

Moonlight Forestry Consulting

Michael C. Eckley, CF
97 FR Aumiller Lane
Jersey Shore, PA 17740

May 16, 2019

Farm Number:
Tract Numbers:

Dear Mr. and Mrs. John and Catherine Smith:

Please find within your *Pennsylvania Natural Resource Conservation Service, Environmental Quality Incentive Program, Conservation Activities Plan 106 Forest Management Plan* for your 68-acre property known formally as 'ChicoryLane'. The tract encompasses a portion of 'valley ground' located between the small communities of Spring Mills and Millheim. It lies approximately 17 miles northeast of State College (as a crow flies) and is accessible by way of Brush Mountain Road which connects to PA Route 192 and PA Route 45 within the Penns Valley region of Centre County. It is a pleasure to know that the Smith family has a true interest in sustainable forest management and that you are collectively working to formulate well integrated, viable 'ecological-focused' strategies to provide good stewardship to this property into the foreseeable future.

In this plan, there are two basic components. The first is your personalized management plan based upon your objectives for managing the property. The second component is a small library of information to help you with your management decisions. All of the recommendations within this plan are for your consideration. You may do as much or as little as you desire.

I hope you find this plan and associated materials to be interesting, informative, and helpful in attaining your goals and objectives. If you have any questions or comments please feel free to contact me at any time.

Sincerely,



Michael C. Eckley, CF
Moonlight Forestry Consulting
97 FR Aumiller Lane
Jersey Shore, PA 17740

PENNSYLVANIA CAP 106 FOREST MANAGEMENT PLAN

Location: Between the boroughs of Centre Hall & Millheim; 17 miles NE of State College
Latitude 40.87574° North
Longitude 77.54832° West

This CAP 106 Forest Management Plan was designed to help guide the management activities of the natural resources on your property. The plan is based upon the objectives you have defined as being important to you. All project recommendations are for your consideration.

GOALS YOU IDENTIFIED FOR MANAGING YOUR PROPERTY INCLUDE:

1. Promote Ecological Diversity to Enhance Ecosystem Function and Resilience
2. Protect Unique & Natural Areas that may include RTE Species
3. Enhance Wildlife Habitat for Improved Recreational Opportunities
4. Manage for a Scenic and Healthy Forest
5. Improve Understanding of Historic and Cultural Resources

INTRODUCTION:

The land management actions of woodlot owners are becoming more important all the time because land is being divided into smaller and smaller parcels. In the mid-Atlantic region, at least 2/3 of forest landowners own 25 or fewer acres. Similar trends in land ownership are seen throughout the country. This means that more landowners than ever before are playing an important role in managing the land resource. Surveys show that people own woodland properties primarily for quality-of-life issues. They want to enjoy wildlife and scenery, have more privacy, feel a part of the land, and work outdoors towards a goal. Many people who own land feel a responsibility – a sense of stewardship – to take care of the land so that it will be fruitful for future generations. When we view land and nature as a larger community of which we are just a tiny part, we tend to have more respect for the land. The naturalist and author Aldo Leopold wrote, “We abuse land because we regard it as a commodity belonging to us. When we see the land as a community to which we belong, we may begin to use it with love and respect”.

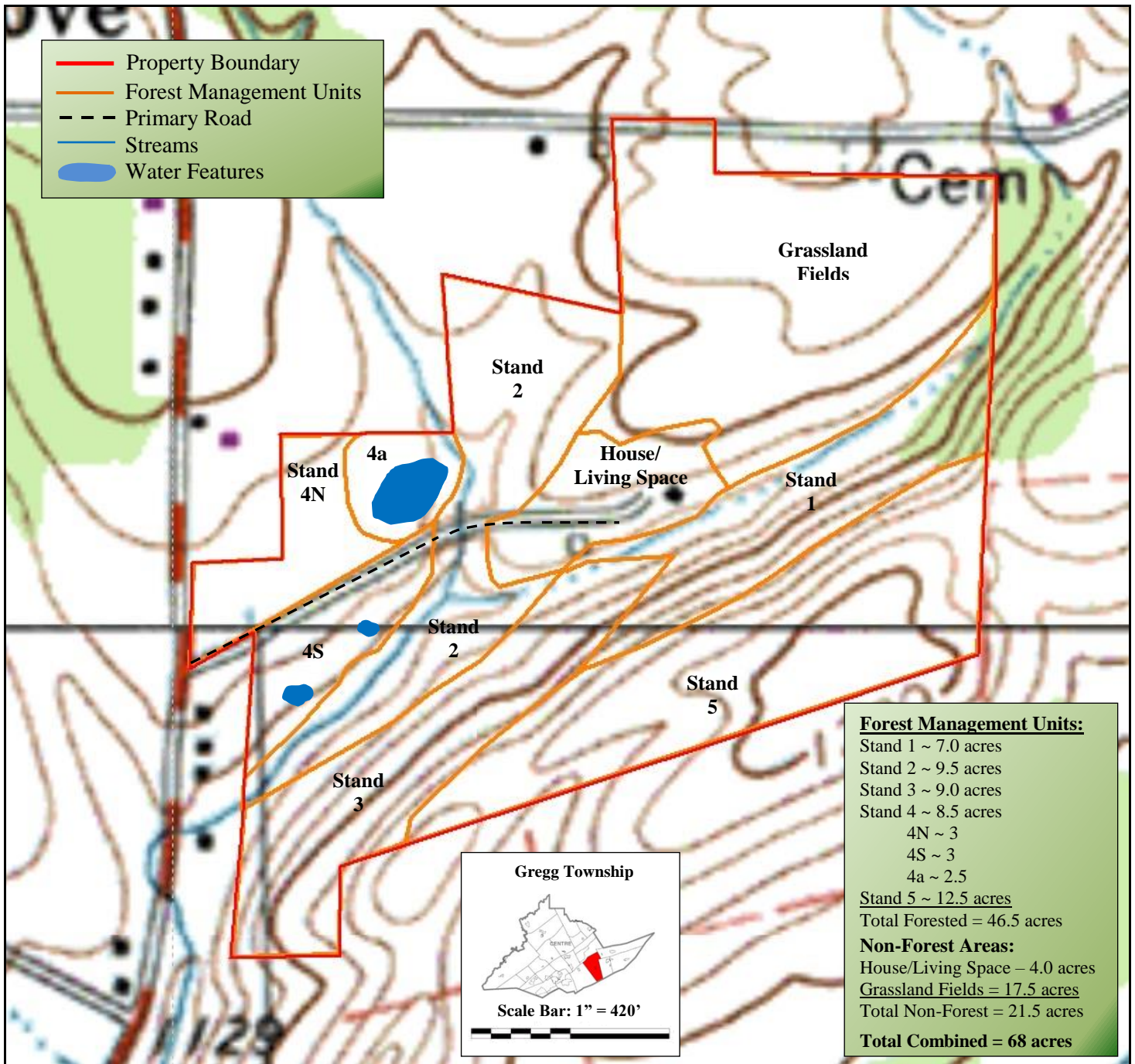
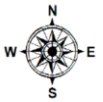
This forest management plan serves as a “blue print” to help guide the Smith family along with those who have a vested interest in managing the forested portions of the property to meet primary goals and objectives. This plan is based on the examination of approximately 45 acres of a mix of upland hardwood and conifer forest and bottomland shrubland located in south-central Centre County, Gregg Township, Pennsylvania. Management recommendations are given on the following pages. Tract maps (aerial and topographic) along with a soils map have been created and are located at the front of this book. You’ll want to reference the maps as you read through the plan. Your property boundaries are outlined in RED and within your ownership your woodlots have been broken down into stands or forest management units, which are outlined in ORANGE.

Boundaries and acreages are estimates derived from Google Earth aerial photography and Terrain Navigator mapping software.

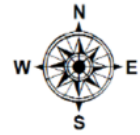
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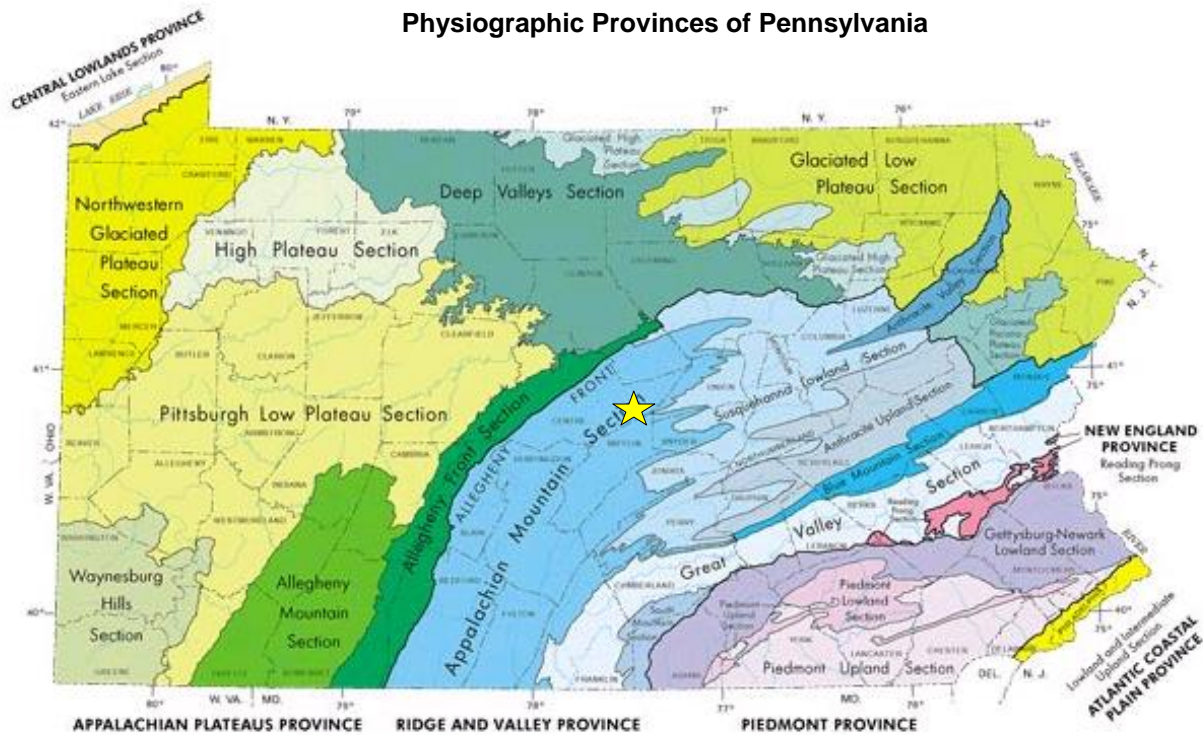
ChicoryLane Topographic Stand Map



ChicoryLane Aerial Stand Map



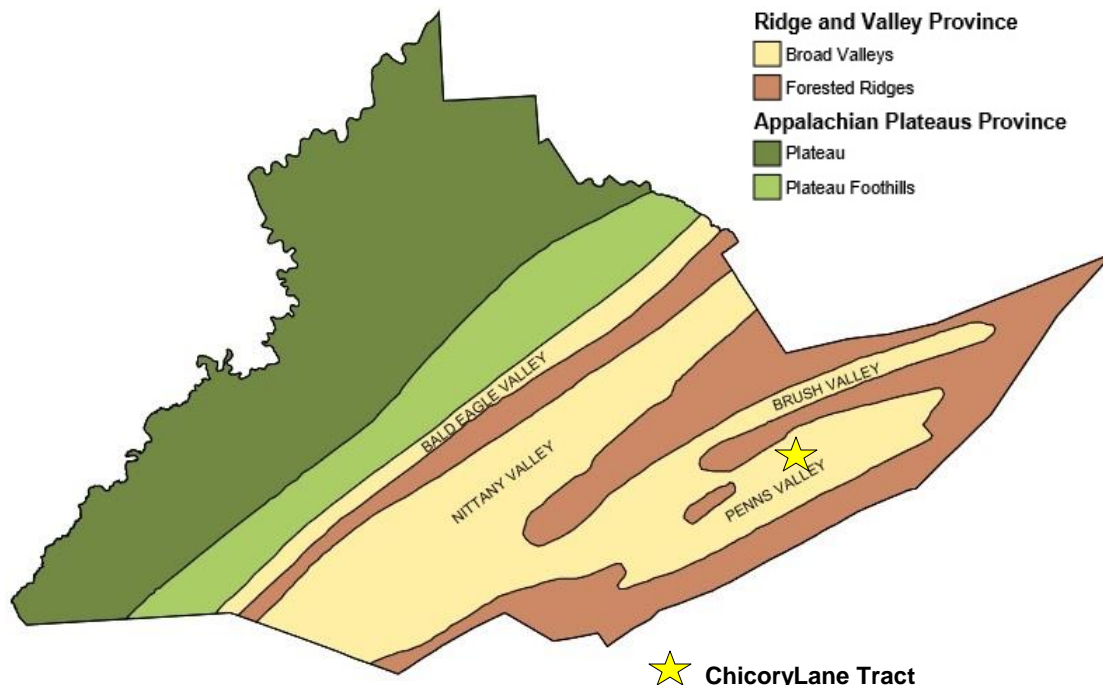
Physiographic Provinces of Pennsylvania



★ ChicoryLane Tract

PHYSICAL SETTING:

Centre County's unique geographic shape encompasses the divide between the High Allegheny and Central Appalachian Forest Ecoregions. Its land-base spans across a narrow sliver of the Pittsburgh Low Plateau, a segment of the Allegheny Front, and extends into the heart of the Ridge and Valley province. ChicoryLane tract is situated within the Appalachian Mountain Section of the Ridge and Valley Province. The Ridge and Valleys originate in southeastern New York and extend into northwestern New Jersey, down through the heart of Pennsylvania, into Maryland, West Virginia, Virginia, Tennessee, Georgia, and Alabama. The landscape forms a broad arc between the Blue Ridge Mountains and the Appalachian Plateau. The mountains are characterized by long, even ridges, separated by narrow to wide, continuous fertile valleys in between. The tops of the ridges are always several hundred feet higher than the adjacent valley. Elevations range from 440 feet to 2,775 feet, with local average being 1,200 feet above sea level. Very tough sandstones occur at the crests of the ridges and relatively soft shales and siltstones occur in most of the valleys. Some valleys within the province are underlain by limestone and dolomite, which support very productive soils, often identified as Farmland of Statewide Importance.

