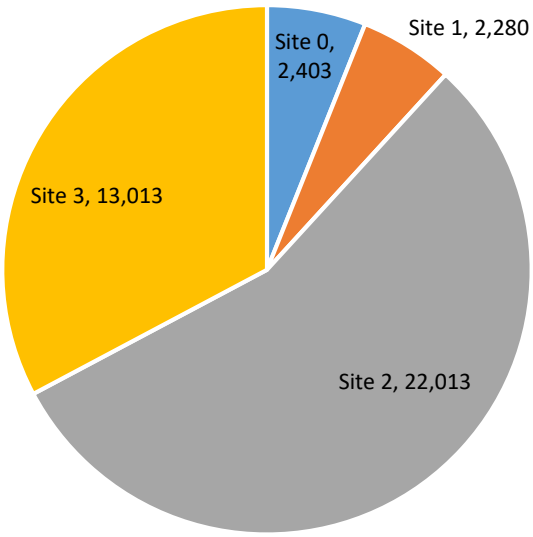


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

The timber quality in this LMU is average, with most areas belonging to the site 2 class. Many of the site 3 class areas have been able to have silvicultural treatments performed in response to Gypsy Moth mortality by marketing large acreage salvage sales to timber operators with mechanized equipment interested primarily in pulpwood and firewood.

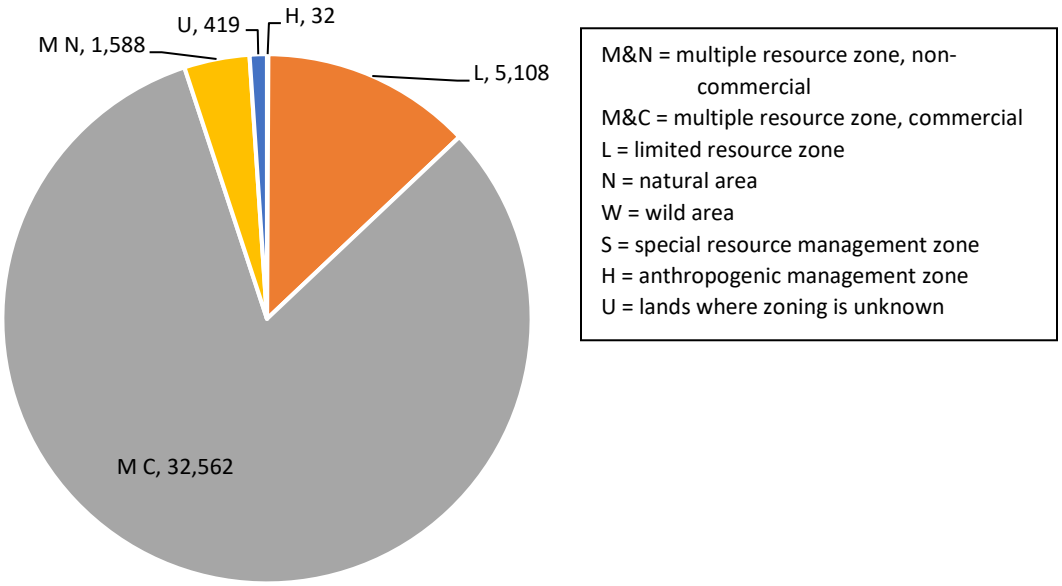


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

A high percentage of the land base in this LMU is zone multiple resource and commercial, which allows for this area to be open to numerous silvicultural treatments, and in recent years salvage operations. Most of the limited areas are found along the slopes of drainages and in wetlands near Black Moshannon state park.

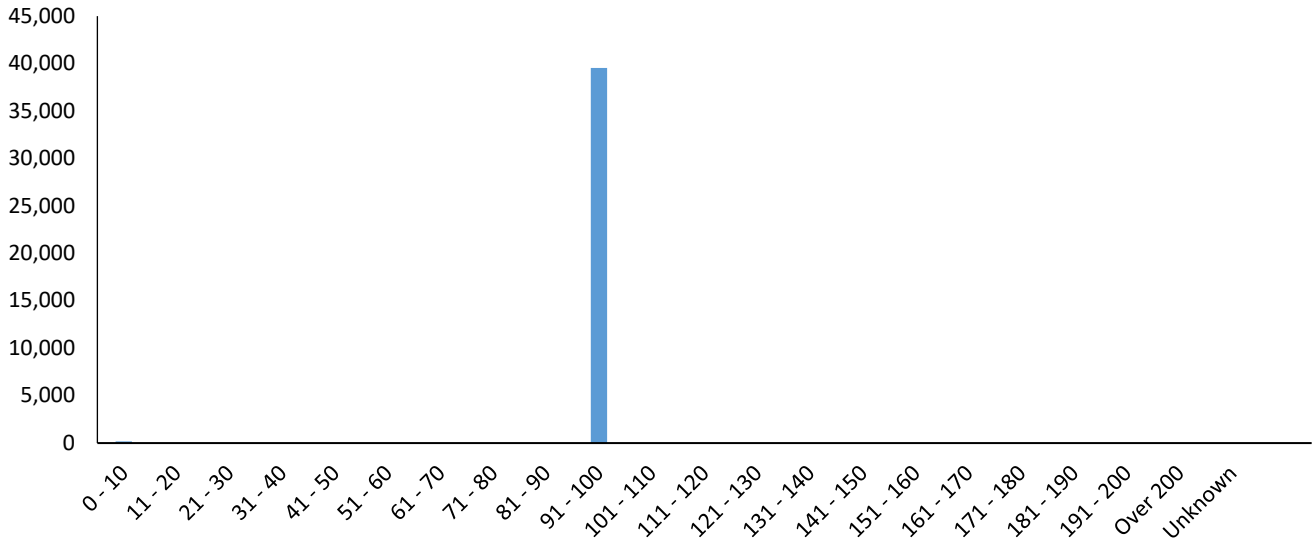


Figure 5. Acres of state forest land in this LMU by forest age classes.

Most of the forestland in this LMU is in the 91-100 age class, however, due the silvicultural treatments in response to recent Gypsy Moth mortality, there are several thousand acres of overstory removals soon to be harvested and proposed that will begin the process of balancing age classes in this LMU.

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	21
High Quality Waters	109
Perennial Cold Water Streams	7
Exceptional Value Waters	35
Human-made Impoundment/ Pond	<1
Total	**173**

The major streams in this LMU include Six Mile Run, Black Bear Run, Benner Run, Black Moshannon Creek, Moshannon Creek, and Rock Run.

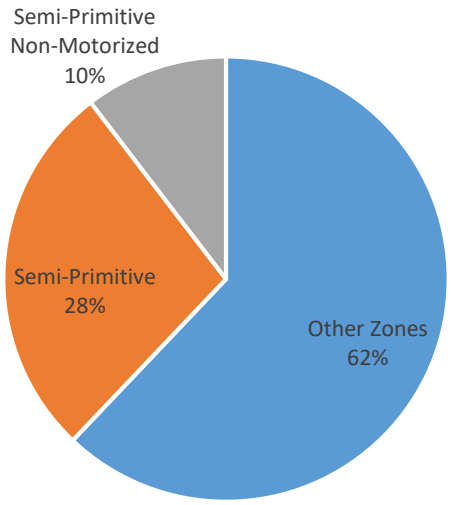
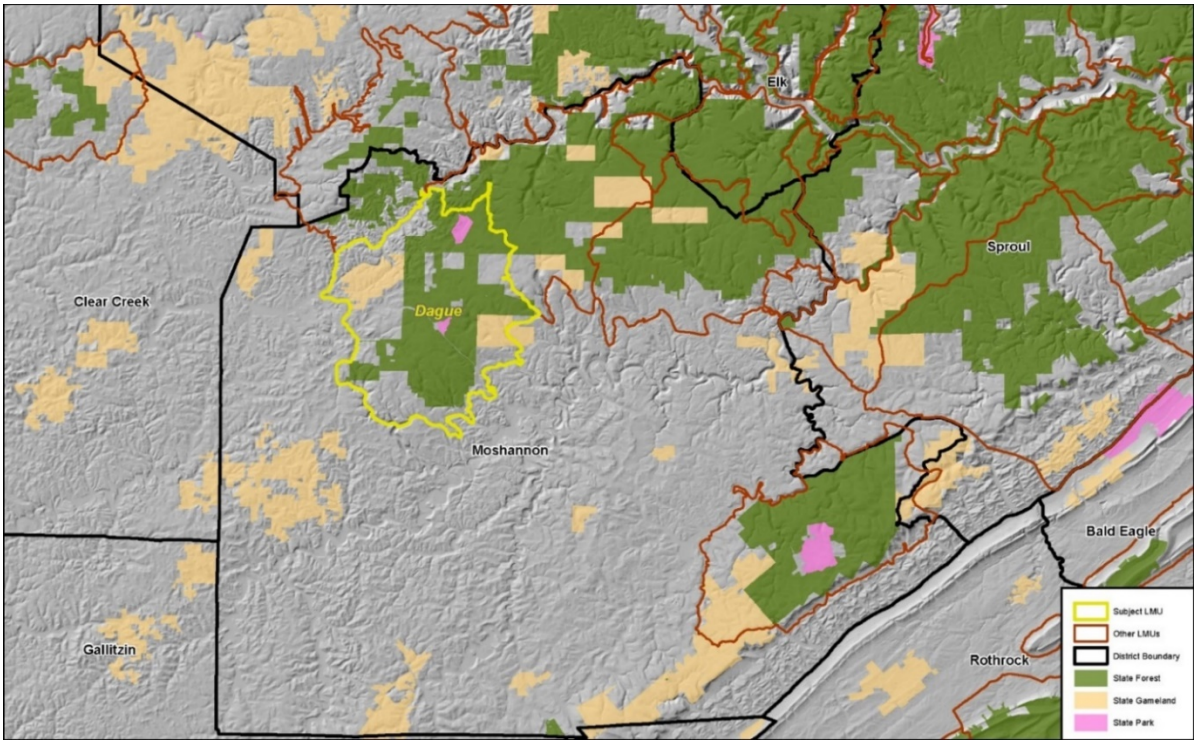


Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS, 2012) classifications. ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers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

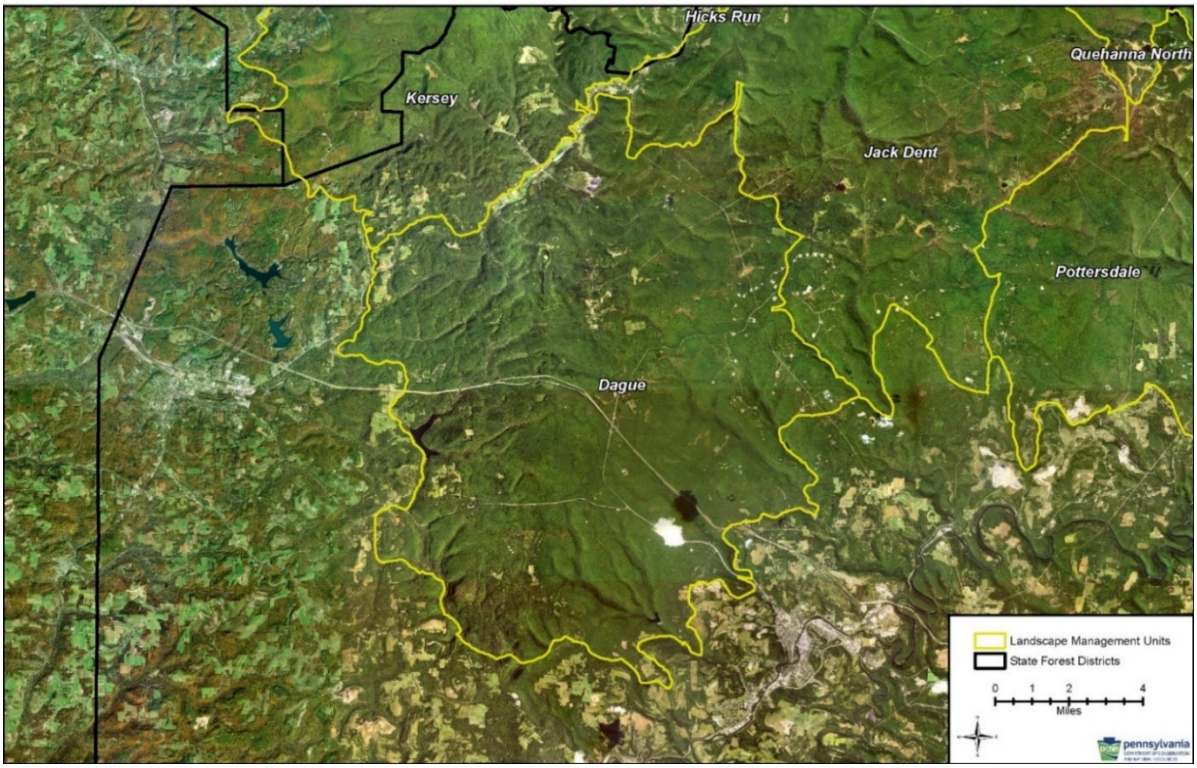
There is numerous acreage of Semi-Primitive Non-Motorized in this LMU. An effort will be made to maintain these areas for their current recreational uses and not open them to access by vehicle.

Dague

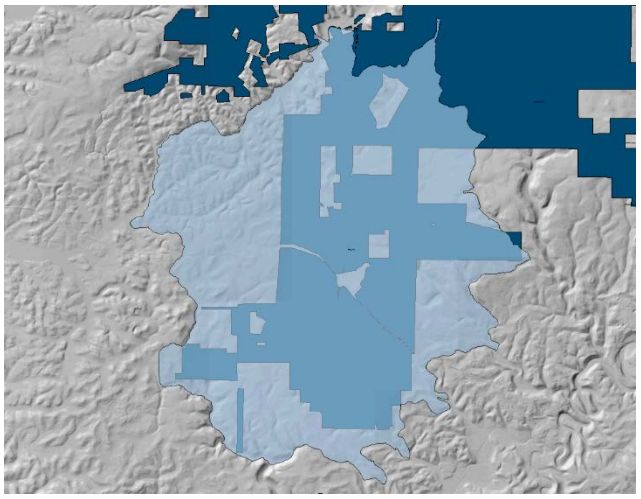
Landscape Management Unit



Dague LMU



Overview



The Dague LMU is approximately 86,243 acres in central Clearfield County. Most of this area is within the Pittsburgh Low Plateau ecoregion. This consists of relatively shallow valleys of forested and reclaimed strip mines. It has a relatively smooth to irregular undulating surface while the subsurface consists of shale, siltstone, sandstone, limestone and coal. Approximately 50% of the LMU is state forest land. The non-State Forest Land within the LMU is consists mostly of forested land with a small portion of open fields. The fields are a mix of reclaimed strip mines, old farms and some active farms. Within the area is a 1,000-acre Parker Dam State Park, some PA State Gamelands, DuBois City Watershed property, and a few hunting club properties. The non- State Forest Land is made up of a few small communities, rural houses and camps. There are 136 state forest leased camps on this portion of the Moshannon State Forest. The LMU is divided by four major transportation corridors: PA Route 153, PA Route 255, PA Route 322 and Interstate 80. The high point along state route 322 in Rockton contains numerous communication towers and a state forest fire tower.

This LMU has many recreation trails with more than 175 miles of useable sections. These are used for hiking, biking, snowmobiles, horses, and cross-country skiing. A portion of the Quehanna State Forest Hiking Trail lies within the LMU. This LMU provides opportunities for wildlife viewing , as it is in the southwestern range of the elk management area, as well as being within elk hunt zones 1 and 5.Water resources include many small tributaries, one larger stream which is Bennetts Branch of the Sinnemahoning creek, Clearfield and DuBois watersheds, and a wild plant sanctuary.

The majority of the forest types within this LMU are oak/hickory with isolated stands of northern hardwoods and hemlock in the valleys. Most of the area was cut over in the late 1800's to early 1900's. The Bureau has conducted timber sales in the past and continues to conduct timber sales today. Many of the early Bureau timber sales around the 1960's and 1970's were salvages for oak leaf roller and gypsy moth. Today most timber sales within the LMU are regeneration type harvests, and timber harvest and management will likely continue into the future. On May 31, 1985 an F4 tornado originated and moved west to east through the northern most section of this LMU leaving major destruction and flattened areas of forest in a path 69 miles long, 3,330 yards wide. The area has since re-vegetated naturally with a young thriving forest.

Oil and gas rights on this LMU portion has mix of fee simple (62,153 acres), severed rights (17,325 acres) and leased oil and gas rights (6,143 acres). Within this LMU the state forest land has also has a mix of fee simple (19,607 acres), severed rights (16,998 acres) and leased oil and gas rights (6,765 acres). There has been little unconventional gas development, but an abundant amount of conventional gas activity in the past on Moshannon State Forest portion, as well as on private lands within the LMU. Throughout this LMU there is ongoing strip mining, evidence of past strip mining and potential for more. There is also evidence of old deep mine shafts within the LMU. Many of the historic strip mines and deep mines have been reclaimed as part of the initiative to clean up the Bennett Branch of the Sinnemahoning Creek and other surrounding streams. The area has many small to moderate gas/electric transmission lines and it also has one major line running from east to west from the Colby area through the Medix area.

Priority Goals

a) Because of ease of access and quantity of Multiple Resource/Commercial acreage in this LMU, encourage natural regeneration following timber activities while following the harvest allocation model.
b) Work with gas operators to strategically minimize fragmentation through appropriate practices, such as co-locating infrastructure, reclamation, and re-establishing scrub-shrub and tree cover.
c) Protect sensitive plants found in the wild plant sanctuary from negative impacts.
d) Enhance and maintain early successional habitat created during timber sales to provide habitat for wildlife species that may enjoyed sustainably by the public through viewing, hunting, trapping, and other opportunities.
e) Continue to remove deer fencing as natural regeneration develops beyond threat of browsing and be selective about future fencing needs.
f) Take a proactive approach to invasive plant control, prioritizing treatment of multiflora rose, reed canary grass, *Phragmites*, and barberry. Continue to eliminate any knotweed found and perform follow-up monitoring.
g) Continue to maintain opportunities for low-density recreation, especially hiking and snowmobiling.
h) Maintain high quality watersheds used for public water supply, by maintain healthy forest buffers and minimizing impacts during forest use operations.
i) Continue to work with partner agencies (DEP, State Parks, PGC, FBC, etc.) and stakeholder groups for AMD remediation, wildlife projects, and recreation opportunities. For all such projects, the Bureau's relevant guidance documents, such as the Brook Trout Management plan and Aquatic Resource Management Plan, will be utilized to identify priorities and best practices.
j) Continue to work with Penn Nursery to establish and maintain seed orchards local genotypes and genetic material of species impacted by pests and disease.
k) Because this LMU is part of the Elk Management Supra Area, the LMU-specific guidance found in the Bureau's Elk Management Plan will be considered for planning and prioritizing habitat management actions.

Profile

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

	Acres
State Forest Land	42,816
LMU Total	86,243

Ecoregion: Pittsburgh Low Plateau

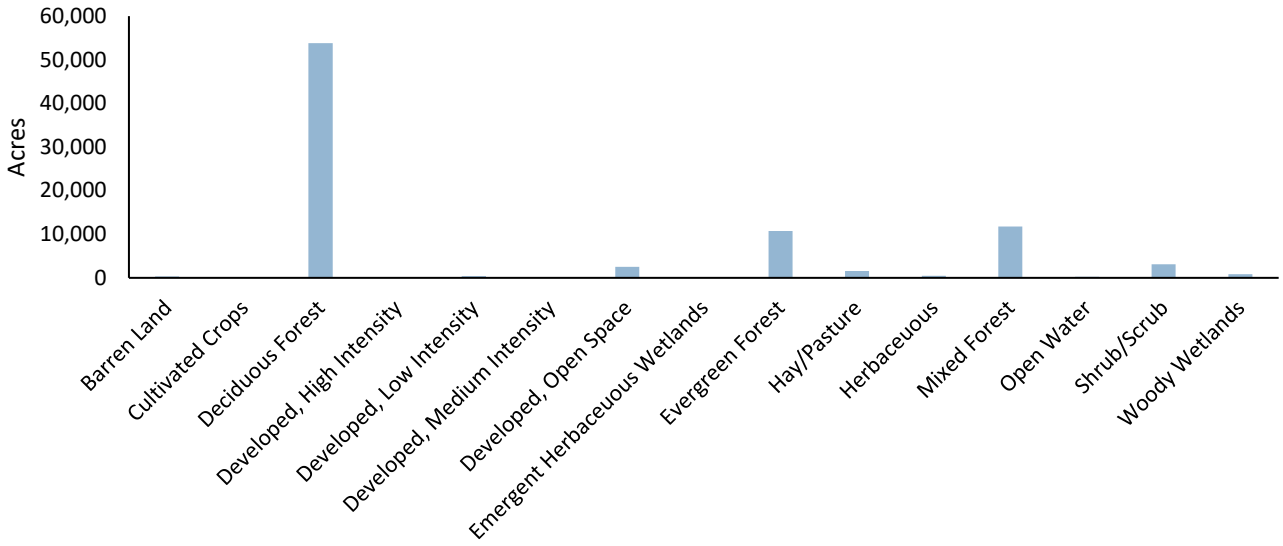


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

This LMU is primarily made up of deciduous forests but has a significant of evergreen forest, which are plantations and hemlock forests in drainages.

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
Public Use Road	87
Drivable Trail	25
Administrative (gated) Road	40
Total	**152**

Main public use road in this LMU is Four Mile Road. This LMU is also bordered by several major transportation corridors: I-80, US-322, and PA 153.

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	67
Biking	21
Equestrian	10
X-Skiing	49
ATV I	0

ATV II	0
Snowmobile / Joint Use Road	66

This trail system includes the Rockton Mountain Trail System. This area receives low to moderate trail traffic and may be a good option for a primitive hiking experience.

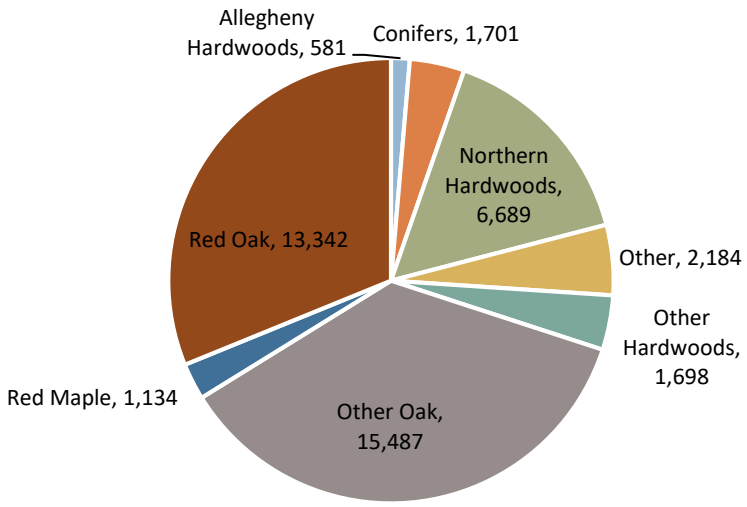


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

Although red maple forest community represents a relatively low percentage of the total acreage, red maple is a significant component of many red oak stands and is often harvested in conjunction with oaks. Other oak forest is primarily the dry oak-heath forest type and found primarily in the south Rockton area.

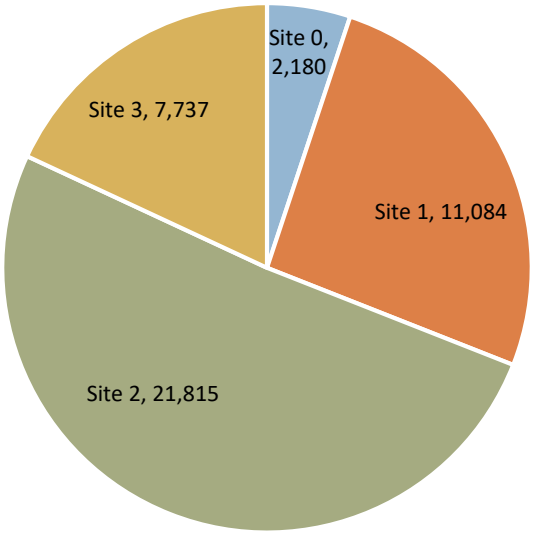


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP. Majority of the area is found in Site Class 2, with Site 1 in the valleys and Site 3 areas on the poorest areas. The Site 2 are often good quality sites and on the high end of the classification.

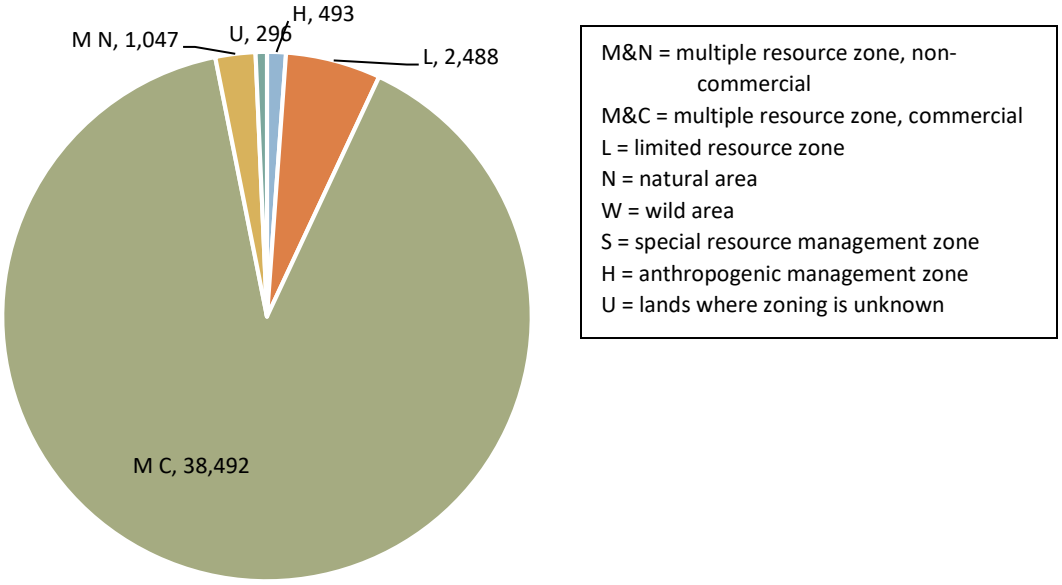


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

Because this LMU is found on the Pittsburgh Low Plateau, much of the area is relatively flat and accessible, leading to mostly M&C acreage throughout this LMU.

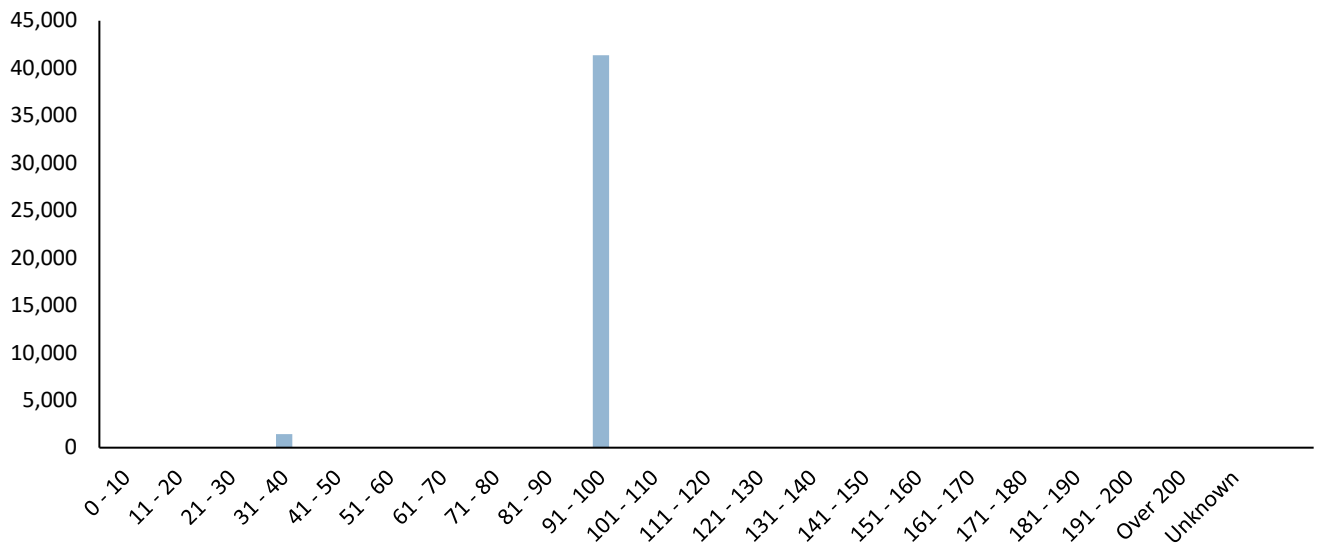


Figure 5. Acres of state forest land in this LMU by forest age classes. The majority of this LMU is in the 90-100-year age class.

The age class distribution is very skewed toward mature forest. Some acreage is found in the youngest category, representing the recently harvested stands. The bump in acreage found in the 31-40 age class represents forest that was affected by the 1985 tornado. This swath of young forest along the tornado's path spans the Jack Dent LMU as well and can be seen in stand age spatial data (Figure 6). As more of the acreage is harvested in the commercial areas in the Multiple Resource zone by following the targets in the Harvest Allocation Model, the forest age will become more evenly distributed across all ages and create a diverse mosaic of habitat types.

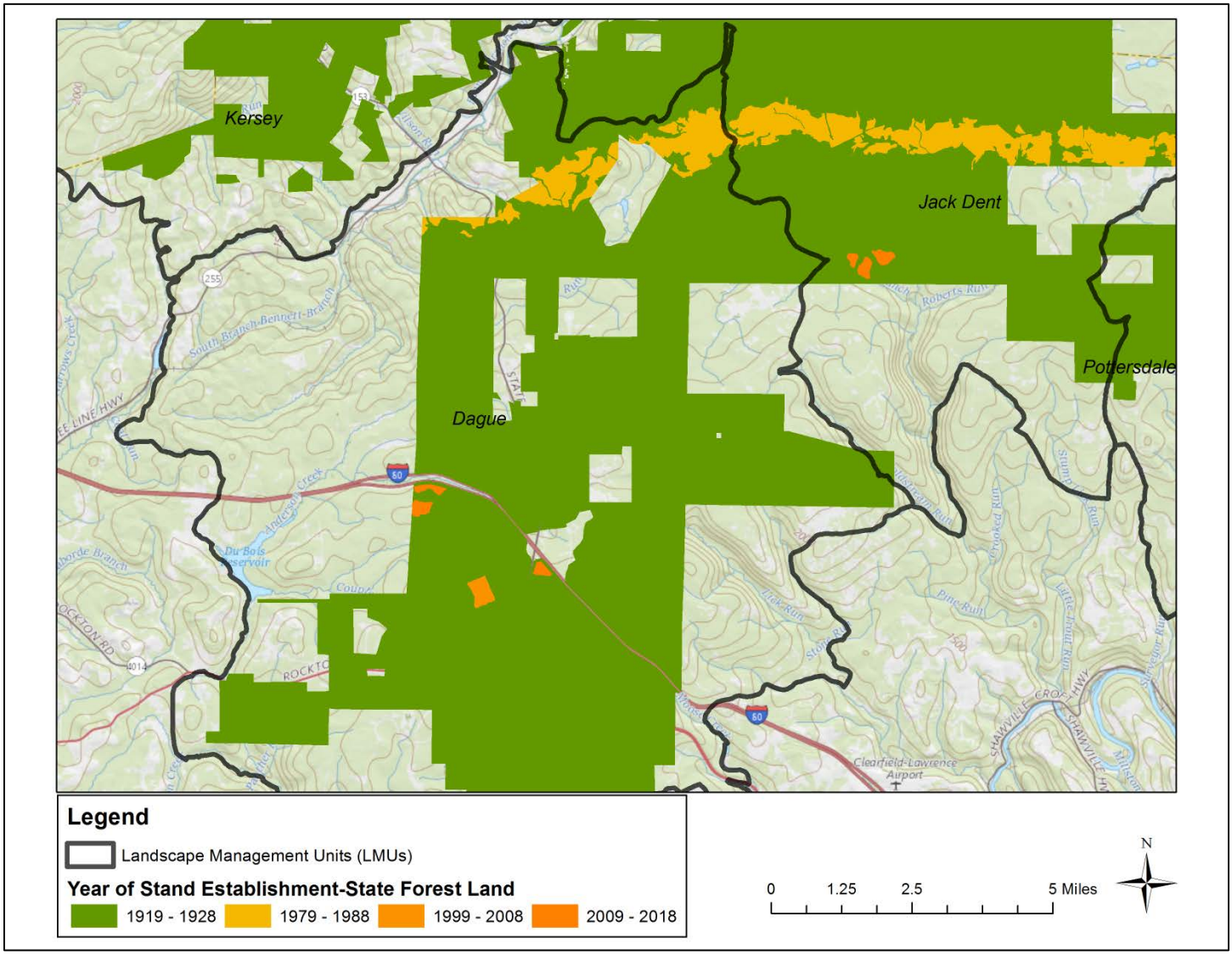


Figure 6. Map of establishment year for stands on state forest land, illustrating the homogenetiy of age classes and the unique pattern of young forest created by the 1985 tornado.