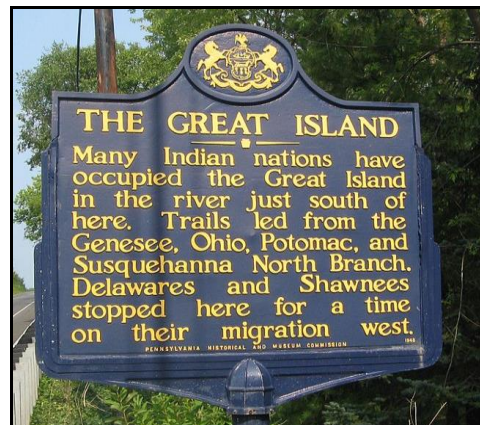


The ChicoryLane tract is part of Penns Valley with the parcel positioned between subordinate valleys, known as Georges Valley and Brush Valley, separated by Brush Mountain and Egg Hill. Nearby Nittany Valley is the largest Valley within Centre County. Area residents experience relatively moderate (150 days) growing seasons, with much of its average precipitation (40 inches) occurring during the winter, spring, and fall. Summers are often dry with low humidity. Presently, agriculture represents 15% of the regional land use.

REGIONAL HISTORY:

Native American bands settled the area in prehistoric times. By the early colonial period, the tribal confederacy known as the Six Nations of the Iroquois ruled the Native American tribes of Pennsylvania, including those who lived near present day State College. Archeological discoveries suggest that sizeable Indian populations existed throughout the central and southern portions of the county and were concentrated along the West Branch of the Susquehanna River and its associated tributaries (i.e. Spring Creek, Bald Eagle Creek).

Numerous Indian Paths formed arteries to promote exchange, communication, hunting, and war for Native peoples for centuries before the arrival of the European settlers. Most notable are the Four Indian trails – the Great Island Path, the Great Shamokin Path, the Bald Eagle Creek Path, and the Sinnemahoning Path. These trails are commemorated through the state’s Historical and Museum Commission. Associated roadside monuments serve as a subtle reminder of the profound influence Native American populations had on our local landscape and its history.



Historical Marker on PA 150 East of Lock Haven

The settlement of Centre County began only a few years prior to the Revolutionary war, the first authentic settlement being made near or at what is now Milesburg, in the Bald Eagle Valley. Scattering settlers came in over the next few years, locating in the valleys, primarily in the eastern part of the county. In the decades to follow, considerable numbers came largely from the eastern part of the state and were for the most part 'Pennsylvania Dutch', Scotch-Irish, and Germans. The early settlers came to occupy the land and engage in farming, while in later years others were attracted by the abundance of natural resources. The forests of Centre County and counties upriver held a huge supply of white pine and hemlock as well as oak, ash, maple, poplar, cherry, beech, and magnolia. The wood was used locally for such things as frame houses, shingles, canal boats, and wooden bridges, and whole logs were floated to the Chesapeake Bay and on to Baltimore to make spars for ships. Log driving and log rafting were common forms of transportation of materials to sawmills which sprouted up along the West Branch around 1800. By 1830 the lumber industry was well established.



Log Drive - West Branch of the Susquehanna River, Lock Haven

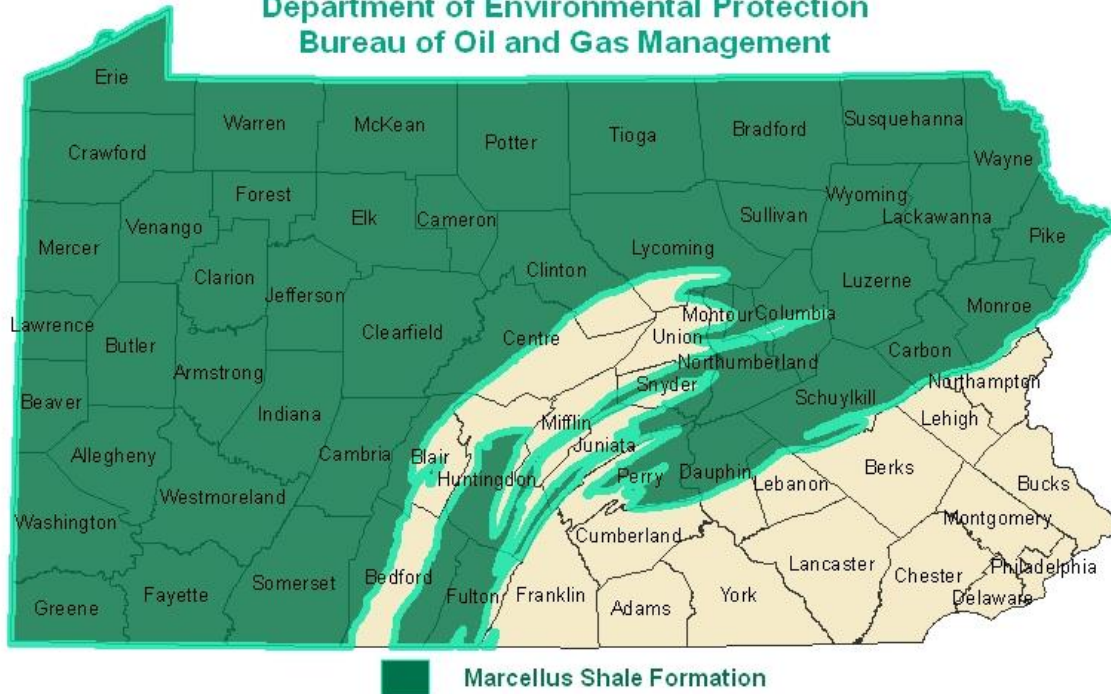
In concert with the peak of the lumber boom era, mining of coal, clay, iron ore, and natural gas provided for a robust economy. An extensive road and railroad network quickly developed through both public and private investment to provide transportation for people, goods, and materials. A short summary from the 1910 Soil Survey of Centre County cites, *"The Pennsylvania Railroad has a number of branch lines connecting with their main trunk lines reaching in all directions. The Bald Eagle Valley branch follows the Bald Eagle valley, connecting Tyrone and Lock Haven. The Lewisburg and Tyrone division extends from Bellefonte east to Lewisburg on the main line in Union County. The Tyrone and Clearfield branch from Tyrone climbs over the mountain to Philipsburg and passes through the mining section in that vicinity, and on into Clearfield. The Snow Shoe branch from the Bald Eagle Valley line taps the coal field at Snow Shoe. The New York Central Railroad is represented by the Beech Creek Division, which also affords outlets to the Snow Shoe and Philipsburg mines."*

The 1910 Soil Survey for Centre County cites, *"according to the census of 1900, Center County had a population of 42,894. The valleys are thickly settled; the mountainous parts, except where mines are located are scarcely settled at all. In fact, large areas, as on the Allegheny Mountain and Plateau are wild lands and unoccupied except for hunters and lumbermen's camps, the former only occupied during the hunting season."*



Centre County homesteaders near Scotia Mining Area: mid-1800's.

Commonwealth of Pennsylvania
Department of Environmental Protection
Bureau of Oil and Gas Management



The Marcellus Formation is a unit of marine sedimentary rock found beneath much of Pennsylvania, Ohio, West Virginia, and New York. Projected to be able to produce nearly 500 trillion cubic feet of natural gas, this black, low density, organic rich shale is the second largest natural gas reserve in the world. The Marcellus shale formation was not widely considered to be an important gas resource until recent advances in technology (horizontal drilling & hydraulic fracturing) have made it operationally feasible and cost effective to mine the gas. The Allegheny Plateau and Allegheny Front are part of the Marcellus fairway and is experiencing modest gas related activities and production. The north-central and northern tier of the state has become an epicenter for Marcellus gas production, with Clinton County being a major hub for servicing the needs and infrastructure development required to bring this energy to market.

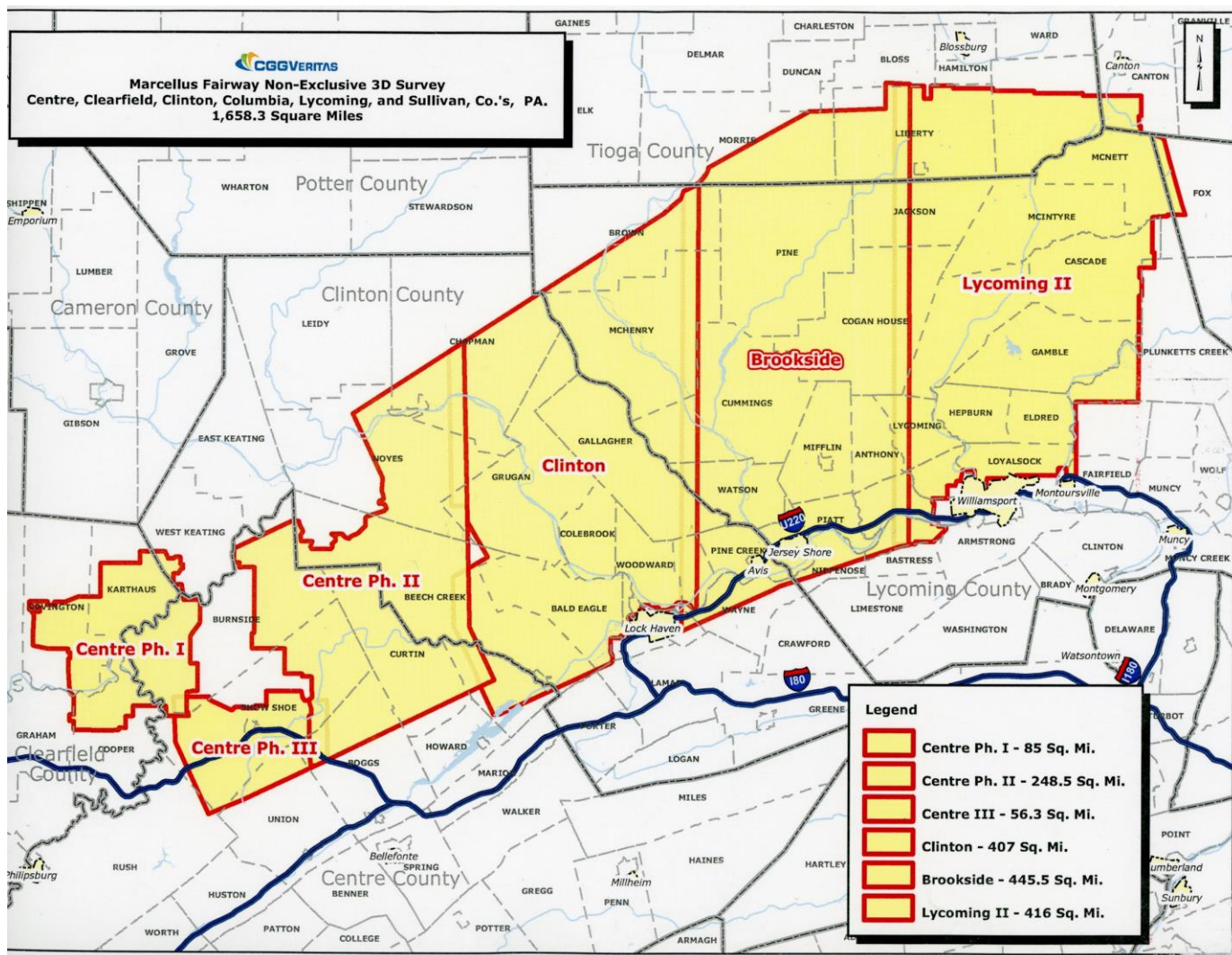
Marcellus gas presents a tremendous opportunity for many Pennsylvania landowners who have retained their subsurface mineral rights; however it also presents many significant challenges and impacts to the landscape that must be carefully planned for to ensure positive outcomes for all parties involved. Landowners interested in pursuing Marcellus gas options for their property should self-educate by way of cooperative extension educational materials, workshops, and representatives that are out there to assist you.