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	22
High Quality Waters	174
Perennial Cold Water Streams	42
Exceptional Value Waters	3
Human-made Impoundment/ Pond	3
Total	**244**

The majority of this area drains to Dubois or Clearfield reservoirs or to Sinnemahoning Creek. Major High Quality streams include Montgomery Run, Laurel Run, Whitney Run, Anderson Creek, and Bennett's Branch Sinnemahoning.

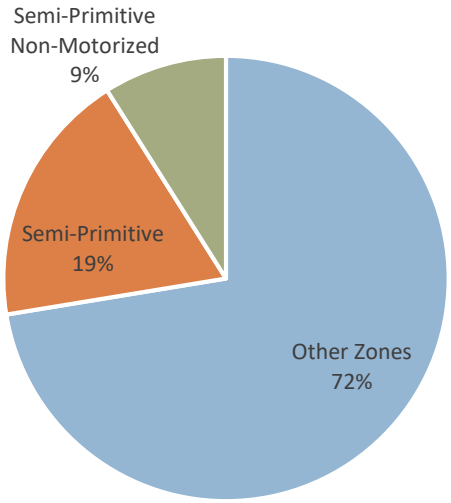
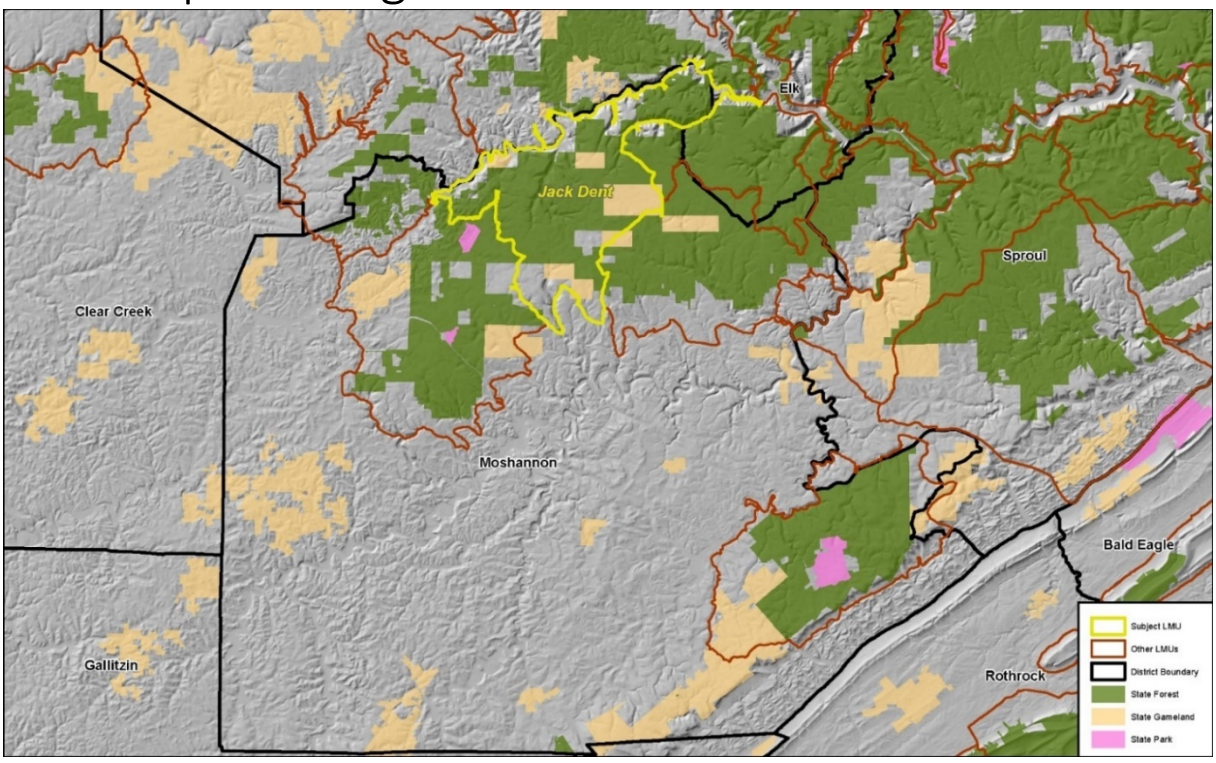


Figure 7. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS, 2012) classifications. ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

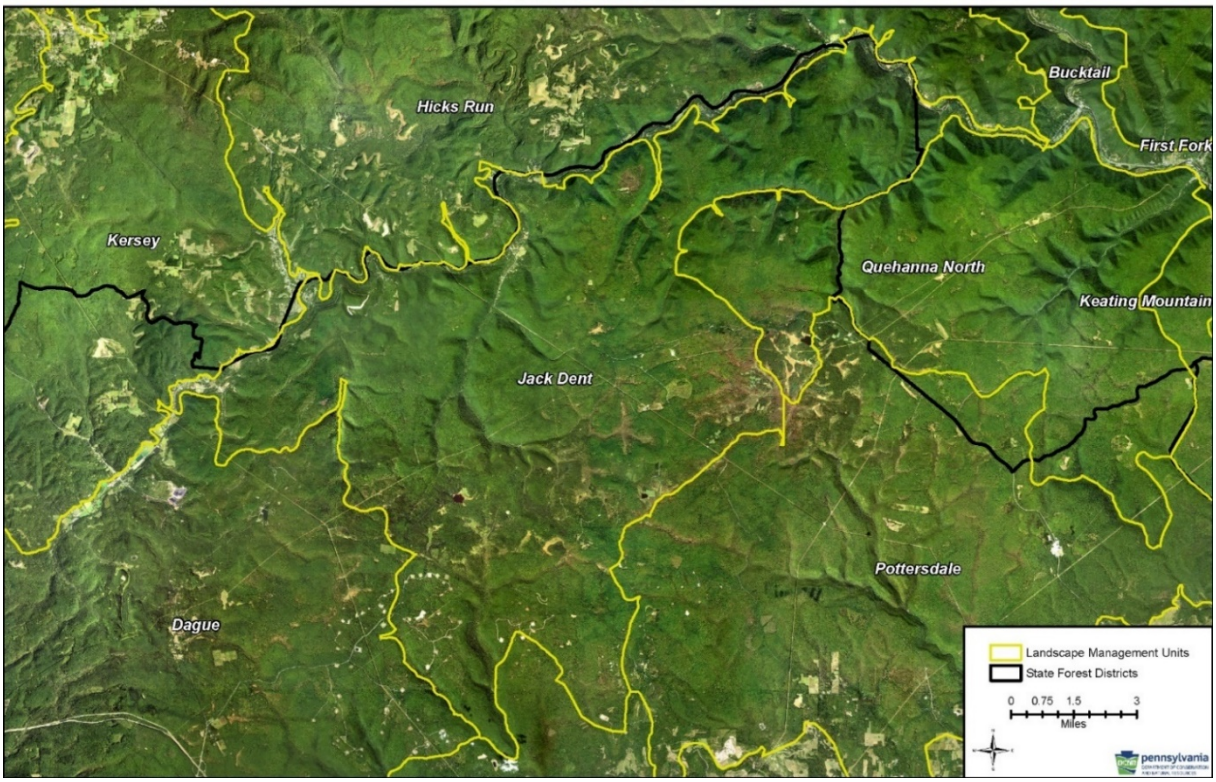
Much of the land base in this LMU falls within the developed "Other Zones" because the flat topography lends itself to high road density.

Jack Dent

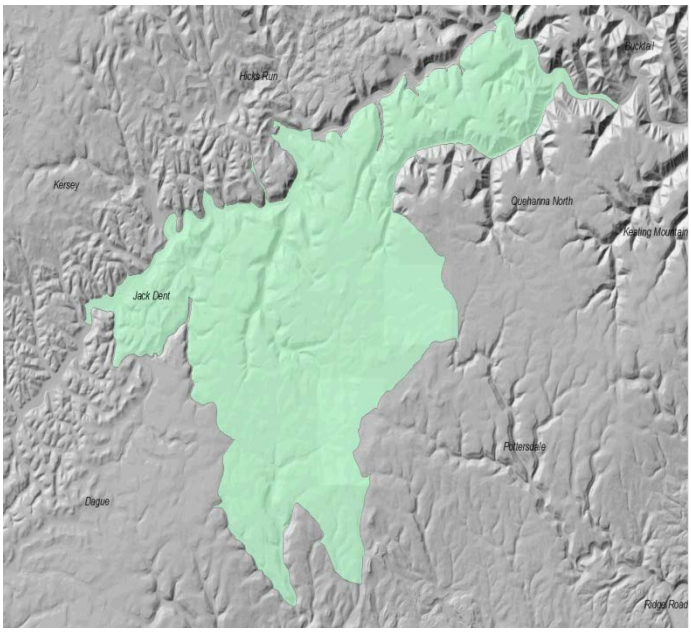
Landscape Management Unit



Jack Dent LMU



Overview



The Jack Dent LMU is approximately 73,794 acres in northern Clearfield County, southern Elk County and western Cameron County. Of this total acreage, 47,197 acres is State Forest land. The non-State Forest Land within the LMU consists mostly of forested land comprised of state game lands, hunting clubs, small communities, rural housing and private camps. The LMU does not contain any major transportation corridors but several state forest roads. This LMU is unique in that it is a continuous forested landscape broken up only by pipelines and dirt roads. The highest point in this LMU is "High Knob" and contains a communication tower, which is located along the Caledonia Pike.
This area contains many recreation trails that are open to hiking, biking, snowmobiles, horses and cross country skiing. A portion of the Quehanna State Forest hiking trail lies within the LMU. Elk use this area extensively year round and the LMU is located within several elk hunt zones. This particular LMU holds the majority of the state leased camps in Moshannon State Forest as well. Water resources include many small tributaries, one larger stream which is Bennetts Branch of the Sinnemahoning creek that lies along the northern border of the LMU. This LMU also contains a man made 27 acre shallow water impoundment called "Shaggers Inn" that was constructed in 1986.

The majority of the forest types within this LMU are oak/hickory with isolated stands of northern hardwoods and hemlock in the valleys. Most of the area was cut over in the late 1800's to early 1900's. The Bureau has conducted timber sales in the past and continues to conduct timber sales today. In the early 1960's to late 1970's the Bureau's timber sales were salvages for oak leaf roller and gypsy moth. Today most timber sales within the LMU are regeneration type harvests, and timber harvest and management will likely continue into the future. On May 31, 1985 an F4 tornado originated and moved west to east through the southern section of this LMU leaving major destruction and flattened areas of forest in a path 69 miles long and 3,330 yards wide. The area has since re-vegetated naturally with a young thriving forest.

Oil and gas rights on this state forest portion has mix of fee simple, severed rights and leased oil and gas rights. There has been a small amount of unconventional gas development and an abundant amount of conventional gas activity in the past on Moshannon State Forest. There has been both conventional and unconventional gas development on private lands within the LMU. There is also evidence of old deep mine shafts within the LMU. Many of the historic strip mines and deep mines have been reclaimed as part of the initiative to clean up the Bennett Branch of the Sinnemahoning Creek and other surrounding streams. The area has many small to moderate gas/electric transmission lines and it also has one major line running from west to east from Medix to Quehanna and another line running from Tyler Road across the entire LMU ending at Jack Dent Road.

Priority Goals

a) Work with timber and gas companies to improve access, specifically through improvements to Grant Trail, Sullivan Road, and Wilson Switch Road.
b) Maintain recreational opportunities that emphasize a backcountry experience, including hiking, primitive camping, hunting, and fishing.
c) Create early successional habitat in a landscape dominated by mature forest through increased timber harvesting.
d) Create a diversity of wildlife habitat through projects, such as elk food plots, Medix Run fish habitat improvement, aspen cuts, orchard establishment, and maintain Shaggers Inn and Beaver Run shallow water impoundments.
e) Develop Early Detection Rapid Response species list and enact EDRR protocol on this LMU, as there is opportunity in this LMU to control certain invasive plant populations on their advancing front, prior to their widespread establishment.
f) Work with gas operators to retire conventional gas wells and decommission infrastructure to improve aesthetics, wild character, and wildlife habitat.
g) Reduce illegal ATV use by: 1) Enforce restrictions on illegal ATV use, especially in remote areas adjacent to private land; 2) educate users on state forest rules and regulations regarding ATV use; 3) work with gas companies to block access points or establish trees along pipeline rights-of-way when possible.
h) Continue to development relationships with owners of inholdings in the area. Strategically acquire land inholdings and indentures within the LMU as they become available.
i) Because this LMU is part of the Elk Management Supra Area, the LMU-specific guidance found in the Bureau's Elk Management Plan will be considered for planning and prioritizing habitat management actions..
j) Because this LMU contains extensive mileage of High Quality streams, water quality and headwater protection will be a priority when considering management actions in this LMU and the district will look for opportunities to enhance and protect aquatic habitats.

Profile

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

	Acres
State Forest Land	47,143
LMU Total	73,806

Ecoregion:

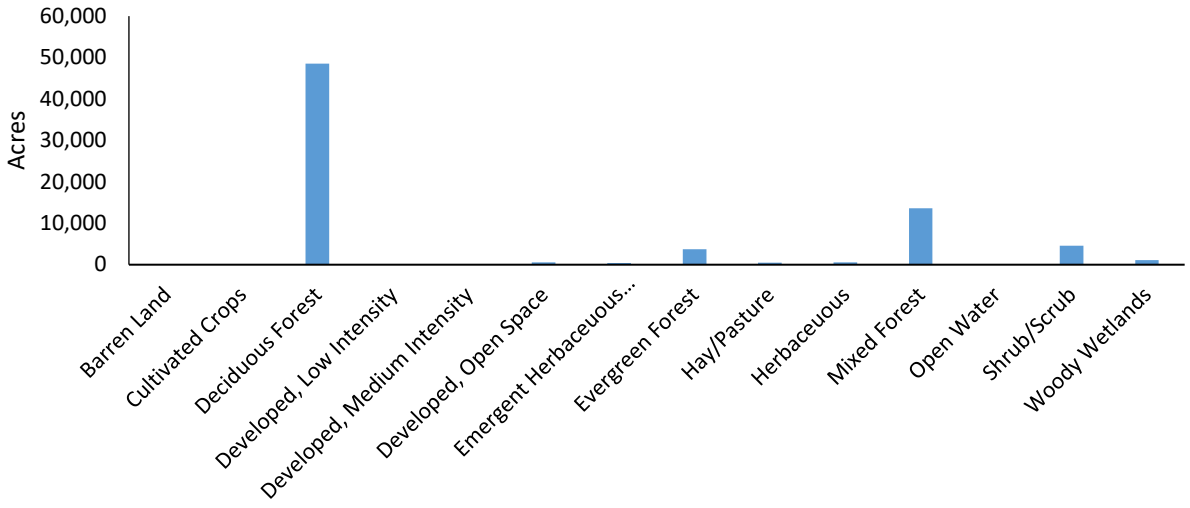


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

The vast majority of land cover is Deciduous forest along with Mixed Forest.

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
Public Use Road	64
Drivable Trail	19
Administrative (gated) Road	50
Total	**133**

The amount of roads in the Jack Dent LMU is adequate. There is potential to improve several Z2 and Z3 roads to gain access to stands where the roads are either impassable or not suitable for local traffic. A good portion of Z1 roads have been improved with DSA, including McGeorge, Shaggers Inn, Wallace Mines. Other Z1 roads that could be improved are the Caledonia Pike and Little Medix.

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	45
Biking	7
Equestrian	20
X-Skiing	31
ATV I	0
ATV II	0
Snowmobile / Joint Use Road	45

The amount of trails in the Jack Dent LMU provides significant opportunities for recreation. The main focus for these trails should be routine maintenance and keeping vistas cleared and open. The most desirable hiking trail would be the Quehanna Trail which runs through the LMU.