Aerial view of Marcellus gas well & pad (Bradford County)

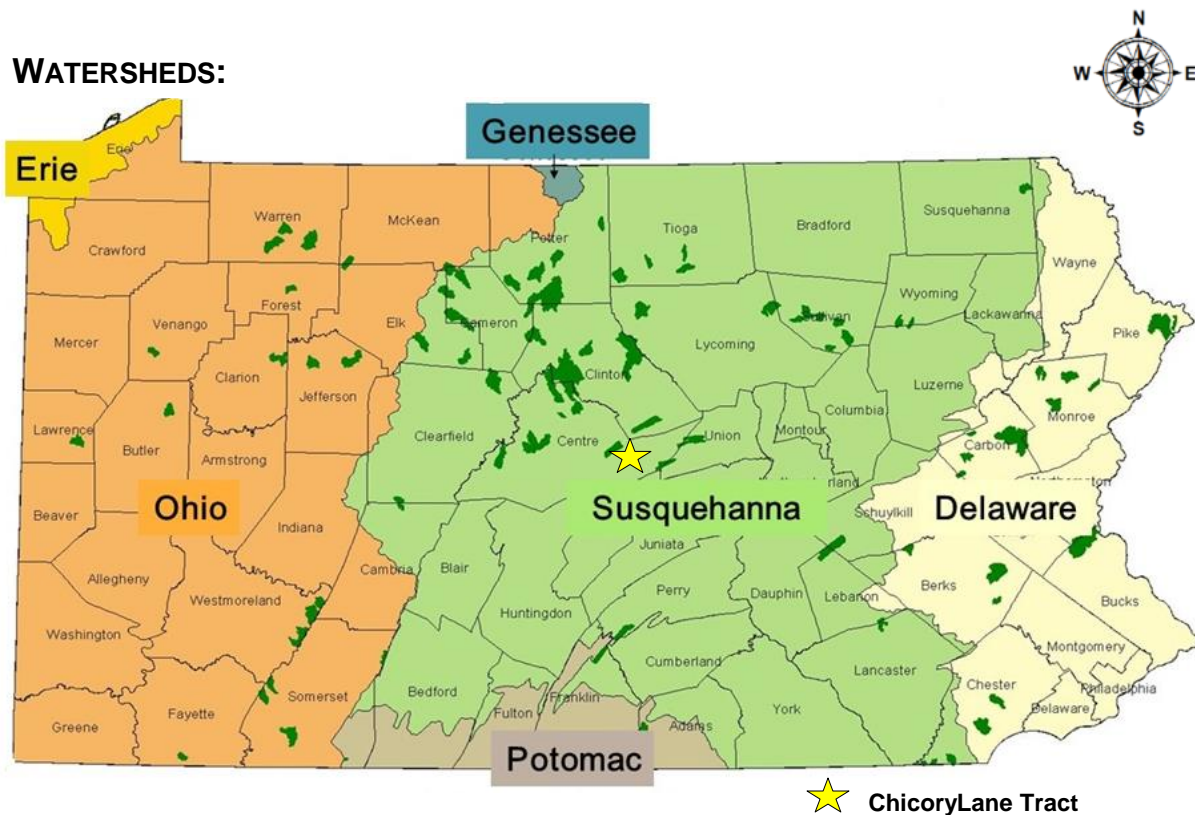
Landowners interested in gas leasing on their property should obtain professional assistance from a qualified environmental attorney who has experience dealing with Marcellus gas in Pennsylvania. Surface impacts from Marcellus gas operations will cause increased fragmentation, increased soil compaction, remove land from agriculture and forest production, and can have implications for wildlife and water quality. For more information on and assistance with Marcellus gas issues for non-industrial private forest landowners, log onto: <http://extension.psu.edu/naturalgas> or contact Tom Murphy, PSU Education Coordinator (570) 433-3040.

The ChicoryLane tract is located a few miles south, just outside the Marcellus play, however that is not to say that other shale layers located deep beneath the property won't become viable for future gas mining opportunities. Since the shale boom started in 2009, most gas activity has been occurring within the Allegheny Front and High Allegheny Plateau portions of the County. Seismic testing was performed to aid in mapping the quality of the shale gas reserves throughout the region. CGG Veritas, a Houston, Texas based firm is conducting the seismic activities through on-the-ground crews supported by helicopters that deliver much of the equipment needed to complete the work. Past coverage within the Lock Haven Express provided details into the complexities associated with seismic surveys being performing over the Marcellus covering much of Clinton, Lycoming, Clearfield, & Centre Counties.



The greatest challenges influencing the accuracy of the seismic mapping within Pennsylvania include the gradients in topography with steep slopes and the diversity of land uses that lead to several natural and man-made obstacles, such as highways, farms, and towns. Strict attention must be paid to these details to ensure efficient operations without compromising the quality of data. Another difficult aspect of working within Pennsylvania and across the East (for that matter), is the large number of private forest landowners with varying objectives. CGGVeritas reports having developed an operational strategy to proactively engage local communities and authorities to adequately manage their expectation. Community outreach programs designed to address concerns and provide information to private landowners and area businesses have been deployed to accommodate the interests of the local people and reduce negative outcomes. Active participation and education on a regular basis keeps the work crews safe and creates an atmosphere of support between service providers and members of the community. Technological advancements have improved modern seismic operations and equipped crews with various tools such as cabled and cableless options, along with helicopter transportation which can be implemented to be more compatible with urban communities or reduce impacts to sites with rare, threatened, and endangered species.

WATERSHEDS:



★ ChicoryLane Tract

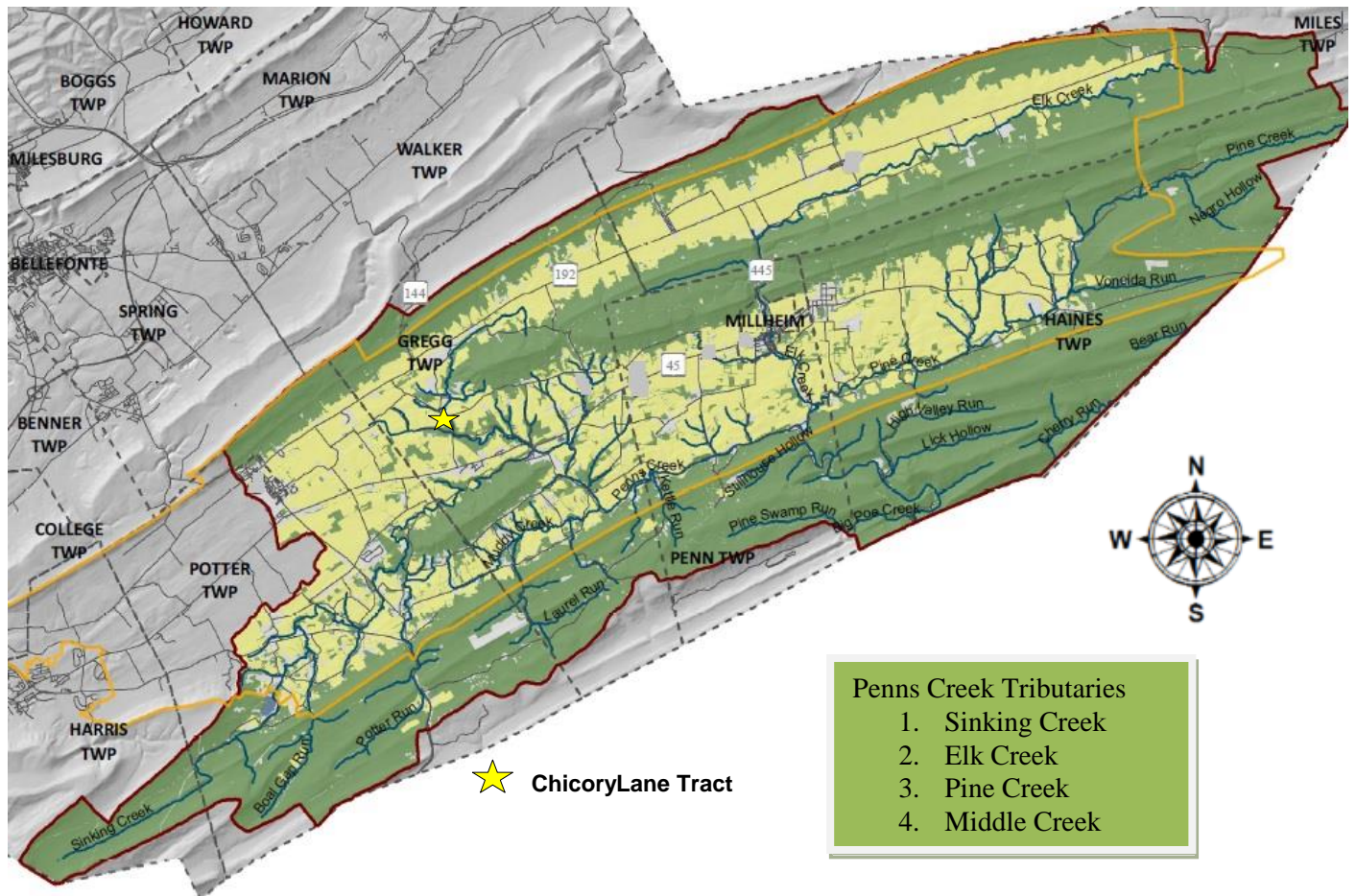
Centre County is within the Chesapeake Bay Watershed. The Susquehanna River and associated tributaries form the principal drainage system of the County's streams, rivers, and creeks. Its nearest tributary, Penns Creek is a widely regarded Class A trout stream recognized for its historic water cavern along with abundant wild and stocked trout fisheries. Penns Creek is derived by karst geology (special type of landscape that is formed by the dissolution of soluble rocks, including limestone and dolomite) characterized by many limestone springs throughout the watershed. The 67.1-mile long limestone stream drains a 163 square mile watershed distinguished by two sub basins in which the ChicoryLane tract is encompassed within the Upper basin. Both upper and lower sub basins of Penns Creek consist of streams and runs that flow from the sandstone mountains. Many of these streams disappear into sink holes as soon as they reach the limestone strata. These underground water courses may reappear as great springs, such as the famed Penn's Cave.

The central region of the state is known for its abundant high quality cold water fisheries that support healthy native brook trout populations. Its many watersheds are home to a number of rare, threatened, and endangered plants and animals. However, past land use activities, such as mining, agriculture, wastewater treatment facilities, and impacts associated with development have degraded water quality and negatively impacted native brook trout populations. Collaborative efforts by State's Fish & Boat Commission along with support from area conservation groups and local Watershed Associations have been successful in improving water quality primarily through stream bank stabilization projects and the establishment and maintenance of functional riparian buffers.

For more information on the area's Water Resources, refer to the following links:

- Pennsylvania Council of Trout Unlimited – <http://www.patrou.org/>
- Penns Valley Conservation Association - <http://www.pennsvalley.net/>
- Lower Penns Creek Watershed Association – [Brochure](#)

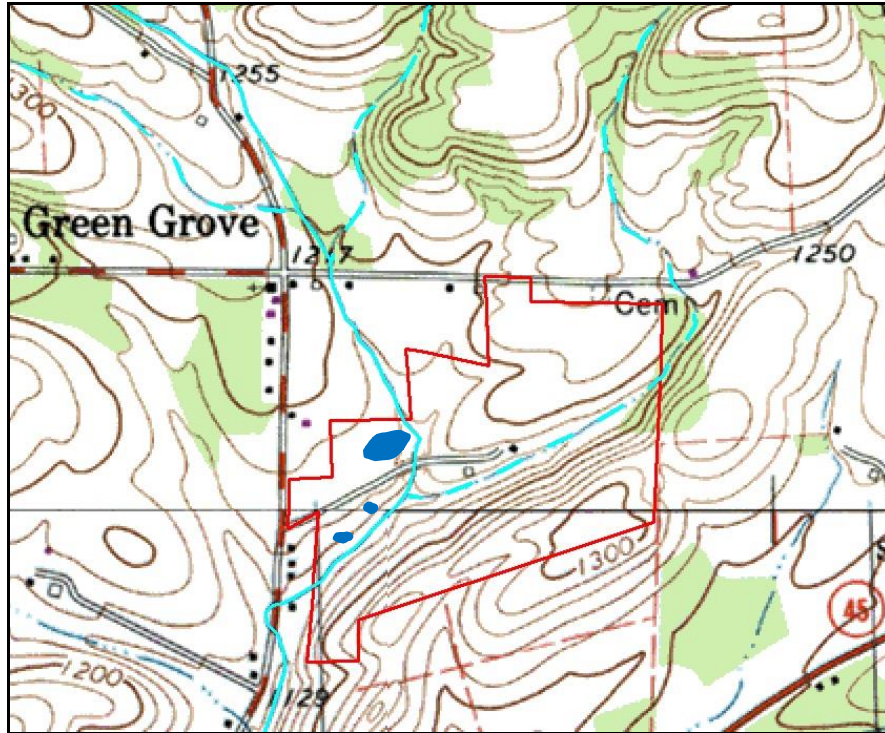
UPPER PENNS CREEK WATERSHED:



The headwaters of Penns Creek originate a short distance to the west of ChicoryLane, along the lower slopes of Brush Mountain, north of Spring Mills. Water resources within ChicoryLane are abundant and collectively drain into Penns Creek. Most notable are three unnamed intermittent stream channels that converge above Green Grove Road and channelize into a perennial stream (designated as Cold Water Fisheries) that passes through the western half of the Farm. A separate (fourth) intermittent channel with seasonal flow enters the northeastern boundary of the farm, meandering southwest through the heart of the property before connecting with the other stream. At this convergence point, the channel widens and shortly thereafter departs the southwestern boundary of the farm, flowing another 1.5 miles before emptying into Penns Creek below the village of Penn Hall. There are more than a half mile of stream channels within the ownership that in many instances function as prominent habitat and plant community transition zones.

The lower elevational gradients of the farm lay 'wet' with complex hydrology. Nearly a quarter of the property exhibits hydric soils that support mesic plant species. With assistance from the Alliance for the Chesapeake, professionally engineered water impoundment structures in the form of a pond and series of vernal pools were constructed to enhance habitat value within the west-central portion of the farm. These subtle, yet significant water features integrate nicely and add to the overall array of microsites that should be considered 'special' with regard to the vegetative diversity that they offer and habitat that they provide, particularly valuable for amphibian life.

WATER FEATURES: WET MEADOW/MARSH, SEEPS, STREAMS, POND & POOLS



Water Resources Summary

- Perennial Streams (1,275')
- Intermittent Streams (1,690')
- Farm Pond (1) (~1/4 acre)
- Vernal Pools (2) (~1/5 acre)
- Mesic Grasslands (~ 8 acres)
- Wet Meadows (~ 18 acres)
- Cat-tail Marsh (~ 1 acre)

WATER FEATURE PHOTO-COLLAGE



ROAD INFRASTRUCTURE AND ACCESS:

Most forest landowners within Centre County benefit from its extensive road network that provides year-round access and adequate transport of forest products to enable active forest management. ChicoryLane is situated approximately 20 road miles east of State College between the boroughs of Centre Hall and Millheim and within close proximity of multiple major state routes and interstate highways. Primary egress and ingress to the ownership is limited by way of Brush Mountain Road (Township Road 2007) which spans a distance of 3.4 miles. Its northern terminus intersects State Route 192 (Brush Valley Road) and its southern terminus State Route 45 (Penns Valley Road), a short distance west of the Penns Valley High School.

Physical Address:

246 Brush Mountain Road
Spring Mills, PA 16875

Directions from State College:

Travel East on business route 322 for approximately 4 miles to Boalsburg. Turn left onto PA-45 East/Earlstown Road and proceed east for 14.5 miles. A short distance after passing through Spring Mills (1.5 miles) turn left onto State Route 2007 (Brush Mountain Road) and continue for approximately 1 mile. Turn right onto a graveled driveway indicated by a blue road-side address marker labeled 246. The road leads back to ChicoryLane with its primary living quarters distinguished by a log house, barn, and outbuildings.



Looking North - Entrance to ChicoryLane
East side of Brush Mountain Road

Relevant nearby routes that provide for travel in all four cardinal directions include US route 322 and 220, along with PA routes 45, 445, 144, 192, and 150. These roads serve as connection points to major highway transportation networks in Interstate-80 and Interstate-99. The nearest town/small city is State College which has an estimated population of 42,000 people.



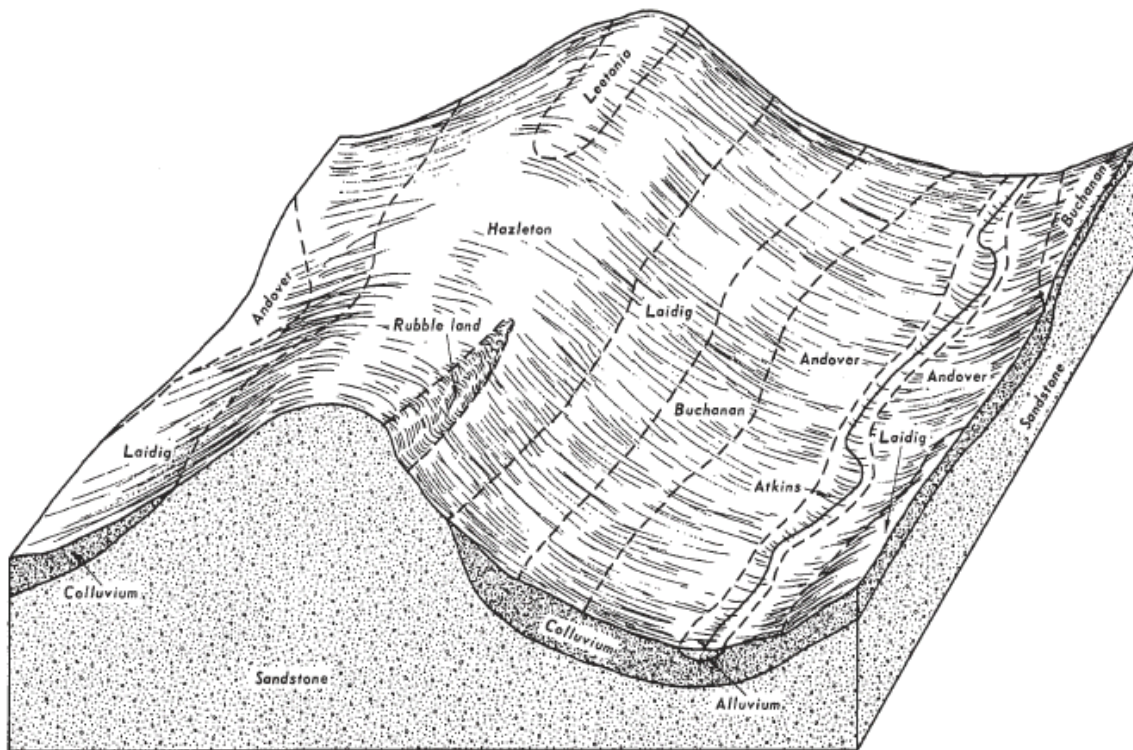
ChicoryLane Tract Location Map with Associated Road Infrastructure

SOILS IMPACT ON MANAGEMENT:

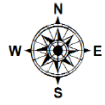
The types of soil on a property play a key role in determining appropriate land management options and strategies. Soils differ greatly in their suitability for growing certain trees, crops, and vegetation. The soil throughout Centre County consists of a variety of associations. These associations evolved from horizontal and gently folded sedimentary rocks of sandstone, shale, and siltstone that lie beneath the surface. Local differences in soils exist because of an assortment of parent material, the topographical features of the land, drainage, and age. The USDA soil surveys for Centre County (1910 & 1981) indicate that all portions of the ChicoryLane property are conducive for woodland management.

The most important factors that affect the productive capacity of a soil to grow trees include its ability to provide a good supply of moisture and adequate space for root growth. Hardwood timber is much more site-specific and sensitive to soil conditions than pine trees. Hardwoods require the ideal site to produce a high quality tree, whereas pines can grow on nearly all soil types. Based on the soil quality within your property, good to excellent tree growth and survival can be achieved for both hardwood (deciduous) and pine (coniferous) tree species. Tree species to favor include sugar maple, red maple, black cherry, mixed oak, and eastern white pine.

Graphic portraying soil association formations found within the ChicoryLane Tract



ChicoryLane Soils Map



CHICORYLANE SOILS SUMMARY:

Soil Symbol	Soil Name	Slopes	Acreage	% Area
At**	Atkins silt loam	0-3%	15.6	23%
BkB**	Berks channery silt loam	3-8%	3.5	5%
BkC**	Berks channery silt loam	8-15%	4.8	7%
BkD	Berks channery silt loam	15-25%	1.5	2%
BMF	Berks and Weikert soils, steep	25-50%	8.9	13%
BrB	Brinkerton silt loam	3-8%	7.3	11%
ErB**	Ernest channery silt loam	3-8%	0.7	1%
HSD	Hazleton extremely stony sandy loam, moderately steep	25-50%	0.9	1%
MnB*	Millheim silt loam	2-8%	10.1	15%
MnC**	Millheim silt loam	8-15%	10.1	15%
MnD	Millheim silt loam	15-25%	4.6	7%
Tract Totals			68	100%

* Soils identified as **Prime Farmland**

** Soils identified as **Farmland of State-Wide Importance**

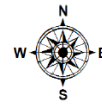
PRIME FARMLAND:

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when properly managed.

FARMLAND OF STATE-WIDE IMPORTANCE:

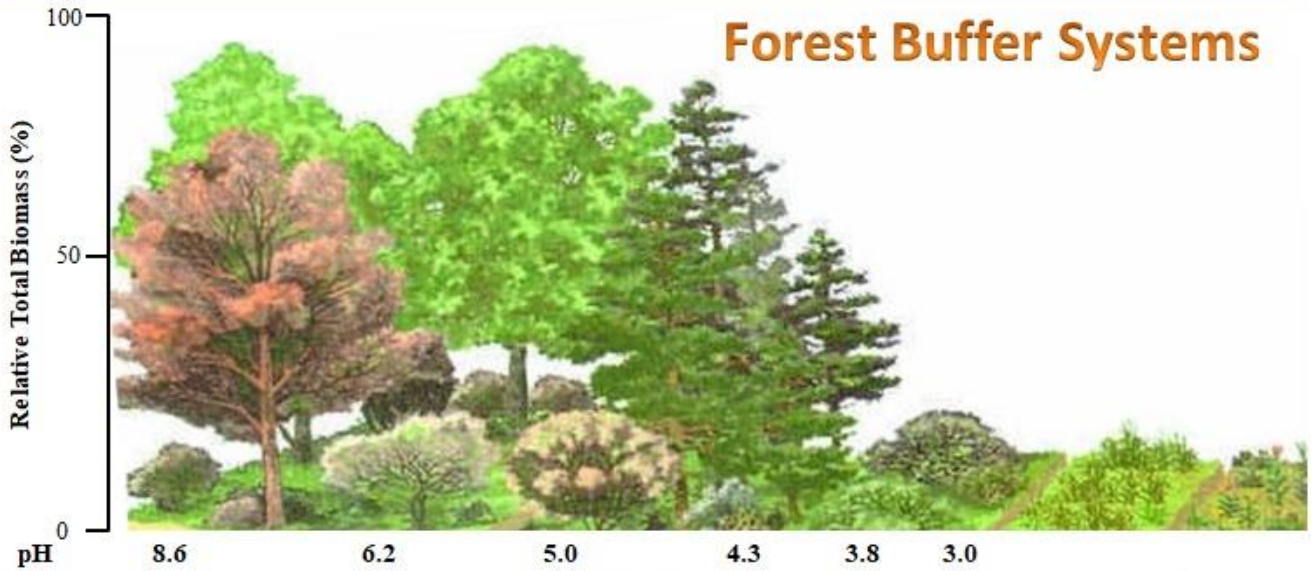
Farmland of state-wide importance is generally land that has soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

CHICORYLANE SOIL SAMPLING LOCATION MAP:



Soil samples were taken from 6 landowner directed areas of the farm during the winter of 2018. The samples were sent to Penn State University's Agricultural Analytical Services Laboratory and processed under the context of Forestry with a mixed categorization of *Woodlot, Hardwood, To Plant* and/or *Maintain* along with *Woodlot, Mixed Species, to Plant* and/or *Maintain*. Results were received as electronic reports and are summarized in the following paragraphs. Overall, pH levels range from strongly acidic at 5.2 within the cat-tail swamp (sample 1; management unit 2) to neutral with a 6.9 pH at sample site 3 which can be characterized as the transition from flood plain to upper hillside shoulder (lowest portions of management unit 3).