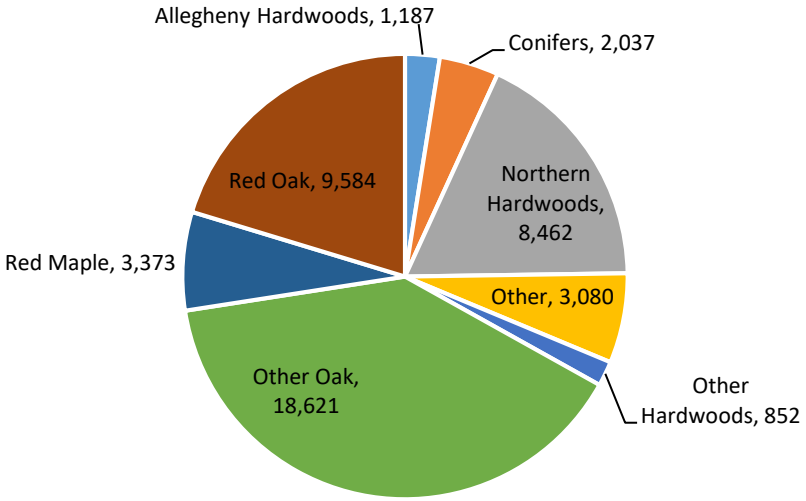


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

The Jack Dent LMU has a high percentage of oak forest type, the emphasis will be to maintain this forest type through silvicultural treatments. Within these treatments, we will try in enhance the less common forest type/species by reserving them in our state forest timber sales.

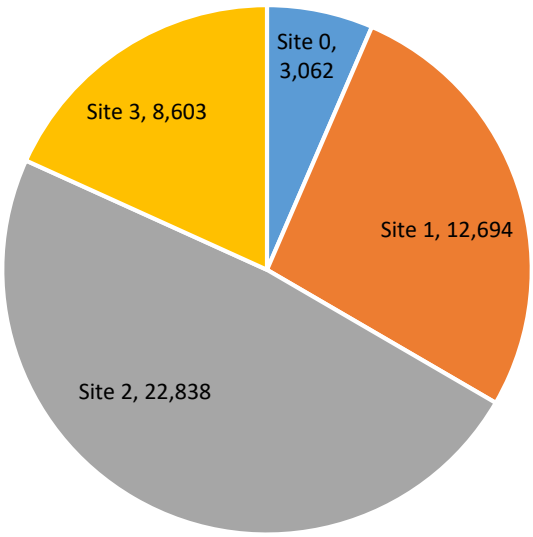


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

A large amount of this LMU falls into the site 2 class. Harvesting in the site 1 and site 2 class will continue. Whenever possible additional site 3 class timber will be added to timber sales.

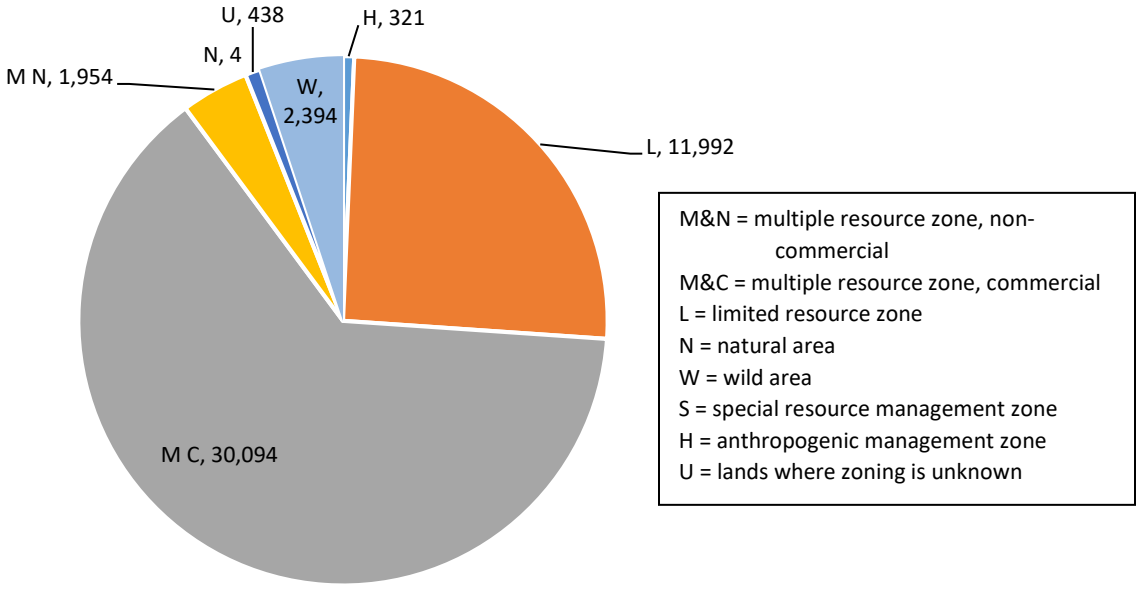


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability.

A high percentage of the management zone is typed as multiple resource and commercial. That allows for the area to be open to numerous silvicultural treatments. The limited areas are found along the slopes.

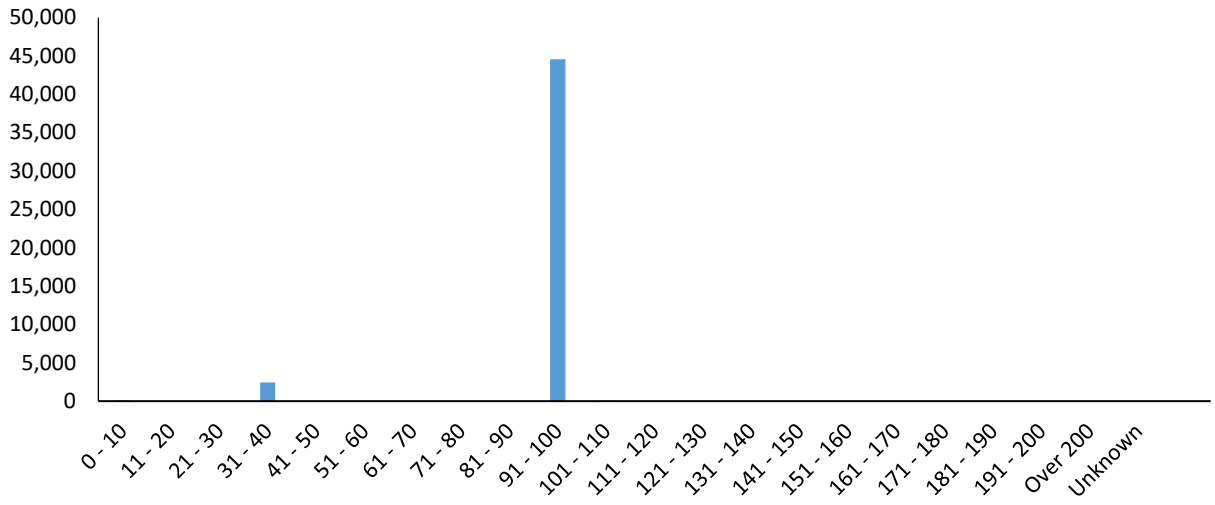


Figure 5. Acres of state forest land in this LMU by forest age classes.

Most of the forestland falls into the 91-100 age class and the process of balancing the age classes by following the targets set forth in the Harvest Allocation model will continue. The small amount of 31-40 age class is due to a tornado in 1985 (Figure 6)..

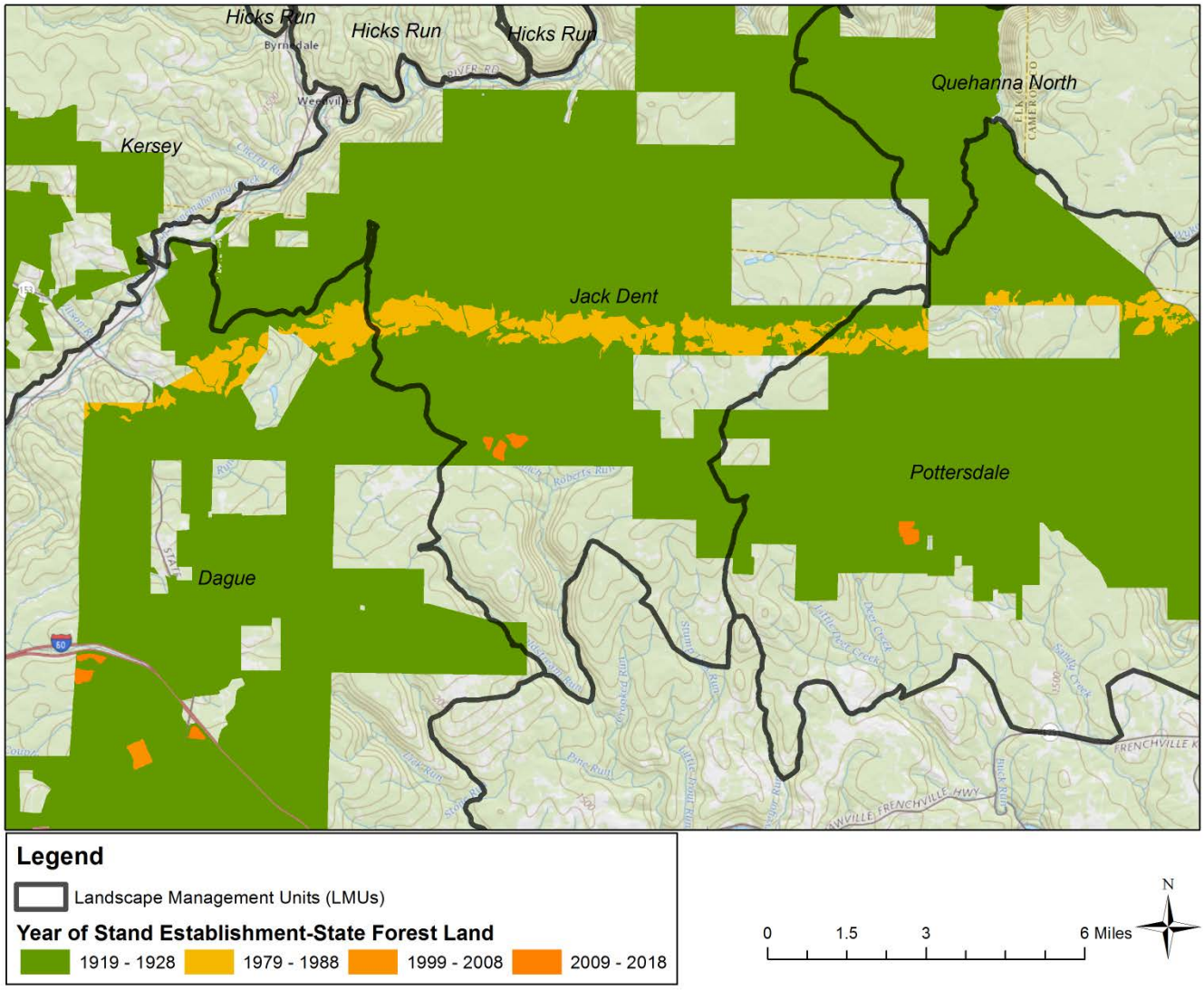


Figure 6. Map of establishment year for stands on state forest land, illustrating the homogenetiy of age classes and the unique pattern of young forest created by the 1985 tornado.

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	3
High Quality Waters	172
Perennial Cold Water Streams	37
Exceptional Value Waters	9
Wilderness Trout Streams	0
Human-made Impoundment/ Pond	0

Natural Lake/ Pond	0
Total	**222**

The major streams in this LMU include: Little Medix, Medix Run, Saunders Run, Sullivan Run, Mix Run and Miller Run. This LMU has many miles of high quality streams. Water quality and headwater protection will be a priority when considering management actions in this LMU and the district will look for opportunities to enhance and protect aquatic habitats.

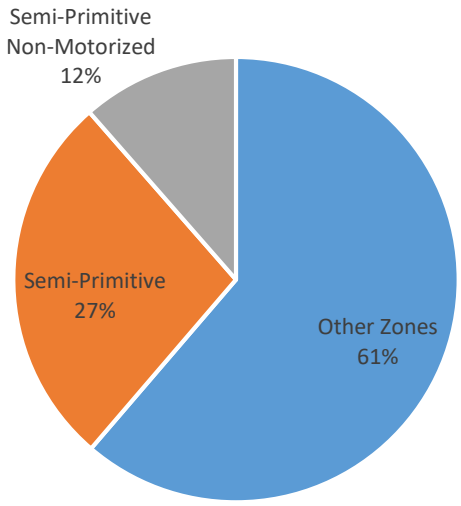
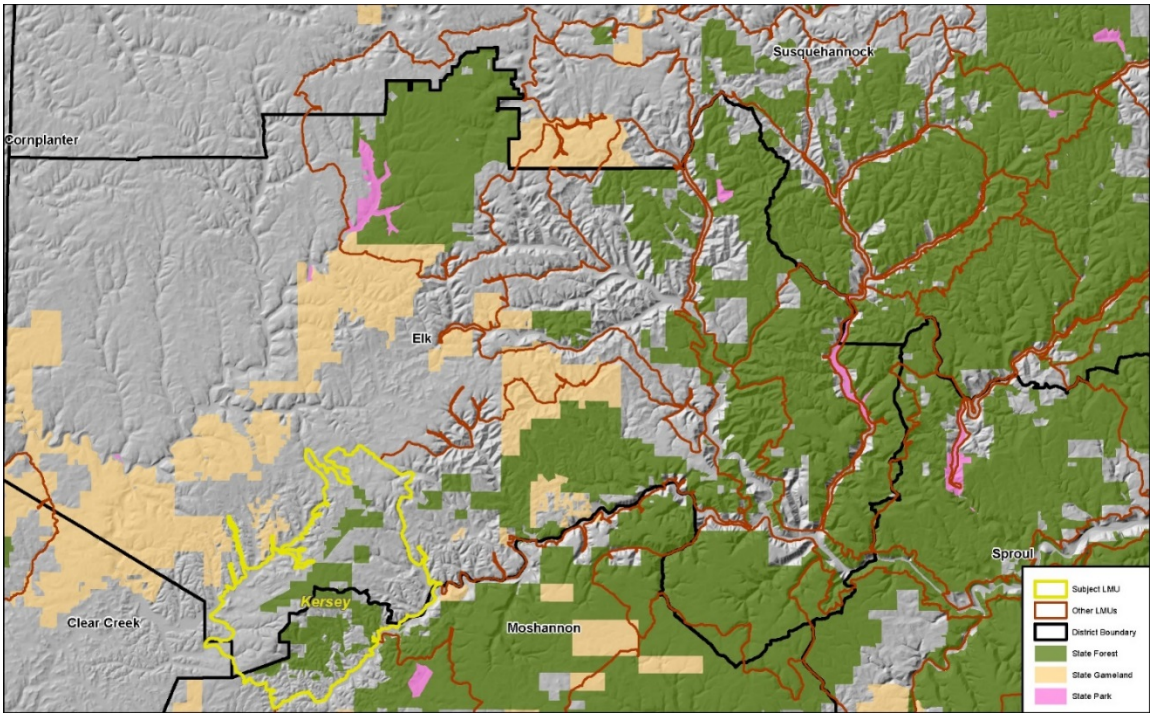


Figure 7. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS, 2012) classifications. ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers to Semi-Developed and Developed zones.

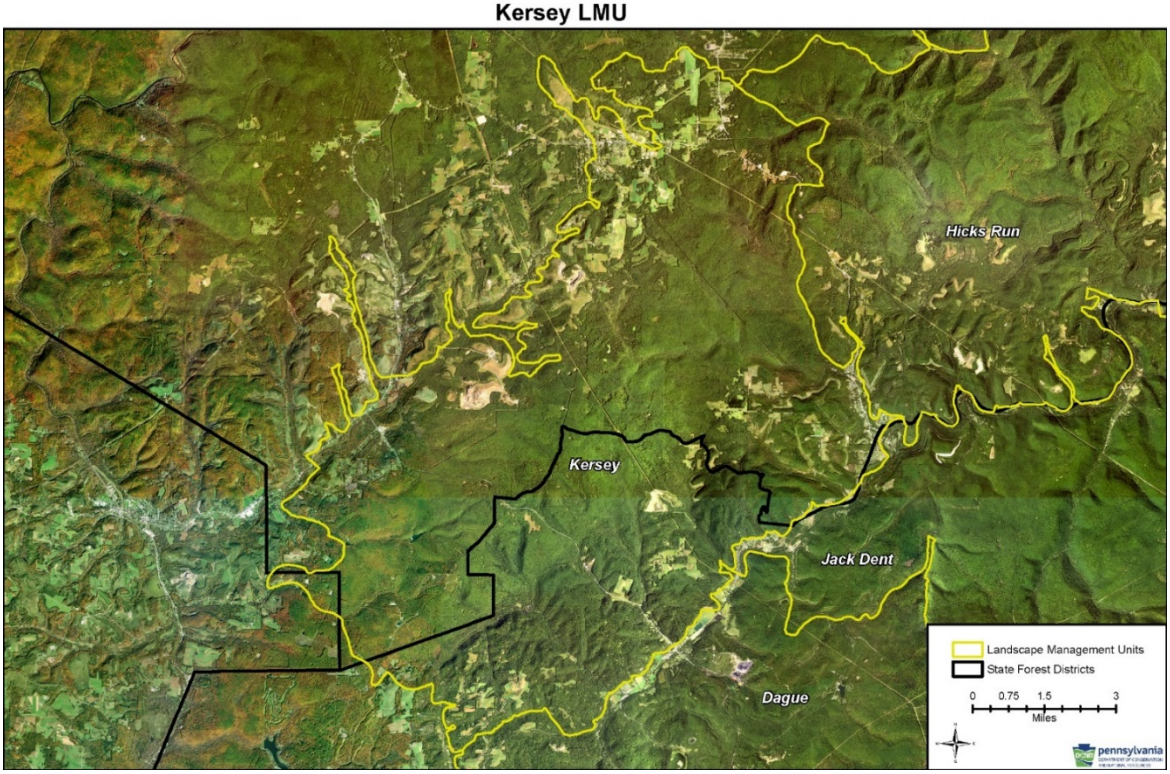
There is a large amount of acerage of semi-primitive non-motorized area in the LMU. An effort will be made to maintain these areas for their current recreational uses and not open them to public access by vehicle.

Kersey

Landscape Management Unit



Kersey LMU



Overview

The Kersey LMU is approximately 62,992 acres in south central Elk and north central Clearfield counties. Most of this area is within the Pittsburgh Low Plateau ecoregion. Only about 25% of land is state forest land, with the rest being private, large timber industry or conservancy properties. The non-state forest land within the LMU is a mix of forestland and open fields made up of many small communities, rural houses, and camps. The fields are a mix of reclaimed strip mines, old farms, and some active farms. Also within the LMU is a 1,200 acre landfill and 307 acre Boy Scout Camp. This state forest land is divided between the Elk and Moshannon State Forests. The Elk State Forest has 6,438 acres or 10% of the land area and the Moshannon State Forest has 9,315 acres or 15% of the land area. Within the Elk State forest there is a 510 acre parcel with a timber rights reservation until 2035. There are two state forest leased camps on the Elk State Forest portion and no state forest leased camps on the Moshannon State Forest portion. The ridge along Boone Mountain Road and Kersey Road contains numerous communication towers and formerly contained a state forest fire tower. A municipal water authority owns and manages a large parcel within the LMU. The LMU is bisected by four major transportation corridors: US Route 219, PA Route 153, PA Route 255 and PA Route 948. Several ecologically important species and communities exist within the LMU, including timber rattlesnake, creeping snowberry, and hemlock-mixed hardwood palustrine forest.

The majority of the forest types within this LMU are oak/hickory with isolated stands of northern hardwoods and hemlock in the valleys. Most of the area was cut over in the late 1800's to early 1900's. The Bureau has conducted mostly salvage timber sales starting in the 1960's and larger regeneration timber sales since the 1980's and continues to conduct timber sales today. Many of the early bureau timber sales were salvages for oak leaf roller and gypsy moth. Today most timber sales are regeneration harvests. Timber harvest and management will continue into the future.

Oil and gas rights are severed on nearly all of the Elk State Forest portion and subleased to another company. There has been both conventional and unconventional gas development within the LMU. There are fee simple, severed rights and leased oil and gas rights. There has been both conventional and unconventional gas development on private lands within the LMU. Throughout this LMU there is ongoing strip mining, evidence of past strip mining, and potential for more in the future. There is also evidence of old deep mine shafts within the LMU. Many of the historic strip mines and deep mines have been reclaimed as part of the initiative to clean up the Bennett Branch of the Sinnemahoning Creek. Watershed and riparian buffer management, as well as acid mine drainage reclamation projects, are well suited to this LMU because of the large impact they can have.

Priority Goals

a) Continue to work with surface and subsurface owners and lease holders of timber and natural gas (Seneca Resources, EQT, EOG, Rosebud Mining Company, and Forest Investment Associates) on management challenges, such as rehabilitation/abandonment and invasive species management.
b) Continue to develop relationships with adjoining landowners to state forest land including Seneca Resources, Western PA Conservancy, Pa Game Commission, Boy Scouts of America and Green Tree Landfill. These relationships will be beneficial in wildlife projects, invasive species management, and public education of best management forestry practices.
c) Maintain and enhance ecological important species and communities, including timber rattlesnake, elk, creeping snowberry and hemlock-mixed hardwood palustrine forest. Two wetlands, Four Points and Kersey Swamp, are sites that should be protected because of the unique plants and animals they harbor.
d) Develop and implement a strategy to control illegal ATV and other off-road activity.
e) Continue to development relationships with owners of inholdings in the area. Strategically acquire land inholdings and indentures within the LMU as they become available to create a more contiguous tract of state forest land.
f) Take advantage of abundant regeneration and accessibility to harvest timber, including emphasis on harvests in lower quality sites or limited zones to meet landscape and ecosystem management goals.
g) Use artificial regeneration to reforest the abundance of reclaimed strip mine land.

Profile

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

	Acres
State Forest Land	15,753
LMU Total	62,992

Ecoregion: Pittsburgh Low Plateau

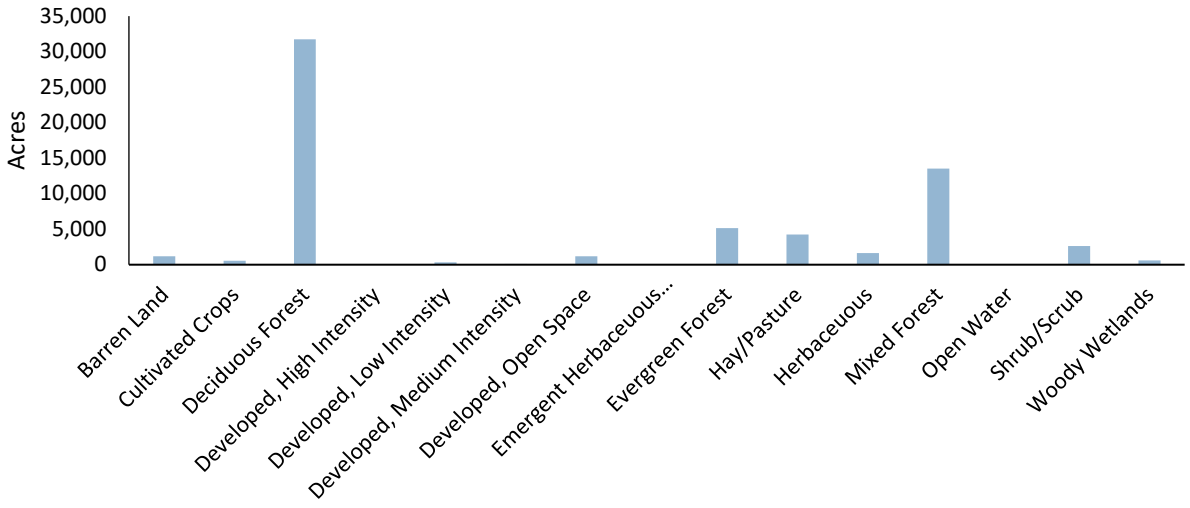


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

The majority of the LMU is made up of deciduous forest with a variety of other forest types.

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
Public Use Road	23
Drivable Trail	1
Administrative (gated) Road	45
Total	**69**

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	2
Biking	2
Equestrian	0
X-Skiing	0
ATV I	0
ATV II	0
Snowmobile/ Joint Use Road	6

The majority of the roads are for administrative use and there are very few trails within the LMU. The main public use roads that run through this LMU, Boone Mountain and Four Points Roads, are owned and maintained by townships.

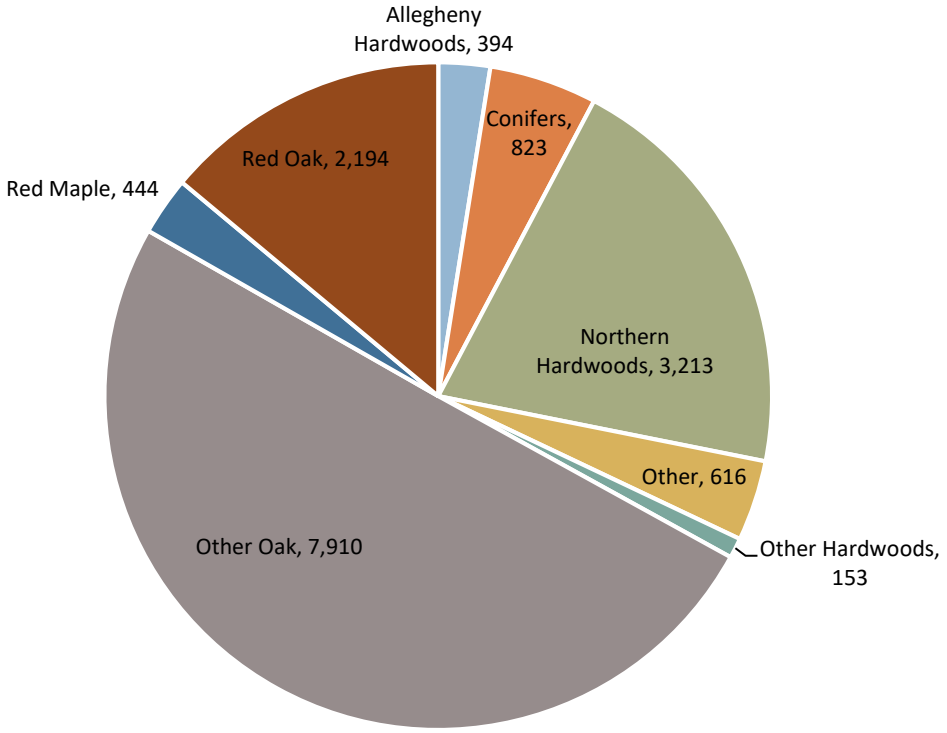


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

The majority of the forest types are other oak with several other types present in the LMU.

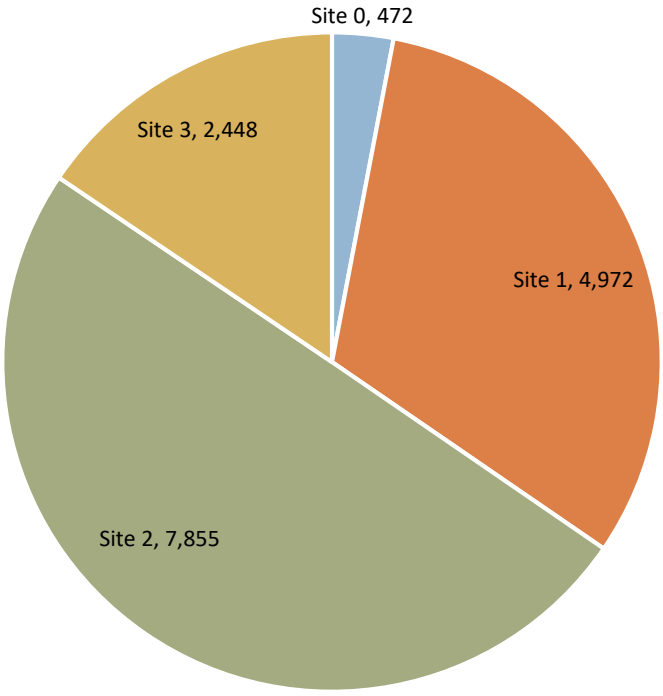


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

The majority of the LMU is Site 2 with the presence of all other site classes.

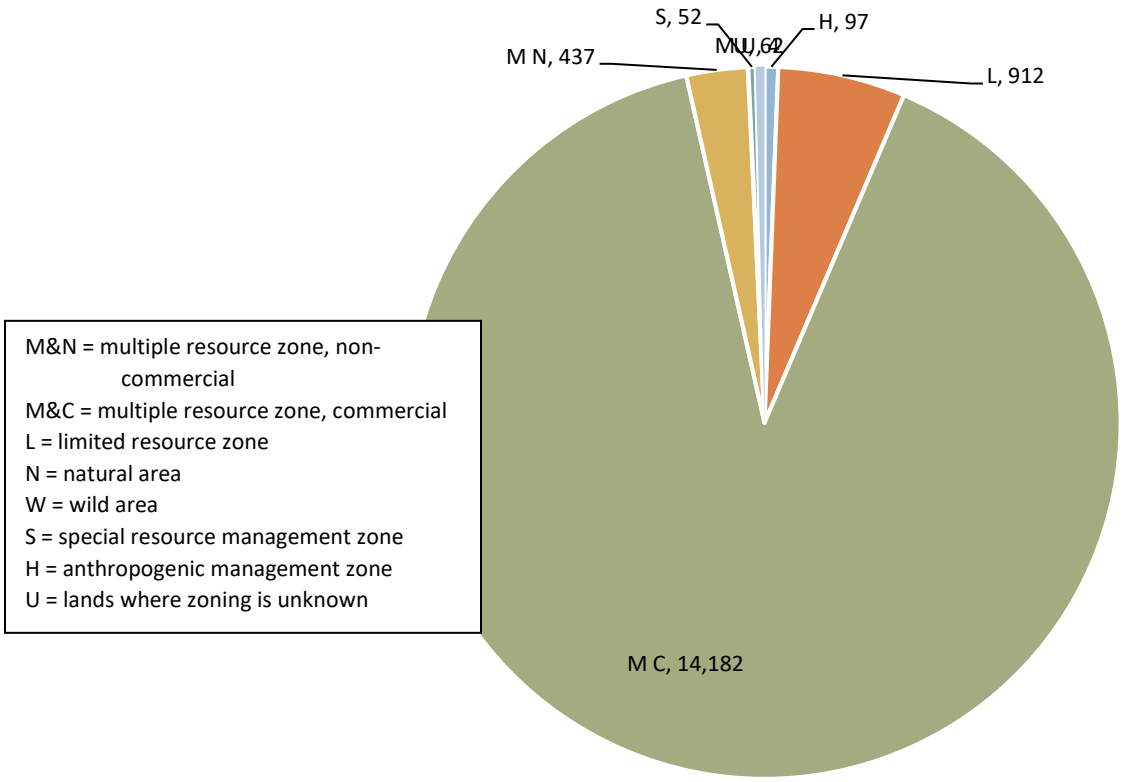


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

The majority of the LMU is zoned multiple-use and commercial with small areas of other zonings.

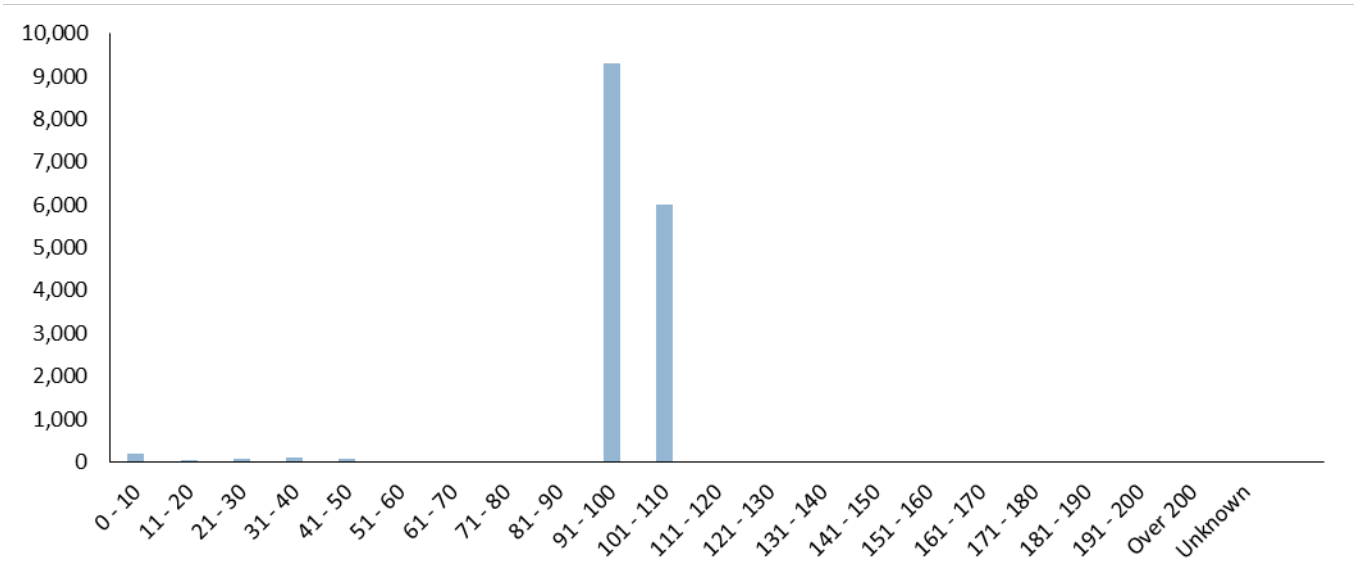


Figure 5. Acres of state forest land in this LMU by forest age classes.