Forest Buffer Systems








Leaching of Nutrients	Mainly Calcium	Very limited	Leaching of exchangeable Calcium, Magnesium, and Potassium	Base cation leaching complete, Aluminum dominates	Iron and Hydrogen dominate exchangeable cations
Limitations for Plant Growth	Small limitations	No limitations	Non-tolerant plants suffer from Aluminum toxicity	All plants suffer from Aluminum toxicity	Only plants rooting in top organic layer survive

RATINGS (Characterization)	pH RANGE
Ultra acidic	< 3.5
Extremely acidic	3.5–4.4
Very strongly acidic	4.5–5.0
Strongly acidic	5.1–5.5
Moderately acidic	5.6–6.0
Slightly acidic	6.1–6.5
Neutral	6.6–7.3
Slightly alkaline	7.4–7.8
Moderately alkaline	7.9–8.4
Strongly alkaline	8.5–9.0
Very strongly alkaline	> 9.0






Species	Optimum pH Range
Hydrangea Shrub	4.0-5.0
Blueberry/Blackberry Shrub	4.0-6.0
Azalea Shrub	4.5-6.0
Laurel/Rhododendron	4.5-6.0
Spruce, Hemlock, Fir, Pine, Juniper	5.0-6.0
Apple	5.0-6.5
Chestnut	5.0-6.5
Mixed Oak	5.0-6.5
Dogwood	5.0-7.0
Cherry, Peach, Pear	6.0-7.0
Ash	6.0-7.5
Basswood	6.0-7.5
Lilac	6.0-7.5
Sugar Maple	6.0-7.5
Boxelder*	6.0-8.0
Plum	6.0-8.0
Black Walnut*	6.0-8.0
Willow*	6.0-8.0

CHICORYLANE SOIL TEST RESULTS:






Sample Area 1: Cat-tail Marsh

SOIL NUTRIENT LEVELS	Below Optimum	Optimum	Above Optimum
Soil pH			
Phosphate (P ₂ O ₅)			
Potash (K ₂ O)			
Magnesium (MgO)			
Calcium (CaO)			






Sample Area 2: Palustrine Woods

SOIL NUTRIENT LEVELS	Below Optimum	Optimum	Above Optimum
Soil pH			
Phosphate (P ₂ O ₅)			
Potash (K ₂ O)			
Magnesium (MgO)			
Calcium (CaO)			






Sample Area 3: Hillside Shoulder

SOIL NUTRIENT LEVELS	Below Optimum	Optimum	Above Optimum
Soil pH			
Phosphate (P ₂ O ₅)			
Potash (K ₂ O)			
Magnesium (MgO)			
Calcium (CaO)			






Sample Area 4: Successional Forest

SOIL NUTRIENT LEVELS	Below Optimum	Optimum	Above Optimum
Soil pH			
Phosphate (P ₂ O ₅)			
Potash (K ₂ O)			
Magnesium (MgO)			
Calcium (CaO)			

Sample Area 5: Red Oak Reforestation Field (West)

SOIL NUTRIENT LEVELS	Below Optimum	Optimum	Above Optimum
Soil pH			
Phosphate (P ₂ O ₅)			
Potash (K ₂ O)			
Magnesium (MgO)			
Calcium (CaO)			

Sample Area 6: Red Oak Reforestation Field (East)

SOIL NUTRIENT LEVELS	Below Optimum	Optimum	Above Optimum
Soil pH			
Phosphate (P ₂ O ₅)			
Potash (K ₂ O)			
Magnesium (MgO)			
Calcium (CaO)			

HISTORY:

Pennsylvania has a vast history, ranging from Paleo Indian cultures to famous explorations; numerous historical figures to the multiple Civil War battles and skirmishes that took place throughout sections of the Commonwealth. Determining the history of one's property can help a landowner develop a strong bond with their land and give them a better understanding of the current state that their land is in today.

Potter is the oldest Township in Centre County, settled in 1767. It was named for General James Potter of Revolutionary War fame, who first saw his Penns Valley 'empire' in 1765 from atop Nittany Mountain at the crest between Pleasant Gap and Centre Hall. In the early 1770's he returned to the site of his explorations, began to acquire land, and built a home. He erected a stockade around his house and a nearby spring at Old Fort, making it the anchor of a chain of three forts at the foot of Nittany Mountain for defense against Indians. In the 1780's he built a log house, tavern, grist mill, and sawmill at what became known as Potter's Mills. The earliest settlers of Gregg Township, which didn't formalize its boundaries until 1826, arrived at Spring Mills in 1773. As was typical, water resources were utilized for building mills and adjoining valley land cleared to capitalize on agricultural production.

The history of the present-day ChicoryLane property is well documented in the Smith family's website (www.chicorylane.com) with the following excerpt that provides a glimpse of the depth of information cataloged here:

ChicoryLane originated in Reuben Haines' holdings. It began as a tract originally surveyed by William McClay in Cumberland (now Centre) County on September 26, 1766. This tract was specified as "Hopewell situate on the head of Penns Creek containing three hundred thirty three acres seventy two perches with the usual allotment of six acres percent for roads." Valentine Epler warranted or ordered the survey. Deeded to Haines in 1767, the tract was located roughly two miles southeast of Penns Creek's headwaters and a mile east of (later named) Egg Hill just below Brush Mountain's western end. The warrantee map (of now Centre County) shows this tract as a long rectangle extending from (later-named) Green Grove Road on the north to Heckman Cemetery Road on the south. Notable features identified by the surveyor were the large stream flowing from Brush Mountain south through the tract, as well as a white oak tree at its southwest corner.

A brief reference in a 1775 travel journal has Daniel Long, a blacksmith, living there; presumably he purchased from Haines. We do not know what part of the tract Long occupied, or how much of it, or for what purpose. Tax records in 1778 show Daniel Long holding "200 acres, 10 improved." Improvement could mean clearing, or planting, or building structures, or something else. Long might have built a dwelling house on the site, or he might have only timbered it for making charcoal iron to be used in blacksmithing. Or both.

Based on our deed and tax record research so far, an incomplete list of owners of parcels within the original tract follows:

- Daniel Long (or his son Michael), blacksmith, 200 acres, prior to 1775
- Adam Reed, blacksmith 1794
- Andreas Hausman, one hundred one and one half acres 1796
- Coalman, wagon maker, 31 acres 1800
- Jacob Hering, tanner, 116 acres, 1809; heirs 23 acres 1829
- Peter Pauly, shoe maker, 47 acres 1829
- J. Swartz, 1836
- J. Rockey, 2 acres, 1846
- J. Shadow, 1850
- Philip Ertle, miller, and Catharine Ertle heirs 1850
- J. Dunmoyer, 80 acres 1866
- Michael Ream, weaver, farmer, 75 acres 1875
- Adam Ertle, 72 acres 1875
- S. Bickle, 3+ acres 1925
- D. Ertle, 72 acres 1926
- Theodore Sweeley, farmer, 72 acres 1942
- Jake McCool, farmer, 72 acres 1961
- Clyde Glick, truck driver and farmer, and Verna Glick, 72 acres 1969
- John Smith and Catherine Smith, educators, 69 and one half acres 1974

Agricultural Dependent Communities & Lifestyle (Twentieth Century Context)

The **1910 Centre County Soil Survey** cites that *early settlers grew wheat, corn, rye, potatoes, hemp, flax, and the grasses. Wheat and corn were their principal crops, but rye soon became of even more importance, as it could be changed into a product – distilled spirits – of less bulk for transportation. The census of 1900 reported 297,564 acres in farms, or not quite one-half of the area of Center County. The average size of the farms is 127.2 acres. Valley soils bring of course the highest land prices ranging from \$40 to \$60 an acre, with practically none on the market. Tree fruits are grown on most farms but not produced on a commercial scale. Livestock is an important factor on every farm; cattle and horses lead, but some attention is given to the raising of hogs and sheep. Both dairy and beef cattle are produced. In the limestone valleys the farmers raise horses suitable for heavy farm work and for draft purposes in the cities. While dairying is practiced generally, there are no very large dairies in the county, each farmer keeping what cows he can conveniently pasture, feed, and tend. Alfalfa does best on the heavier limestone soils, the Hagerstown clay loam, clay, and silt loam being best adapted to its production. Yields of from 3 to 6 tons per acre per year have been obtained.*

According to the 1997 Census of Agriculture, *there are 788 farms in Centre County on 135,982 acres. Of those 788 farms, 449 are in full-time operation. The average farm in*

Centre County covers approximately 173 acres, but there are 11 farms in the County exceeding 1,000 acres in size. Farming remains an important industry in Centre County, however in recent years a lot of farmland has gone out of production. Centre County Planning Office figures (1997) indicate a total of 16,249 acres were lost to other uses between 1975 and 1997. This trend can be characterized as a loss of 2 acres of farmland per day.

In recognition of the ecological importance and interest in preserving the legacy of the property, John and Catherine Smith granted Clearwater Conservancy a permanent conservation easement, legally executed on July 25th, 2017.

Examination of historic aerial photographic images of the region in 1957, 1971 and 1994, along with communications with the current landowner helped to ascertain the following information:

1938 Penn Pilot Aerial Photograph (ChicoryLane Tract)



This 1930's aerial photograph shows a well-defined agricultural footprint, with the present-day ChicoryLane tract and surrounding neighbors having a majority of their acreage in production for hay, crop, and grazing. Approximately 5.5 acres of the farm was forested, most of which is concentrated on what can be considered steep, inoperable terrain. The tremendous demand placed on forest resources resulted in aggressive timber harvesting throughout the region during the mid to late 19th century.

A major turning point was when coke was discovered as a viable and more abundant replacement to charcoal to fuel the state's iron industry. Only then did the cutover landscape stabilize and begin to reestablish into mixed hardwood and pine tree species.

The ownership, along with size and shape of the farm was much different then and may be reflected in the network of interconnected roads and hedgerows that spanned across multiple parcels.

1957 Penn Pilot Aerial Photograph (ChicoryLane Tract)



Nearly two decades pass and no significant land use changes are evident. Within the farm, the most notable change is a reduction in forest cover where it appears that much of the standing trees, including hedgerows – were cutover and some of the growing space converted to agricultural use.

1971 Penn Pilot Aerial Photograph (ChicoryLane Tract)



In addition to a slight increase in residential housing development, expanded tree crowns, most visible on adjoining properties suggest that much of the area's forests were left free to grow without human influence. Moderate intensity defoliation events occurred throughout the northcentral region during the latter part of the 1960's into the early 1970's resulting from both oak leafhopper and oak leafroller outbreaks. PA DCNR Bureau of Forestry records for Centre County reported that the area's mixed oak dominated forests were stressed, but spared from noticeable tree mortality. Then, in the mid-1970's, the region was hit by consecutive years of severe defoliation associated with non-native gypsy moth outbreaks. Region wide oak mortality resulted and corresponding timber salvage operations, which transitioned to 'dead wood' sales, occurred up until the mid-1980's.

John and Catherine Smith purchased the 68-acre farm in 1974 and brought forth a new vision for how to manage and derive value in the property.

1994 Google Earth Timeline Aerial Photograph (ChicoryLane Tract)



Nearly a quarter century passes and the farm shows dramatic changes signified by abandonment of agricultural uses, construction of a farm pond, and the re-initiation of plant community succession, distinguished by expanded forest cover. Open fields were left to go fallow, with some reverting to grass and shrub lands naturally, while others were strategically planted with an assortment of targeted native species to accelerate restoration of desired early successional habitats.

Additional efforts would continue throughout the following years to advance this vision of restoration through land stewardship with focus on ecological diversity, aesthetics, and habitat enhancement.

Land use within the general area was heavily influenced by extraction and utilization of its abundant natural resources during the late 1800's and then shifted primarily to farming throughout the twentieth century. Similar to the trend depicted in the above sequence of historic aerial photographs of the current day Smith Family property, many farmers and area business owners abandoned marginal ground and allowed for it to revert back to forest or successional grass and shrublands over the past half-century.

In summary, the footprint of this property has experienced minor changes over the past 75 years, the most noticeable elements becoming visible in recent decades, signified by a reduction in the intensity of agricultural practice, past selective timber harvesting and the construction of roads, water features, and other infrastructure. These activities have resulted in changes to forest cover over time, with losses derived initially through farming. Gains in forest cover have been achieved through abandoned fields that have and continue to revert back to grass, shrub, and forests over time. However, the greatest changes and present day challenges for maintaining forest health and the legacy of the ChicoryLane property are difficult to discern from within the above series of historic photographs. The effects selective 'high-grade' timber harvests, decades of an excessively high deer population and their corresponding browse impacts on the forests, rapid encroachment of non-native invasive plants, and increased tree mortality associated with non-native pests and diseases are dramatically influencing and changing the character of Penn's woods, including the Smith Family woodlots. In addition, land use changes are occurring more rapidly and in more complex fashions resulting from a myriad of inter-related factors including expanding residential housing development, advancements in technology enabling deep shale gas drilling, and social complexities such as an aging landowner demographic that is indicating an unprecedented amount of forest land will transfer to new ownership in the next decade. <http://news.psu.edu/story/156056/2011/08/29/sustainability-pennsylvania-forests-challenged#nw63>

Since becoming the primary owner of ChicoryLane in 1974, John and Catherine Smith have devoted countless hours to stewarding the property towards desired future conditions. They are now expanding efforts to better understand the current conditions of the shrub and forest areas; assess viable management strategies, and work to improve the health, functionality, diversity, and economic values of the natural resources that exist within their ownership. This document will assist in advancing this vision to realize and leverage benefits from and for this property into the foreseeable future.

PROPERTY-LEVEL MAP:

For the purpose of management planning, your property has been broken down into primary management units for each tract and assigned numeric labels. These units were delineated based on forest cover and similarities in biotic and abiotic conditions. Specific attributes taken into consideration include soils, slope position, aspect, vegetation, stocking, and age class structure of the current timber. Past land use and forestry operations that took place in years previous are also taken into consideration and influence the stand delineation process.

INVENTORY SAMPLING METHODOLOGY & PROCEDURE:

Before recommendations can be made for managing a forest, an inventory of the ecological resources (timber, shrub, understory vegetation, wildlife habitat) should be conducted at the stand level. The information derived from an inventory is the foundation for making decisions and determining appropriate “silvicultural” treatments. It is also the first stage in seeking answers to the questions: “What do we have?” and “Are our goals for these stands achievable?”

The inventory is merely a sampling process. Samples, or plots, are placed throughout the forest where information is collected from a set of trees. Using a specific statistical procedure, the data from these samples are mathematically combined to create models, which allow us to gain a better understanding of structure and condition of the forest as a whole.

Primary forested stands identified on your property map were inventoried to determine the stocking, structure, and condition of the timber resource; data was collected from the smallest seedlings to the largest mature trees. The data is used herein to characterize forest cover type, tree species composition, ecological state, site conditions, forest health, merchantable quality, reproductive potential, and to prescribe silvicultural/management treatments. Photo-stations were also established to help in more broadly defining ecological condition attributes.

Subject Area & Sampling Intensity:

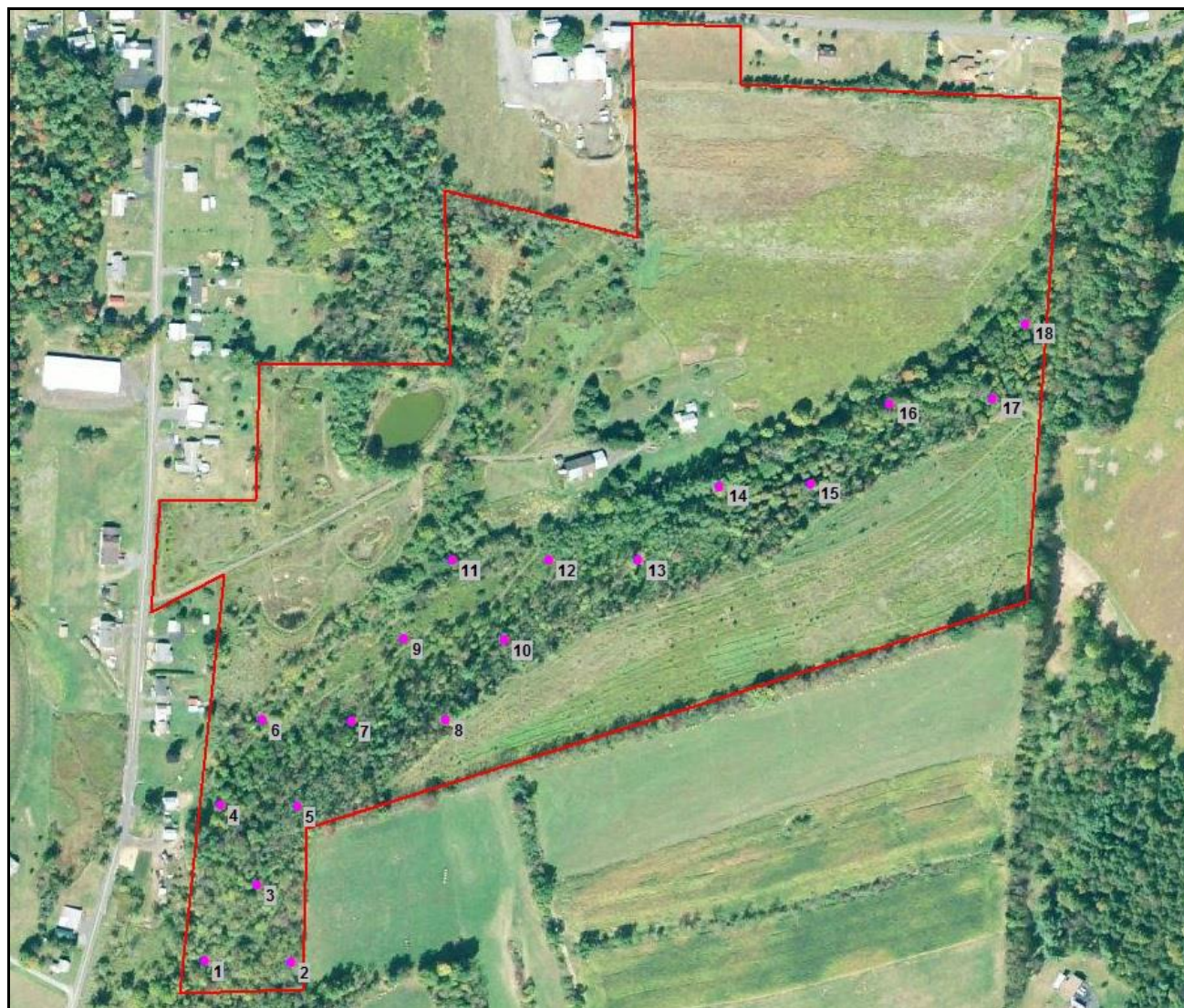
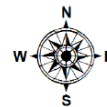
To capture good representation of forest stand conditions, 18 relatively even spaced points were initially established at 250 foot intervals throughout the forested portions of the ChicoryLane property. Plot center locations were marked with blue flagging and gps coordinates were taken to aid in accurate mapping. Any unique observations or findings from the field work were documented and correspond with the nearest individual inventory plot location.

Sampling Methodology:

- The variable radius point method was used with a Basal Area Factor (BAF) 10 prism to sample the overstory trees 1” inch in diameter at breast height and larger.
- Fixed area plots, mil-acre in size were used for collecting regeneration data – trees seedlings growing on the forest floor up to sapling sized stems 6 inches in diameter at breast height.

**For detailed information on the inventory data collection and analysis process, please refer to *Managing Timber to Promote Sustainable Forests: A Second-Level Course for the Sustainable Forestry Initiative in Pennsylvania*, which is included in the appendix.

ChicoryLane 'Initial' Inventory Point Location Map



Inventory Plot Locations (n=18) throughout the ChicoryLane property

CURRENT CONDITION OF CHICORYLANE PROPERTY:

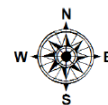


The ChicoryLane property can be described as a highly visible, ecologically important, historic farm that has been formally protected into perpetuity through a working forest conservation easement. Traditional farming activities of haying and grazing open fields have been abandoned and in some areas replaced by the cultivation of aesthetically pleasing plants along with strategic tree and shrub plantings, all for the benefit to area wildlife.

More than half (68%) of the 68 +/- acre property is in a non-field, seral stage of plant succession, in many cases consisting of a mixture of grasses, forbs, shrubs, and trees.

The average elevation throughout the property is approximately 1,200' feet above sea level. The lowest elevational point (1,135') is along the southwestern boundary where the unnamed tributary of Penns Creek departs the property near other private residents adjoining Brush Mountain Road. The highest elevation point reaching 1,315' is found near the property's southeastern corner boundary, within the reforestation area referred to as the 'knoll up top'. Overall, the terrain is gently rolling to relatively flat with a long and narrow section of ground resembling a 'band' within the center of the property that exhibits moderate to very steep slopes. This north and northwest-facing hillside area spans approximately 10-acres. It serves as a pronounced transition zone, giving rise to riparian streamside buffer and wet riparian areas to the north and to the south drier

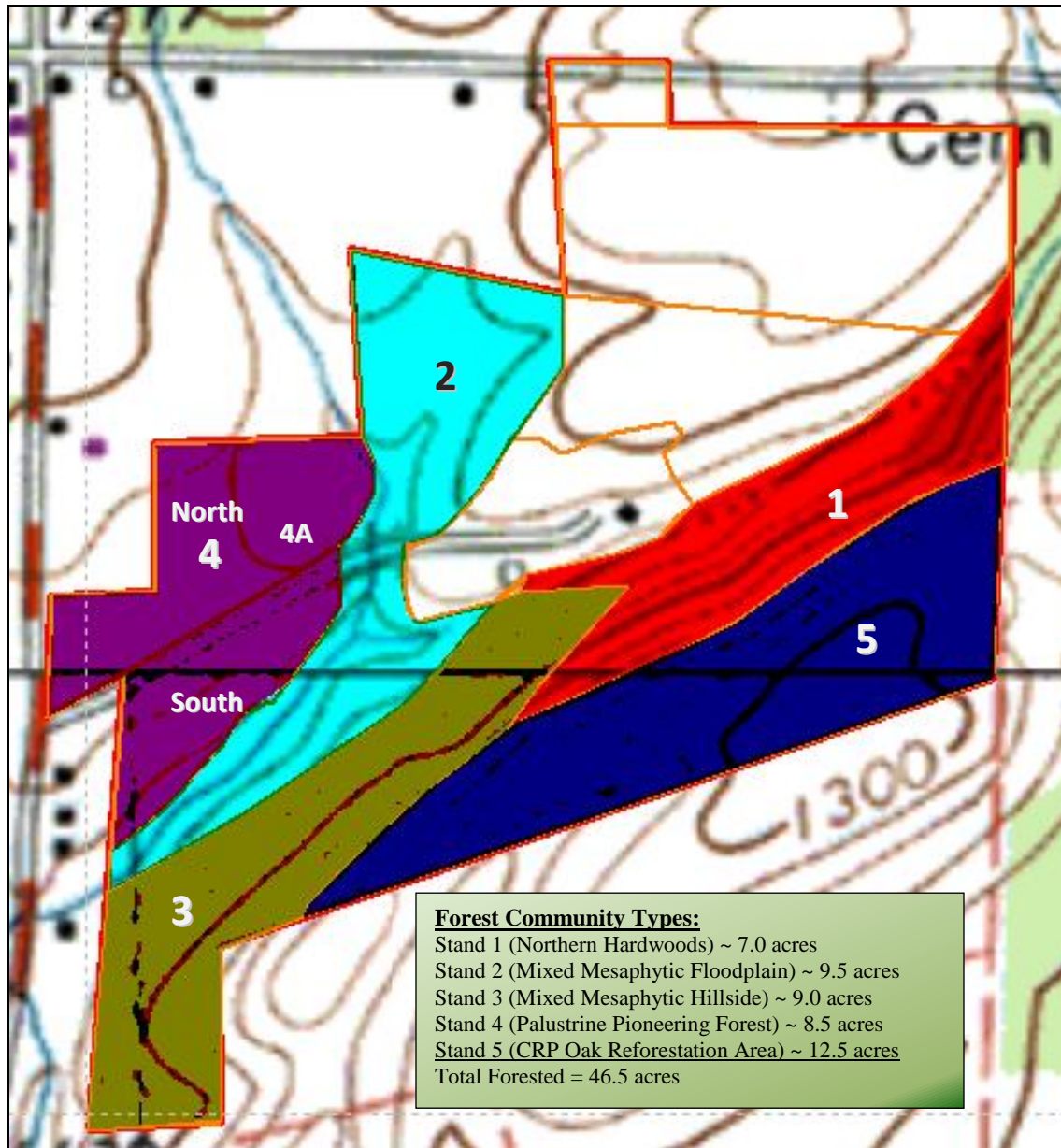
upland sub-xeric and xeric soils that flatten out along a hillside. Overall, this section of steep ground and ecologically sensitive areas with hydric soils and obscure, intermittent and ephemeral stream channels concentrated within the central portions of the farm are the main elements that pose concern and limitations to active forest management operations.