The majority of the forest in this LMU is between 91 and 110 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.

Class	Total (miles)
Undesignated	7
High Quality Waters	27
Perennial Cold Water Streams	112
Exceptional Value Waters	22
Human-made Impoundment/ Pond	0
Total	**168**

The majority of the streams within the LMU are perennial cold water fisheries.

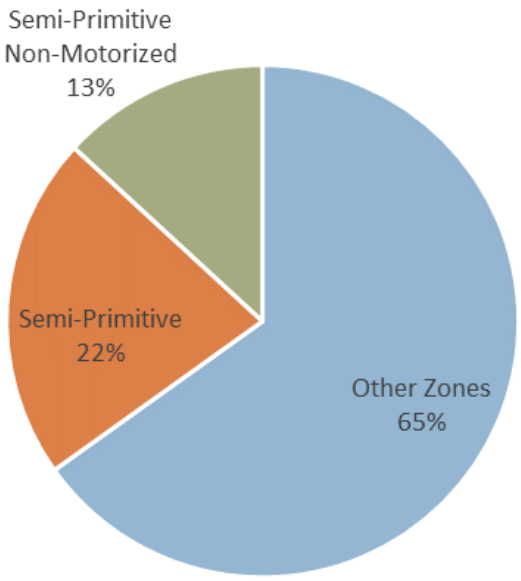


Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers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

The majority of the LMU is zoned "other" due to is accessability and proximity to roads.

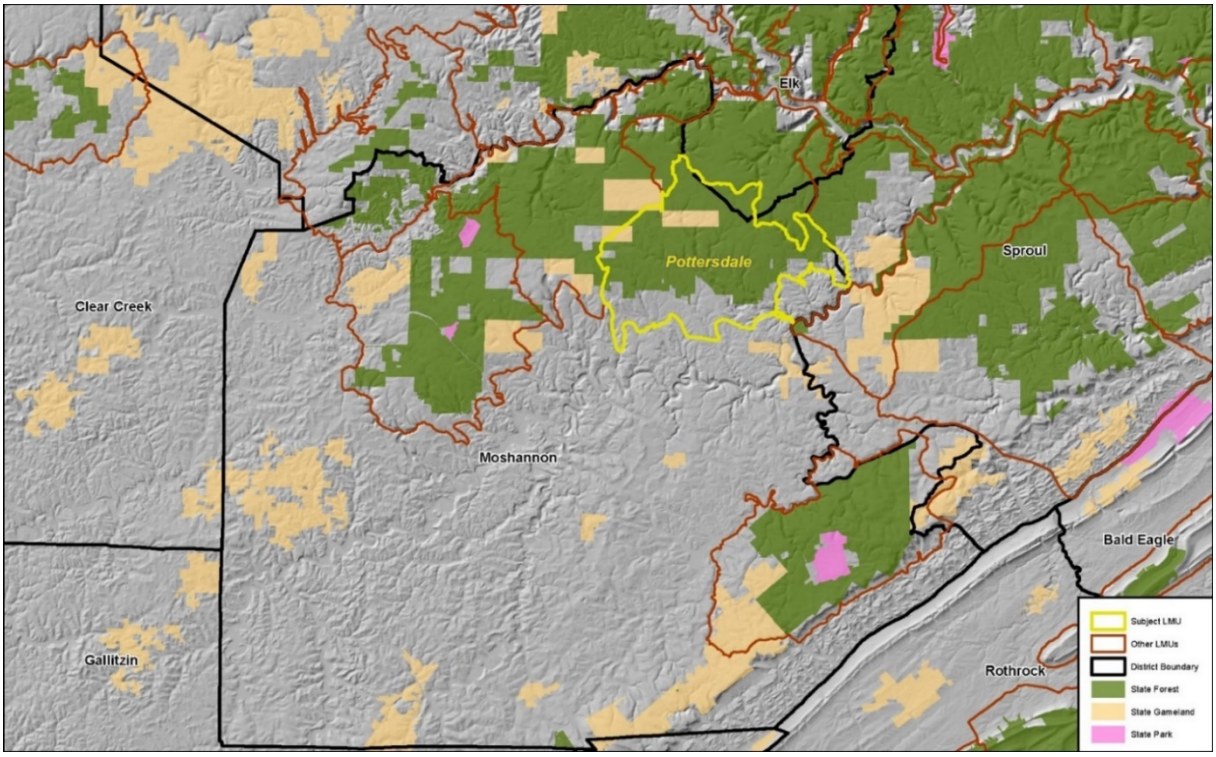
Table 5. Gas rights ownership, by acres, on state forest land of the LMU.

Fee_Simple_or_Unknown	Leased	Severed_Rights
2,877.61	1,986.96	11,143.65

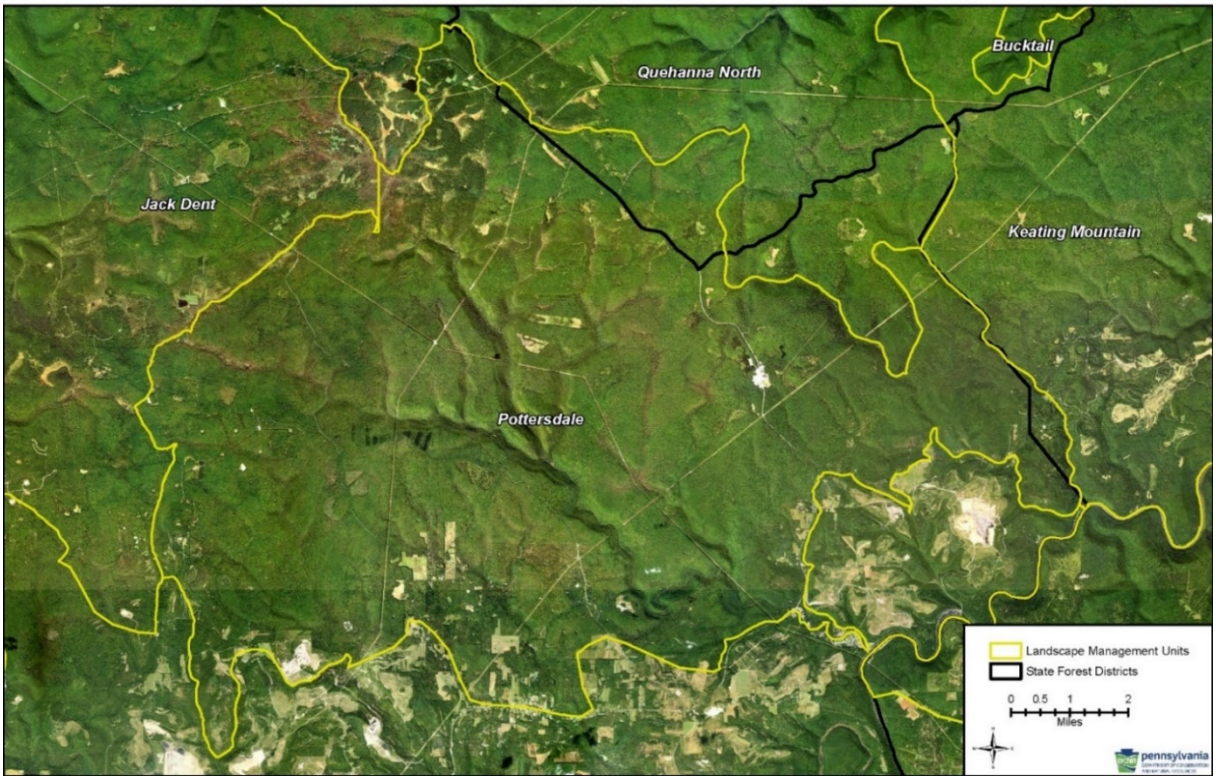
The majority of the gas rights are severed rights.

Pottersdale

Landscape Management Unit



Pottersdale LMU



Overview

The Pottersdale Landscape Management Unit (LMU) is 64,960 acres and includes state forest land, State Gamelands 34, and private land. The LMU is located on the Pittsburgh Low Plateau ecoregion with its deep valleys draining towards the head of Mosquito Creek. The Allegheny Plateau in this landscape has a large number of oak flats mixed with maple and northern hardwoods. Early on in history, the land was part of the Seneca Tribe territory of the Iroquois Nation. The Sinnemahoning Trail just outside the LMU is known as an old Native American trail. Following the European settlement, the area became a popular spot for trappers specifically along the Bennetts Branch to the north which led to the settlement of towns along the waterway. The town of Karthaus to the east of the LMU was established with a boom in the iron ore and was a main hub for the industry in the mid-1800s. Like most of the region, the LMU had extensive logging during the turn of the twentieth century. Today, the Pottersdale LMU is rather remote, with a score of 94 on the core forest index.

The LMU contains roughly one half of the Quehanna Wild Area (QWA), which is divided between Moshannon and Elk State Forests. The Quehanna Wild Area was established in 1965 following the industrial development of the Curtiss-Wright Corporation facility that was a vision of the “Atoms for Peace” initiative. This project occurred in the 1950s and 1960s and the facility contained a reactor site that was used for nuclear jet engine research and testing, among other product development. Prior to this development, the area was very remote and difficult to traverse by motor vehicle.

Timber harvesting occurs in this LMU outside of the Quehanna Wild Area and mostly on the upper flats. This LMU is diverse with several heavy mountain laurel areas, and different forest community types mostly made up of oak species. The area has suffered infestation from oak leaf roller and gypsy moth on several occasions which initiated salvage timber sales. The tornado of May 31, 1985 also impacted areas of this LMU, as well as a subsequent wildfire that helped to create some pockets of aspen stands. The aspen stands, several open areas, and food plots are managed for wildlife, including elk, and nearby Gamelands 34 is managed by the Pennsylvania Game Commission (PGC) also contains several food plots and browse cuts.

Oil and gas rights are mixed with 7,476 acres in leased tracts, 1,151 acres with severed rights, and the remainder of owned fee simple by the bureau. There has been sparse gas development in the LMU, and there are several pipelines and various gas infrastructure throughout the LMU.

The Pottersdale LMU also has a variety of recreation opportunities, such as hiking, including a large part of the Quehanna Hiking Trail, shared-use trails, snowmobile joint-use roads, and wildlife viewing. Yellowsnake Camping Area in the Quehanna Wild Area provides motorized campsites, from which visitors can access numerous trails. Beaver Run Wildlife Viewing Area is located on the western edge of the LMU and includes one of two shallow water impoundments on Moshannon State Forest. This LMU is heavily utilized by elk year round and is location within elk hunt zones 10 and 12. This LMU contains three Natural Heritage Areas: Twelve-Mile Run, Cole Run, and the Quehanna Right-of-Way Natural Heritage Area.

Priority Goals

a) To promote low-impact recreation and conservation of wild character on the Quehanna Wild Area.
b) Maintain opportunities for high use areas for hiking, mountain biking, and horseback riding.
c) Protect rare, threatened, and endangered species and habitats from impacts from forest uses and activities, specifically the unique wetland habitats that are found within this LMU.
d) Continue to work with PGC to maintain and enhance food plots for elk habitat and wildlife viewing recreational opportunities. Because this LMU is part of the Elk Management Supra Area, the LMU-specific guidance found in the Bureau's Elk Management Plan will be considered for planning and prioritizing habitat management actions.
e) Maintain water quality of High Quality and Exceptional Value streams for ecosystem health and fishing opportunities and assess streams for opportunities for aquatic habitat improvement projects, such as the addition of large woody material to streams.
f) Take advantage of the abundant oak regeneration and ease of access in the southern portion of the LMU by focusing timber harvest efforts here.
g) Continue to monitor for invasive plants and work with gas companies to address new populations within leased areas, especially poison hemlock, *Phragmites,* glossy buckthorn and Japanese knotweed. Develop a species list for Early Detection Rapid Response and enact this protocol on the LMU.
h) Maintain cooperative relationships with gas operators to minimize fragmentation, decommission conventional gas wells, and reclaim sites when needed.
i) Prioritize the maintenance of wild character and promote opportunities for primitive recreation experiences.

Profile

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

Pottersdale	Acres
State Forest Land	42,916 (40,178 in Moshannon SF, 2,706 in Elk SF, 32 in Sproul SF)
LMU Total	64,960

Ecoregion: Pittsburgh Low Plateau

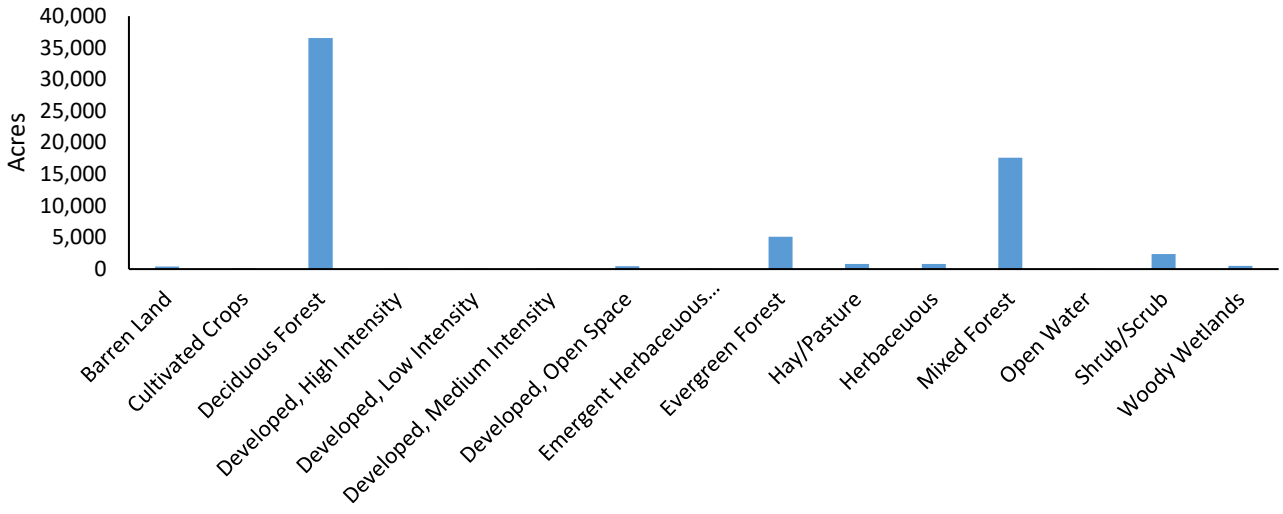


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

This LMU is mostly made up of a deciduous forest consisting of mostly a mixed forest type. There are patches of evergreen forest and understory herbaceous sites.

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
Public Use Road	42
Drivable Trail	16
Administrative (gated) Road	25
Total	**84**

These roads are maintained on a rotational basis and worked on when necessary. Public use roads in this LMU consist of Lost Run Road, Caledonia Pike, Billotte Road, Merill Road, and Ames Road.

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	72

Biking	16
Equestrian	35
X-Skiing	44
ATV I	0
ATV II	0
Snowmobile / Joint Use Road	9

These trails are maintained by volunteers and DCNR personnel. The Quehanna Trail would be the most used and most notable hiking trail in this LMU. The Erie Camp Trail and Black Powder trails are shared-use trails but used mostly for equestrian use.

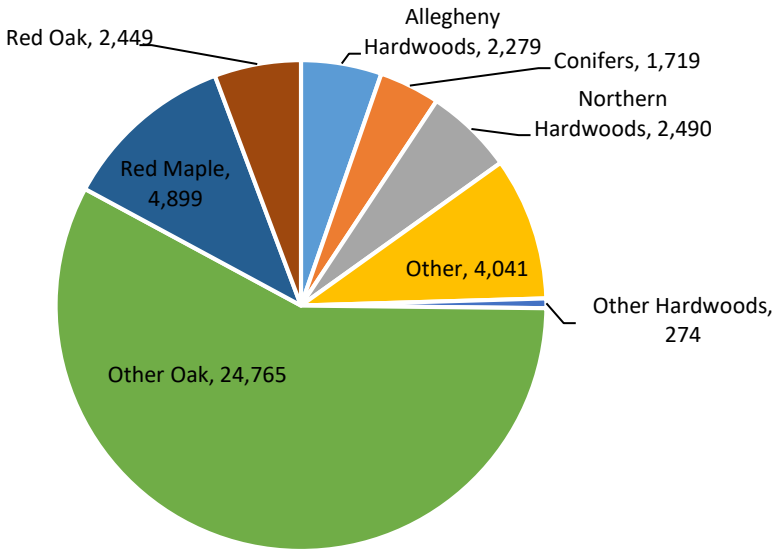
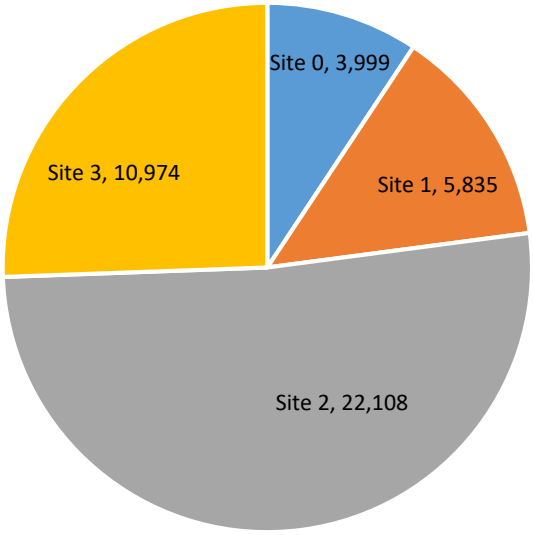


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

This LMU is mostly comprised of some type of oak component. The “other oak” is of mixed oak and dry oak heath.Management recommendations are created based on each stand and its unique features and management zoning.