Red Band indicates slope in excess of 40% as generated by digital elevation model analysis
(Green Leaf Consulting Services, LLC.)

Soils throughout the ownership are highly productive signified by the amount of acreage once utilized for crop production and hayfields. Two-thirds of the growing space within the farm is comprised of a soil type identified as either Prime Farmland or Farmland of Statewide Importance. The farm's loam soils are capable of supporting optimal plant diversity, including above average hardwood (deciduous) and softwood (coniferous) timber growth.

ChicoryLane Tract Community Types Map



ChicoryLane Forest Cover Area Map by Forest Community Type
(Influenced by *DESIRED FUTURE COMMUNITY TYPE CLASSIFICATION*)

More than 25 different tree and shrub species were documented during the 2018 field assessment, with 16 species being of commercial value. The forested portions of the property are broken down into 5 management units or stands ranging in size from 7 to 12.5 acres and fragmented by multiple fields, hedgerows, tree lines, streams, water features, and a general living area. Hemlock (White Pine)-Northern Hardwoods and Red Oak Mixed Hardwoods can be identified as the predominant forest community types comprising the few patches of mature forest cover that exists within the farm.

Due to a high percentage of the forest cover within the farm being in a 'young forest' earlier seral stage of development (reference Harper) along with a growing number of forest stresses, including pests, diseases, non-native invasive plants, and increasing changes in weather patterns, the Mixed Mesaphytic forest type should be seriously considered as the focus for desired future conditions. In particular, decades of high deer browse impacts, increasing upper canopy tree mortality, and encroachment of undesirable competing vegetation is severely limiting the most desirable hardwood species from regenerating. Overall health of the multiple forest ranges from poor to fair. The mid-story and understory levels of the forest are where most of the challenges are found. Important hard and soft-mast producing trees needed to repopulate the forest are not found in great abundance. Seed producing sized stems that do exist are increasingly susceptible to decline and mortality corresponding with age along with the stress of periodic drought and defoliation cycles most often involving gypsy moth. Decades of overabundant deer populations and associated browse impacts have greatly impacted the forest, evident by the shade-tolerant, non-mast producing trees that are dominating the composition of both the lower and middle canopy layers of forested areas.

Where forest cover did exist on the farm, past low-intensity selective harvesting has also contributed to declines in forest health and wildlife habitat conditions. Selective 'High-Grade' timber harvesting occurred throughout much of the region. This practice is associated with the removal of the largest, highest quality and highest value trees with little to no regard to residual conditions of the stand (growing stock). Also known as diameter-limit cutting, this harvesting regime is a common practice, particularly on private forest lands across the region. In this practice a landowner might decide to cut down all of the trees larger than a certain size (e.g., 16 inches in diameter), and all smaller trees would remain standing regardless of general health, species, or commercial value. Typically, diameter-limit cutting does not include consideration of the amount of timber left nor keep future timber growth at an optimum level. Usually, the most harvestable timber is removed in the first cut, thereby providing a landowner with short-term revenue. Diameter-limit cutting leads to a degraded forest, with an unnaturally high component of certain tree species, usually of poor form and slow in growth. Furthermore, repeated diameter-limit cutting leads to decreasing timber yields and declining timber quality over time, resulting in a forest with a reduced economic value (refer to Forest Stewardship Publication Number 7 in the Appendix).

It is no surprise based on the history of the farm being primarily open land that the forest inventory performed by Moonlight Forestry in 2018 shows moderate to severe deficiencies in nearly all forest condition attribute ratings. Specifically, the amount (stocking) of desirable (AGS) trees and shrubs that occupy the growing space is lacking. Forest structure, in terms of the amount and quality of coarse woody debris on the ground along with different size and height classes of trees that contribute to complexity of canopy strata are lacking collectively because of past land use. However, these measurements establish a baseline to quantitatively document current conditions and upon remeasurement in the future can help to discern progress towards targeted goals and objectives. The metrics used to define regeneration can be viewed as the most relevant and meaningful forest condition attributes that speak to early seral plant community stages that the landowner is trying to perpetuate. Unfortunately, the stocking of desirable seedlings is low and regeneration potential further reduced by continued deer browsing and encroachment of undesirable competing plants, some of which are not native to the US. In addition, increasing tree mortality is creating canopy gaps allowing additional sunlight to reach the forest floor. These areas should be growing a diverse mix of young trees to become the next forest, but the growing space in many areas is heavily encroached by undesirable shrubs or choked out by sod-forming grasses. These degraded understory conditions have resulted in regeneration challenges and failures that correspond directly with deficiencies in wildlife habitat. This phenomenon, if not remedied, will limit wildlife habitat potential and serve as the greatest threat to the long-term health, diversity, and viability of this forest. Refer to the *Forest Health and Condition Report* below.

The following Chart represents a comprehensive Report that quantitatively summarizes and thematically rates the current condition of your forest by attributes that together characterize the health, productivity, diversity, and overall sustainability of your property.

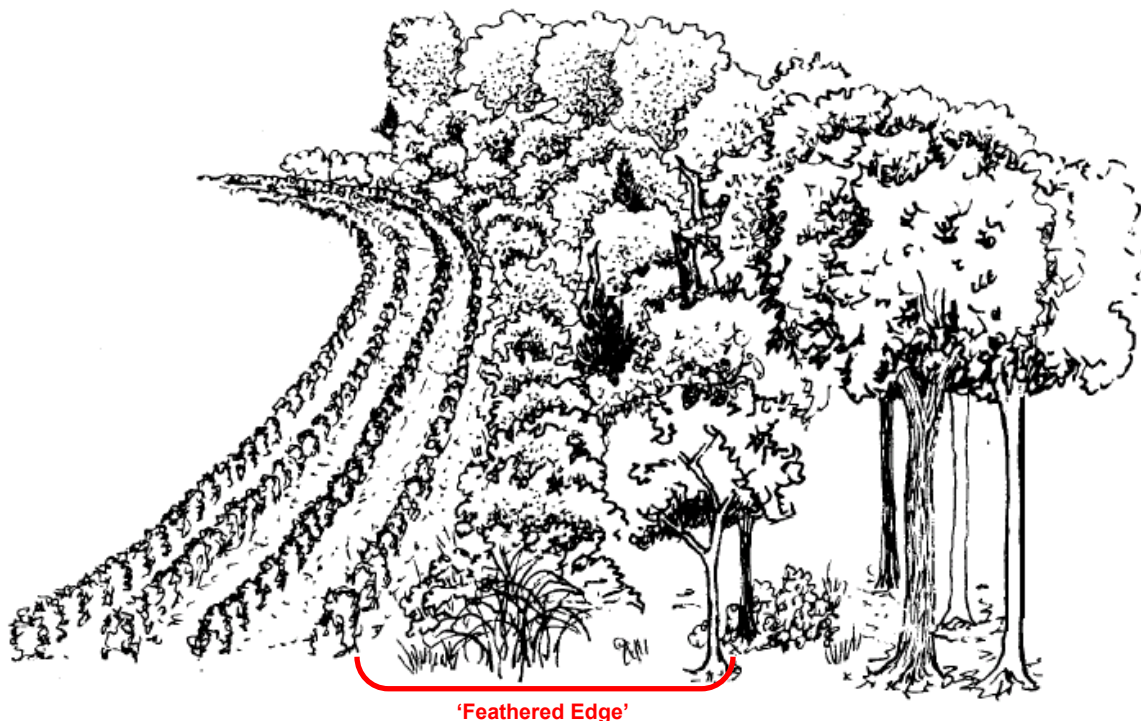
Mgmt. Unit*	COMPOSITION				STRUCTURE		REGENERATION		
	Stocking (%)		Tree Species		live>= 16" dbh	snags>= 10" dbh	seedling (regen)	% desirable (regen)	Deer Browse Impact
	TOTAL	AGS	Diversity	Evenness					
1	72	61	11	0.71	7	5	3000	83	4
2	50	45	4	0.51	0	0	2250	45	4
3	29	12	7	0.78	5	5	1500	22	4
4 N/S	50	50	3	0.74	0	0	0	0	4
4a	66	66	4	0.69	3	37	0	0	4

RATING	Stocking (%)		Tree Species		live>16" dbh	snags>= 10" dbh	all stems (regen)	% desirable (regen)
	TOTAL	AGS	Diversity	Evenness				
POOR	< 44	<40	</=3	0 to 0.6	0 to 3	0 to 2	0-10k	<25
FAIR	45 to 58	41 to 53	4-8	0.61to 0.7	4 to 8	3 to 5	10,001-15k	26 to 54
GOOD	59 to 79	54 to 69	9-12	0.71 to 0.8	9 to 16	6 to 8	15,001-50k	55 to 74
V. GOOD	80+	70+	>12	0.81+	17+	9+	>50k	>75

RATING	Deer Browse Impact Rating
5	V. High Impact
4	High Impact
3	Moderate Impact
2	Low Impact
1	No Impact

For further explanation on how to interpret the above Forest Condition Report refer to the KEA Report Card Summary within the Appendix.

Fields and Forest Openings (Woods Roads and Landings):



High Quality 'Edge' Habitat with a 'Soft' Transition from Forest Opening to Continuous Tree Cover

Conservationist Aldo Leopold once said that many kinds of wildlife are a product of the “edge”. In other words, many living creatures depend on the area that separates a field from a woodland for their existence. Forest edge provides a combination of food and cover that is critical to the amount, diversity, and quality of an area’s wildlife population. Edge quality depends on how gradually the forest becomes a field. Pennsylvania has countless miles of edge produced along road ways, fields, and powerlines, however a good quality edge habitat is defined by a gradual transition zone that requires some work on part of the landowner. High quality woodland edge contains shrubs, small trees, brush piles, weeds, and vines all of which contribute to providing wildlife with food, like berries, seeds, browse, and insects. They also offer better nesting cover and protection from weather and predators.

The vertical structure of a forest is in great contrast to the horizontal structure of a field. When the “horizontal” vegetative structure of a field meets the “vertical” structure of the forest, a sharp, abrupt break between vegetative classes often occurs. Wherever possible, it is best to soften or “feather” this transition to enhance its quality for wildlife and aesthetic purposes.

<i>Feature</i>	<i>Linear Feet of 'Edge' Habitat</i>
<i>Fields & Open Areas</i>	9,119' ~ 1.73 miles
<i>Primary Roads</i>	1,335' ~ 0.25 miles
<i>Secondary Trails</i>	16,841' ~ 3.18 miles
<i>Totals</i>	27,295' ~ 5.16 miles



Grasslands, Pollinator Fields, Mowed Areas, and Transitions to Timberland create a Mosaic of Edge Habitat

Today, the ChicoryLane tract has more than 25-acres of that can classified as transitional plant communities that offer tremendous opportunity to further enhance 'edge habitat' through widening and diversifying the structural characteristics of transitions between herbaceous cover, grassland, shrubland, and forest patches. The riparian buffers surrounding multiple water features, streams, existing roads and the extensive trail network are other potential targeted areas that can be managed to improve 'edge' habitat; all of which is attractive and beneficial to an assortment of mammals, amphibians, and a host of bird species.

The perimeter of the more open grasslands within the ChicoryLane property often exhibit either an abrupt or narrow transition from field to forest and could be enhanced for wildlife and aesthetic purposes.

Adjustments in mowing schedules, strategic piling of brush, along with efforts to eliminate invasive plants and replace them with the plantings of low growing shrubs and trees can lead to enhanced 'edge' habitat. However - although many opportunities exist to improve edge habitat, such efforts should be carefully considered as the probability of success can be low, costs are usually high, and positive results can sometimes conflict with other objectives.

To learn more about options for enhancing edge habitat for the benefit of wildlife, contact the PA Game Commission to take advantage of their Private Landowner Assistance Program (PLAP).