Acreage: 42915.88

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.

There is an abundance of site 1 and 2, indicating that there is a potential for quality timber and perhaps opportunities to carry out some of the harvest targets set forth in the Bureau's Harvest Allocation Model.. Some of this acreage is located within the Quehanna Wild Area where timber harvest is not a standard practice, as the Wild Area manamgenet zone has more focus on water quality, connectivity, and primitive recreation opportunities. Nearly 4000 acres are not typed and will be addressed and updated as the district carries out it landscape exam inventory process, in which all stands are visited and assessed over a 15 year period.

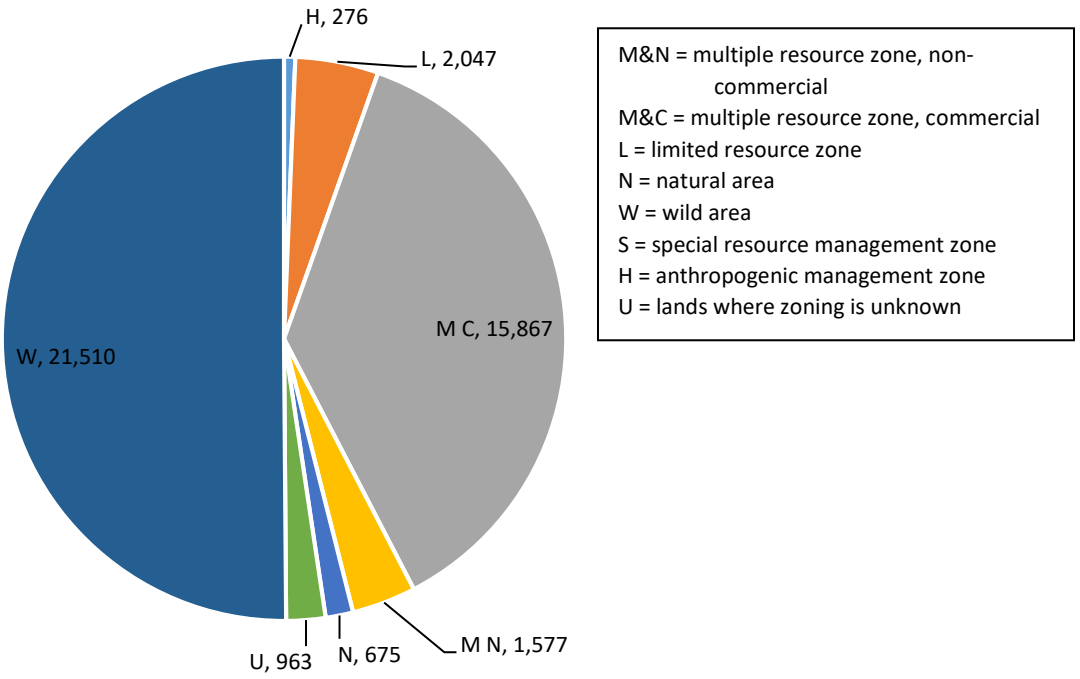


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

Over 50% of the Pottersdale LMU is considered noncommercial as a Wild Are zone, with the majority made up of the Quehanna Wild Area.

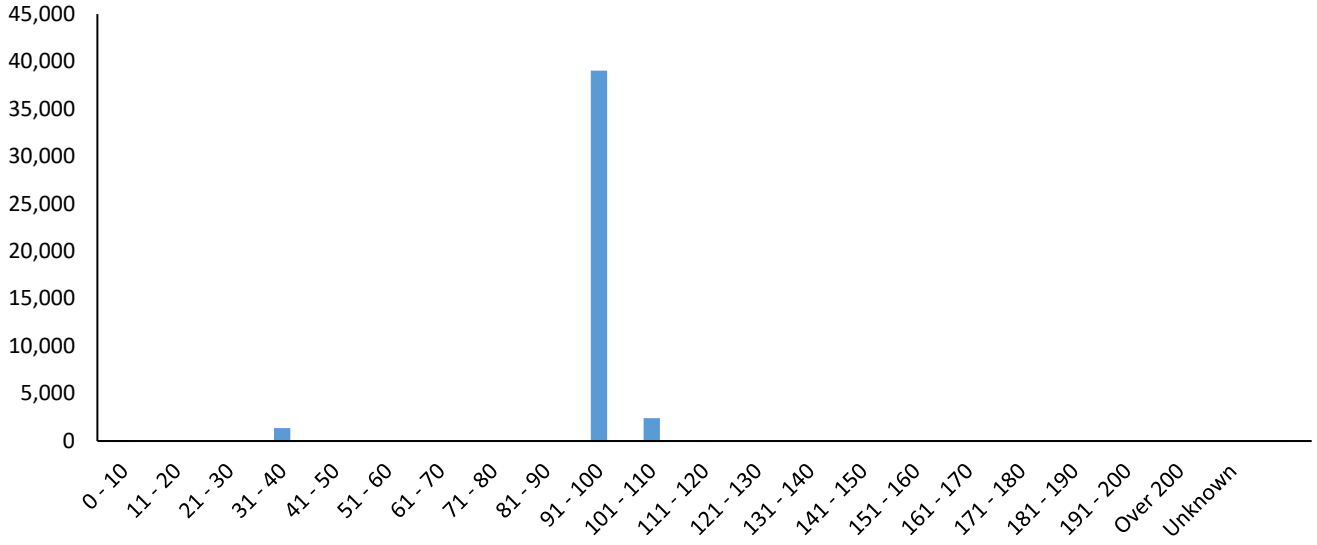


Figure 5. Acres of state forest land in this LMU by forest age classes.

Much of the acreage is found in the 91-100-year age class. This indicates a very homogeneous, mature forest. By following the targets set forth in the Bureau's Harvest Allocation Model over the coming decades, the intent is to create a more balanced age class distribution in order to provide a mosaic of habitat and structure across the landscape.

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)
Exceptional Value Waters	29
High Quality Waters	106
Perennial Cold Water Streams	39
Undesignated	14
Total	**188**

Our notable streams are Twelvemile Run, which is considered and Exceptional Value Stream, and Upper Three Runs and Wykoff Run are considered High Quality Water streams.

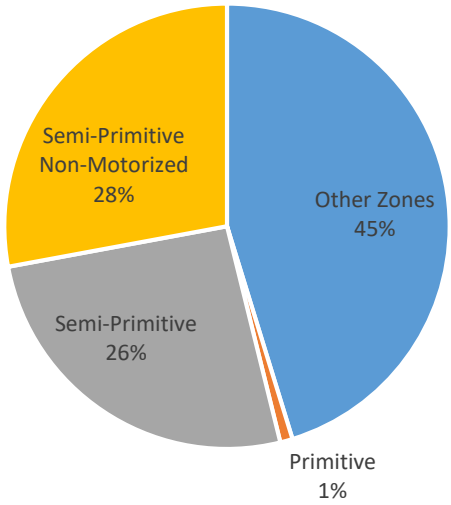


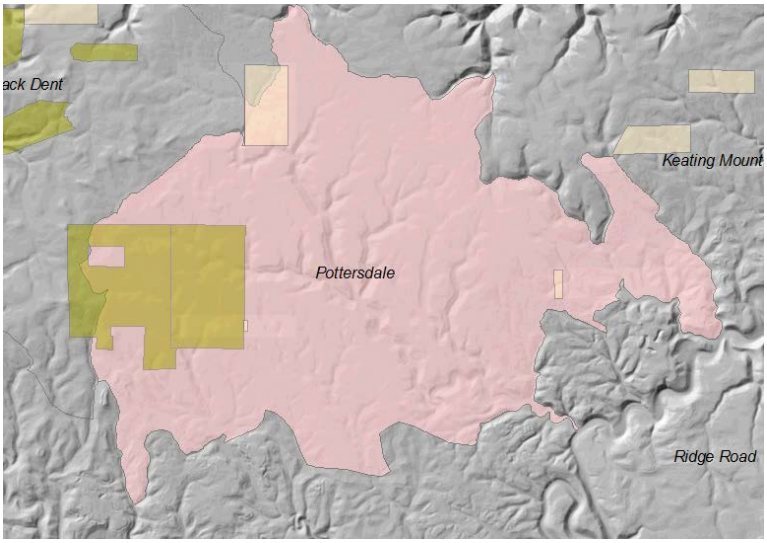
Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS, 2012) classifications. ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers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

These classifications are based on distance from state forest roads and guides the districts reacreational development. This area has a relatively large amount of Semi-Primitive, Non-Motorized acreage, suggesting that management for wild character and low-density recreation should be a high prioritiy in this LMU. The

small percentage of primitive acreage should be prioritized for protection from fragmentation and development where possible.

Table 5: Oil and Gas Mineral Rights broken down into Fee Simple, Leased, and Severed Rights. OGM Ownership is described on p. 162 of the 2016 SFRMP.

Fee Simple (pink)	Leased (green)	Severed Rights (beige)
34,695	7,195	1,093

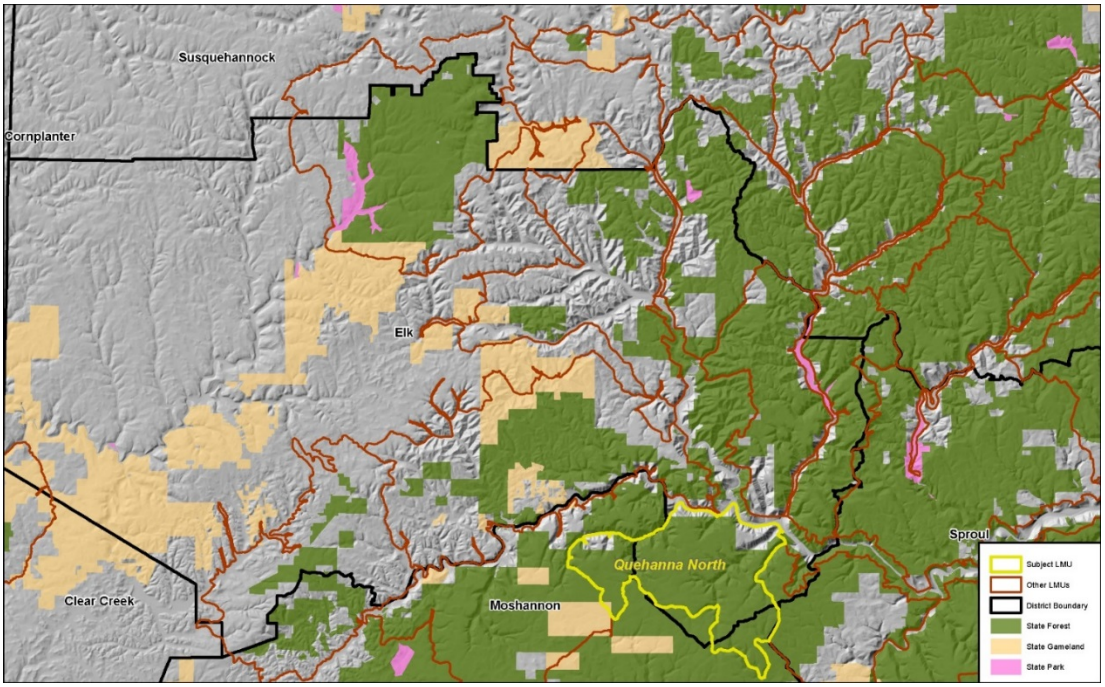


History of Quehanna Wild Area

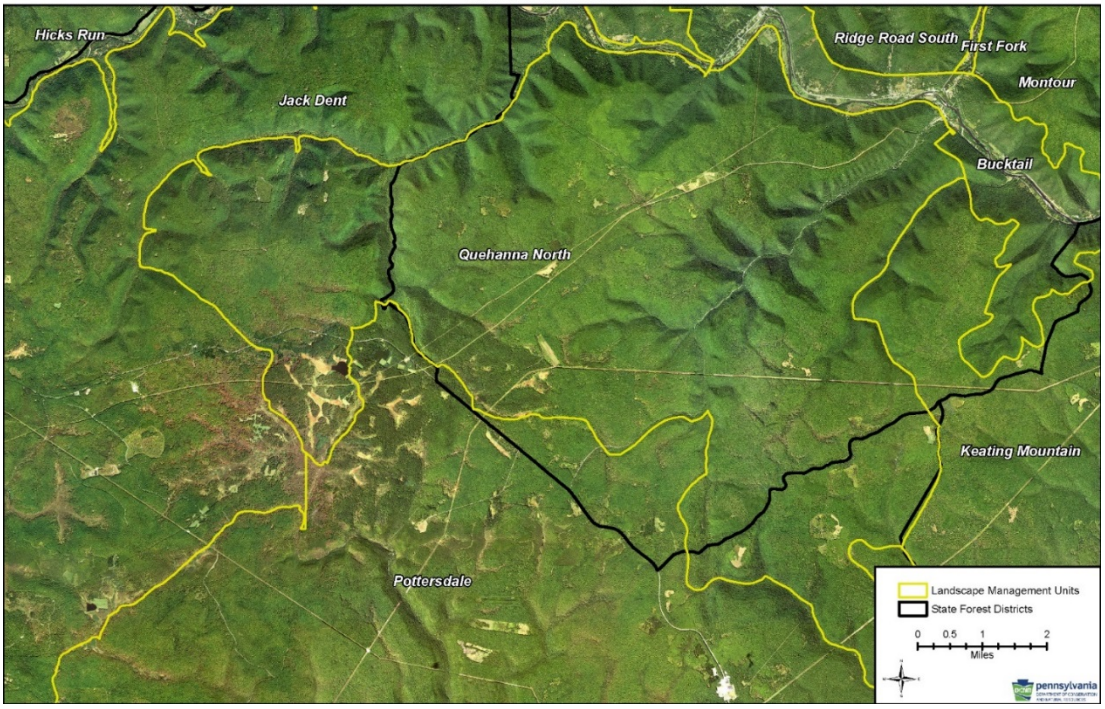
Remnants of the Corporation Dam and Blackwell Splash Dams that sent logs downstream to the West Branch of the Susquehanna River are still evident today. Hollows, streams and roads include the word “draft” in the name noting the draft horse teams that were used to extract the timber from the area such as in Chestnut Draft. Most notably, the LMU contains roughly one half of the Quehanna Wild Area (QWA) between Moshannon (FD09) and Elk (FD13) State Forests. The Quehanna Wild Area was established in 1965 following the industrial development of the Curtiss-Wright Corporation facility that was a vision of the “Atoms for Peace” initiative. The “Atoms for Peace” project that occurred in the 1950s and 1960s contained a reactor site that was used for nuclear jet engine research and testing among other product development. State Forest Leased Campsites were forced to permanently relocate outside of the containment area that the Curtis-Wright Corporation acquired for this initiative. The 16-sided perimeter around the nuclear reactor is the reasoning for the circular shape of the wild area. Prior to the development of the Curtiss-Wright Corporation Facility which included the construction of a two-lane black top road, the area was very remote and difficult to traverse by motor vehicle. Just outside the Quehanna Wild Area is Pennsylvania’s first Motivation Boot Camp called the “Quehanna Boot Camp”, created in the 1990s.

Quehanna North

Landscape Management Unit



Quehanna North LMU



Overview

The Quehanna North LMU is made up of slightly over 40,000 acres. The bulk of the land base in this LMU is forested land in southern Cameron County, but portions also fall into Elk and Clearfield Counties. This area is characterized by the confluence of two different ecoregions, Deep Valleys and Pittsburgh Low Plateau. This ecoregion change is not abrupt, but it does affect the timber types that appear on the landscape with oak stands becoming more dominant as you move farther south into the Pittsburgh Low Plateau ecoregion. Approximately 90% of the land, or 35,700 acres, is owned by the Commonwealth of PA and managed by the Elk or Moshannon State Forest Districts. This LMU encompasses multiple watersheds that are classified as High Quality, with the majority of them eventually draining into the Sinnemahoning Creek watershed.

The overriding factor in this LMU is the designation of over 28,000 acres of land as part of the Quehanna Wild Area. This area was once leased to the Curtis Wright Corporation for research on jet engines and nuclear propulsion. In 1966 the land was returned to the Commonwealth and was quickly designated a Wild Area through legislation. Large scale efforts to clean up the industrial infrastructure and waste were enacted and the area is now known for its extensiv e hiking and equestrian trail systems. Due to the wild area designation, motorized recreation and normal intensive timber management are not permitted. As the forest overstory ages due to the Wild Area policy prohibiting timber harvests, this will continue to differentiate the land base and associated wildlife found in this LMU from other areas of state forest land which have a larger percentage of early successional forest stands.

Although the Quehanna Wild Area is not actively managed for timber production, natural events such as a large tornado in 1985 and forest health issues like gypsy moth defoliations have created open areas and young forests. These areas have proven to be valuable for a wide array of wildlife, including song and game birds, deer, bear, and a growing elk herd.

This LMU is being managed primarily for non-motorized, primitive recreational activities. Even in areas where electrical transmission lines or natural gas pipelines already exist due to joint ownership, the goal is to keep human disturbance to a minimum and allow visitors to enjoy the forest's wild character.

Priority Goals

a) To continue enhancement of timber rattlesnake habitat (basking and den sites)

b) To provide adequate habitat for local elk populations (winter food sources) in cooperation with the PA Game Commission

c) Prioritize the maintenance of wild character and promote opportunities for primitive recreation experiences.

d) Maintain unique wild plant areas and uncommon forest communities native to this area.

e) To restore bat bunkers (jet engine testing sites), thus creating better bat habitat

f) To develop Noble-Chambers into an experimental forest for public demonstration

g) Protect M.K. Goddard - Wykoff Run Natural Area, particularly for research and protection of amphibians and reptiles, and Marion Brooks Natural Area. T

h) Attempt to eradicate Japanese knotweed from the Wykoff Run watershed, by enhanced monitoring efforts, prioritization of existing populations for control, and outreach to private landowners in the watershed.

i) Maintain pine plantations and naturally occurring mature conifer stands for nesting raptors.

PROFILE

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

	Acres
State Forest Land	35,675
LMU Total	40,080

Ecoregion: Deep Valleys and Pittsburgh Low Plateau

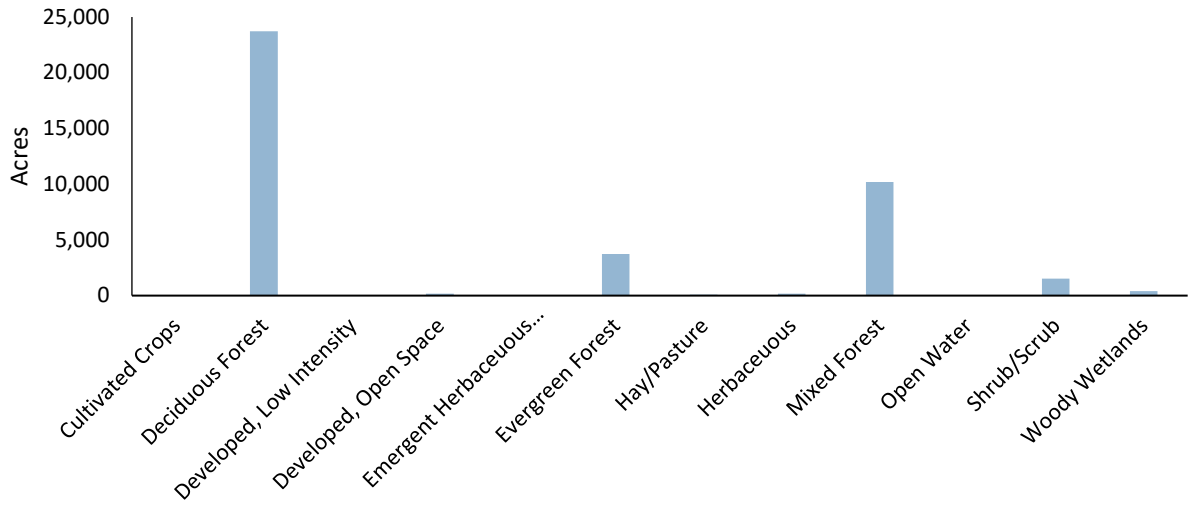


Figure 1. LMU acreage by land cover categories from the National Land Cover Dataset for the entire LMU.

Deciduous forests account for approximately 23,719 acres of the Quehanna North LMU.

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
Public Use Road	32
Drivable Trail	4
Administrative (gated) Road	39
Total	**76**

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	82
Biking	18
Equestrian	23
X-Skiing	35
ATV I	0
ATV II	0
Snowmobile/ Joint Use Road	0

Public use roads (maintained by local townships) include Jerry Run Road (to the east) and Hoover Road (bisecting the LMU). Red Run Road (maintained by the Elk State Forest) is located on the western edge of the LMU. Wykoff Run Road (maintained by PennDot) follows the Wykoff Run stream corridor from SR 120 to the Quehanna Highway.

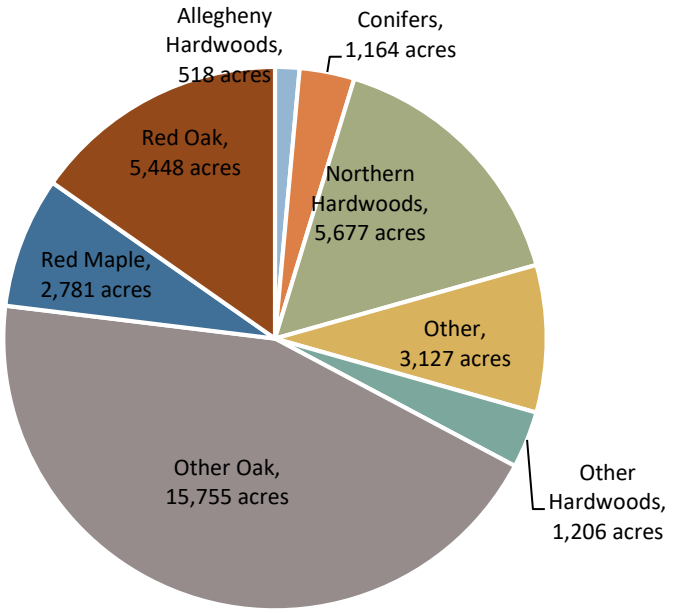


Figure 2. Acreage of state forest land in this LMU by aggregated forest type. The forest types are described on p. 108 of the 2016 SFRMP.

A wide array of tree species can be found in the Quehanna North LMU. Forest type is dependent upon ecoregion (in this LMU's case, either Pittsburgh Low Plateau or Deep Valleys). Within a given ecoregion, site, aspect, and elevation all factor into which forest type is found there.

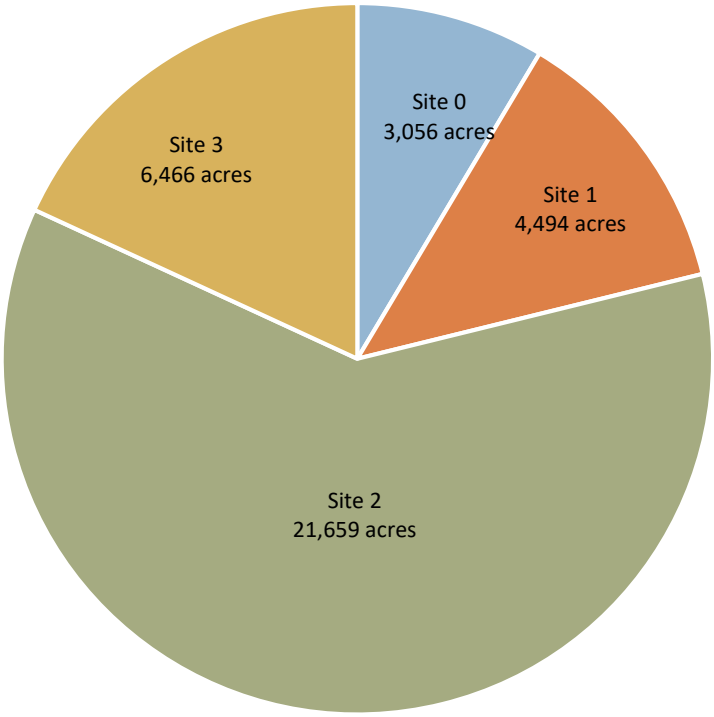


Figure 3. Acreage of state forest land in this LMU by site class. Site classes denote the potential quality of the growing site. "Site 0" indicates non-forested lands or forested lands where the vegetation has not yet been typed. Other site classes are described on p. 53 of 2016 SFRMP.

Site Class 2 accounts for 61% of the acres in the Quehanna North LMU. Site class is a measure of site productivity based on tree growth. Site Class is measured from 0 to 3, with Site Class 1 being the most productive and 3 being the least. Site Class 0 is considered a severely understocked site or a location where tree growth is not possible or acceptable.

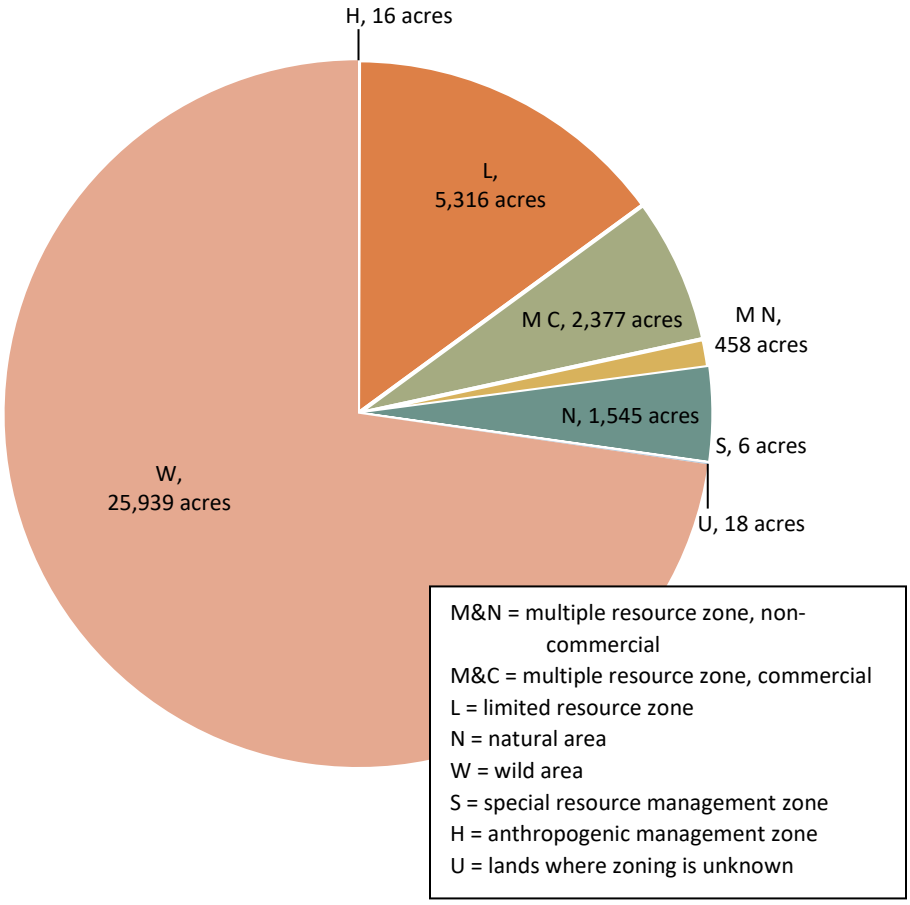


Figure 4. Acreage of state forest land in this LMU by management zone. Management zone is dictated by primary land use and land capability. Further descriptions of commerciality and zoning are found on p. 54 of the 2016 SFRMP.

73% of the Quehanna North LMU is zoned as a Wild Area. A Wild Area is meant for low-impact, non-motorized public use. Development of a permanent nature, including timber management activities, is not permitted. The other major chunk of the Quehanna North LMU is zoned as a Limited Resource Management Zone. Here, management options are limited due to site quality and topographic restraints.

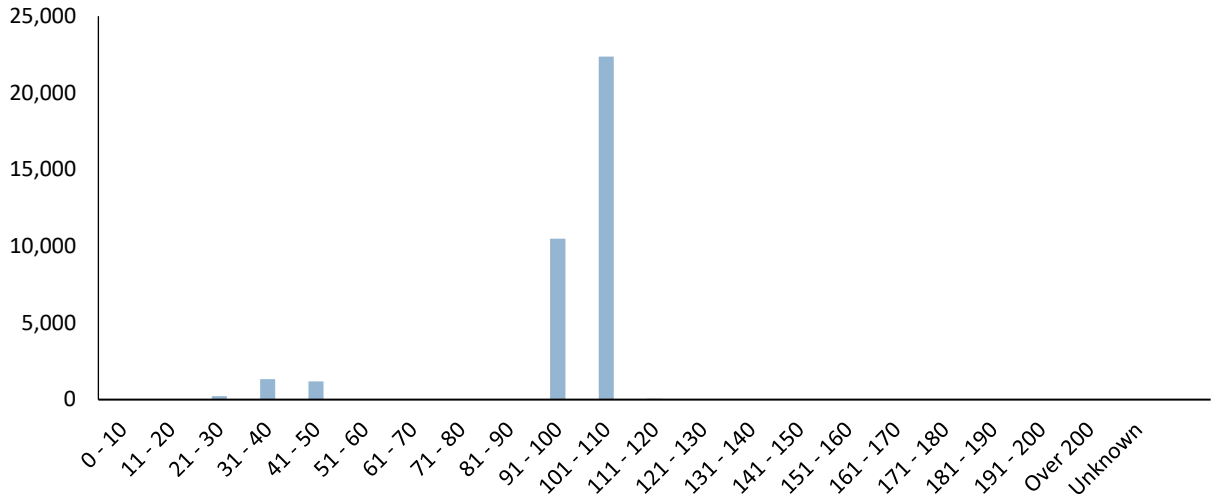


Figure 5. Acres of state forest land in this LMU by forest age classes.

32,861 acres (of the 35,700 total state forest acres in the LMU) fall into the 90 to 110 year Forest Age Class Distribution. The above graph is a good depiction of the forests that resulted from the widespread logging events that took place in the early 1900's.

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)
High Quality Waters	82
Perennial Cold Water Streams	4
Exceptional Value Waters	1
Wilderness Trout Streams	0
Total	**87**

The Quehanna North LMU contains many miles of mountain streams. The Wykoff Run, Mix Run, and Red Run drainages, each having numerous tributaries, contribute to most of the land area in this LMU.

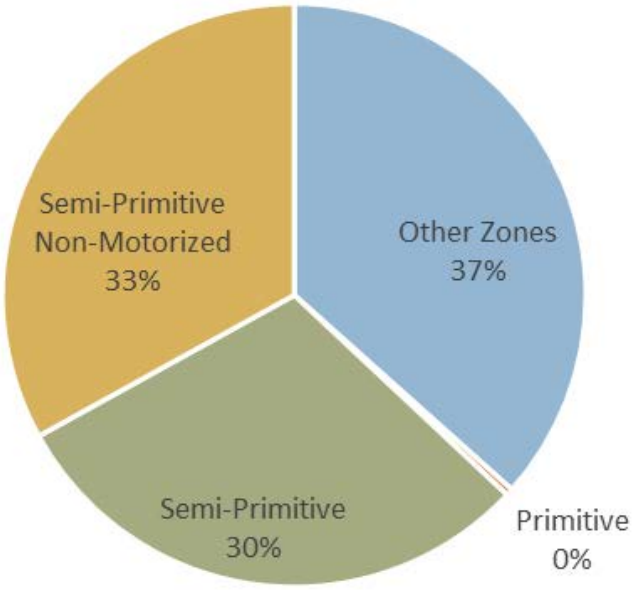


Figure 6. Acres of state forest land in this LMU by Recreation Opportunity Spectrum (ROS) classifications (2012). ROS is an inventory system developed by the U.S. Forest Service, to characterize land by types of recreation experiences. ROS is described on p. 42 of the 2016 SFRMP. "Other Zones" refers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

37% of the Quehanna North LMU is zoned as Other. The zoning in this LMU is determined by the land's relationahip to the road systems within its boundaries.

Glossary of Terms and Acronyms

Terms:

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.

Acronyms:

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