- The enclosed PLAP application can be submitted to the North-Central Regional Office and will result in free consultation with certified wildlife biologist Mario Giazon.
- The program offers custom recommendations for managing wildlife on your property.
- For more information call 570-879-2575 or log onto:
<http://www.portal.state.pa.us/portal/server.pt?open=514&objID=620396&mode=2>

LANDSCAPE-LEVEL FOREST THREATS & CHALLENGES:

Many forest landowners across Pennsylvania, but particularly within the north-central region are dealing with stressed and often degraded forest conditions similar to or worse than that found within the ChicoryLane property. Deer browse impact assessments and tree regeneration survey results show that nearly 70 percent of all forests within the Commonwealth lack adequate regeneration (seedlings/saplings) to establish a new forest. Competing vegetation, both non-native invasive species and unnaturally high densities of select native plant and tree species (e.g., hay-scented fern and striped maple) are inhibiting the establishment and advancement of desirable growing stock (regeneration).

Competing Vegetation:

Non-native invasive species are defined as plants and animals that are introduced into an ecosystem or environment that are otherwise not present. Such undesirable vegetation growing on or along the forest floor has become an increasingly complex problem throughout many regions of Pennsylvania. This phenomenon is negatively impacting the health and diversity of our forests. Non-native invasive species, such as autumn olive, Japanese barberry, multi-flora rose, honeysuckle, and in some cases select native species are overtaking growing space and preventing the development of other desirable tree and shrub species. Hayscented fern is a prime example of native vegetation that has gained a competitive advantage over other native species, thus hayscented fern can be observed in many local forests as dominating the understory, creating a fern-like savanna. Dense thickets of fern significantly reduce the amount of light needed in order for other seedlings to grow. Research has shown that decades of a mismanaged deer herd has led to this altered vegetative condition in many forested areas. To combat undesirable competing vegetation, landowners can invest in fencing to eliminate deer browse impacts along with using appropriate herbicides to kill or significantly reduce targeted species. In some cases, manually removing or cutting of select species may be adequate treatment, but often times this approach requires fencing to completely eliminate deer impact.

The most common, widely acceptable and cost effective approach to dealing with pests, particularly non-native invasive species is through appropriate applications of herbicide approved for forestry use. More details are included within each Stand Description and Recommendations section.

Common Non-Native Invasive Plants found within the Region
Non-Native Invasive Vegetation detected within the ChicoryLane Tract (★)



Autumn-Olive



Honeysuckle



Japanese Barberry



Tree-of-Heaven



Mile-A-Minute Weed



Garlic Mustard



Multi-Flora Rose



Oriental Bittersweet



Japanese Stiltgrass

Refer to the following links for in-depth information on the above species.

<http://efotg.sc.egov.usda.gov/references/public/VT/JS314-AutumnOlive.pdf>

<http://efotg.sc.egov.usda.gov/references/public/VT/JS314-Honeysuckle.pdf>

<http://efotg.sc.egov.usda.gov/references/public/VT/JS314-Barberry.pdf>

<http://efotg.sc.egov.usda.gov/references/public/VT/JS314-Multiflora.pdf>

<http://efotg.sc.egov.usda.gov/references/public/VT/JS314-Bittersweet.pdf>

<http://www.invasivespeciesinfo.gov/plants/stiltgrass.shtml>

<http://www.invasivespeciesinfo.gov/plants/mileminute.shtml>

<http://www.invasivespeciesinfo.gov/plants/treeheaven.shtml>

<http://www.invasivespeciesinfo.gov/plants/garlicmustard.shtml>



White-tailed Deer Impacts:

Deer, unlike most other wildlife species, have a direct and sometimes profound effect on the quality of the habitat in which they live because they consume the vegetation that they rely on for habitat. Deer can completely shift the character of a woodlot; much like beavers can shift or destroy one type of habitat and create a wetland habitat in its place. White-tailed deer are herbivores, constant browsers of succulent new growth on trees and shrubs. They have preferred foods and will select those that they like first, consuming up to 5 to 10 pounds of browse per day. Once preferred plant and woody stem species are consumed, deer will then move on to secondary species that they like less, but can tolerate. If deer densities increase beyond the carrying capacity of a specific habitat, the results of over-browsing can quickly cripple a forest ecosystem, putting it into a degraded state that could take years if not decades to recover.



Deer feed heavily on tree buds during the winter months

Deer browse impacts rated **HIGH** throughout the ChicoryLane property.

The diversity and stocking of young trees (seedlings), particularly in areas that have increased light availability reaching the forest floor have been negatively influenced by deer. In order to promote maximum seedling survival and tree, shrub, and plant species diversity, it is critical to keep deer activity at a minimum on your property, particularly throughout the winter months when deer are most reliant on browsing buds from new seedlings. Small acreage landowners have little control over the local deer herd and the only possible solution is to work collaboratively with adjoining neighbors to harvest adequate numbers of deer on an annual basis. Pennsylvania is known for its 'Deer Wars' to which the Game Commission has struggled to successfully manage the state's deer herd at a responsible level for the past 70 years. This failure has resulted in a forest health and condition crisis, whereby an unprecedented amount of forest land across the Commonwealth is unable to regenerate (grow a new forest) because of the legacy effects of high deer impact. Today, in many cases, hunting alone does not result in the reduction of deer densities to a level that can be sustained for a long enough period to allow the forest to recover; therefore deer fencing has become a viable tool. In response to Pennsylvania's forest regeneration issues, multiple businesses have become established to provide specialized forest regeneration services. Installation of 8



Deer Impact: Inside Fence (left) Outside Fence (right)

foot tall woven-wire fencing is the most effective approach to controlling deer, but costs are prohibitive at \$3 a linear foot, therefore in most cases, is not an affordable option for the average forest landowner. (For more information on protecting trees from deer, refer to Appendix: Forest Stewardship Chapters 2 & 7.)

Quality Deer Management Approach

White-tailed deer (*Odocoileus virginianus*) are the most popular big game species in North America and one of the focal species for managing in this forest dominated property. A successful deer management program is developed through science-based strategies that create and maintain high quality habitat while regulating deer populations through adequate annual harvest levels. Historically, deer managers

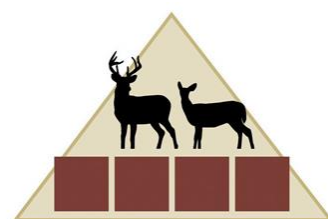
concentrated on increasing deer populations by protecting antlerless deer from harvest. Recent research has demonstrated that the overall quality of a deer herd can be improved through management practices commonly referred to as quality deer management (QDM). Numerous landowners and hunting clubs across the United States have successfully adopted this approach to managing white-tailed deer populations. An increasing number of Pennsylvania deer hunters and landowners are interested in the potential for implementing QDM strategies on property they hunt or own. Quality deer management promotes the philosophy of managing deer herds in a biologically and socially sound manner within the existing habitat conditions in an area. QDM is not trophy deer management, where the emphasis is placed on producing bucks with trophy-sized antlers, nor is QDM a program that promotes shooting only does. QDM simply encourages active participation of landowners and hunters in establishing and achieving defined deer management goals.



QDM strives to produce healthy deer herds in balance with existing habitat conditions by protecting young bucks from the harvest and ensuring an adequate number of antlerless deer are harvested. A recommended antlerless harvest is determined by the following criteria:

- Deer density (number of deer in an area)
- Sex ratio (number of bucks relative to the number of does in an area)
- Habitat condition
- Landowner objectives

Hunters who adopt and practice QDM become the managers of the deer herd by improving the age structure (allowing bucks to survive to maturity) and sex ratio, managing the habitat, and keeping detailed records on deer observed and harvested to ensure program success. In essence, QDM promotes sound deer management. Every area or property has its limitations. Property size, landscape context, habitat quality, soil productivity and land-use practices influence management decisions.



HERD MANAGEMENT
HABITAT MANAGEMENT
HUNTER MANAGEMENT
HERD MONITORING

The Symbolism of QDMA's Logo

The Quality Deer Management Association was founded in 1988 by Joe Hamilton, who designed the original QDMA Logo. While most deer hunting artwork focuses on bucks with monster antlers, Joe put a doe and a buck in the logo to symbolize the importance of managing both sexes to achieve balanced, healthy deer populations under QDM. He depicted a middle-aged buck with modest antlers to present an outstanding deer, yet one that the average hunter could realistically expect to produce by following the Four Cornerstones of QDM.

The DOE

The doe is the lever used to adjust deer density and thus control the deer herd. When the population exceeds the number of deer the local habitat can support, available nutrition is less than optimal. Fawn survival is less than it could be, deer growth rates and body sizes are below potential, antler size is limited, social conflicts are intensified, and susceptibility to diseases and parasites is higher. Taking the right number of does, combined with habitat improvements, can bring a population into balance with resources, greatly increases herd productivity and health. When populations do not exceed available nutrition, little or no doe harvest is necessary



The BUCK

Protecting immature bucks is the key to building "age structure" by allowing some bucks to reach maturity. The starting point for any QDM program is protecting 1½ -year-old 'yearlings', and the target age for harvest is determined by the individual hunter or group, depending on experience level and goals. As number of bucks increase, the ratio of does to bucks approaches a balance. When there is also a range of buck ages in the population, hunters witness the full, natural behaviors of a healthy deer population, including intensified rut competition, increased scrape and rub behaviors, and greater likelihood of encountering a mature buck while hunting.

Determining Deer Management Goals

Scientific research suggests that the average home range of a white-tailed deer is approximately 1 square mile (640 acres). Thus to be successful and have a meaningful effect on managing a local deer herd, landowners must work together cooperatively. Implementing a QDM program takes time and commitment among landowners and hunters. Changing the quality of the deer herd and improving the quality of available habitat may take quite a few years to accomplish. The ability to communicate goals and objectives and work with others is essential. The first step is to set realistic goals and collect appropriate data to help guide management decisions. Every group should strive to attain the following goals:

- Collect and record data, including the age and weights of harvested deer
- Maintain the deer population within the carrying capacity of available habitat
- Improve the buck-to-doe sex ratio
- Improve the age structure

Collaborative Deer Management:

1. Communicate with the adjoining neighbors on your forest condition objectives. Inform them of the activities taking place and try to obtain their support in managing the local deer population through increased antlerless harvesting.
2. Educate yourself on Quality Deer Management and how the Quality Deer Management Association's Cornerstones of Deer Management can be applied to your property (www.qdma.com)
3. Consider subscribing to the Quality Deer Management Association (refer to the enclosed Quality White-tails Magazine)

Chronic Wasting Disease: Pennsylvania Game Commission Summary



Disease Management Areas



ChicoryLane property

In Pennsylvania, Chronic Wasting Disease (CWD) has been detected in the following areas:

- Within a captive deer farm in Adams County (2012)
- In multiple free-ranging deer in Bedford, Blair, Cambria, & Fulton counties (2012)
- Within captive deer farms in Bedford, Franklin, and Fulton counties (2017)
- Within two captive deer farms in Jefferson County (2014)
- One free-ranging deer in Clearfield County (2017)
- A captive deer at a facility in Lancaster County (2018)

Corresponding Disease Management Areas have been established as defined on the above map to help in proactive efforts to manage the disease through various strategies. For more information on how the Game Commission is working to mitigate this threat to the state's deer and elk herd, please visit www.pgc.pa.gov.

Chronic Wasting Disease (CWD) is a contagious, always-fatal disease that infects deer and elk in Pennsylvania. It is a transmissible spongiform encephalopathy (TSE). Other diseases in the TSE family include Bovine Spongiform Encephalopathy (BSE) or Mad Cow Disease in cattle; Creutzfeldt-Jakob disease (CJD) in humans; and Scrapie in sheep and goats. It was first recognized in deer and elk in Colorado in 1967. The cause of CWD is believed to be an abnormal prion (proteinaceous infectious particle). Prions are concentrated in the brain, nervous system, and lymphoid tissues of infected animals. The disease causes death of brain cells resulting in microscopic holes in the

brain tissue. CWD has been diagnosed in white-tailed deer, mule deer, black-tailed deer, and hybrids thereof, as well as elk, red deer, moose, and reindeer.

There is no evidence that CWD is transmissible to humans or traditional livestock. However, the Centers for Disease Control (CDC) reports that *“To date, there have been no reported cases of CWD infection in people. However, animal studies suggest CWD poses a risk to some types of non-human primates, like monkeys, that eat meat from CWD-infected animals or come in contact with brain or body fluids from infected deer or elk. These studies raise concerns that there may also be a risk to people. Since 1997, the World Health Organization has recommended that it is important to keep the agents of all known prion diseases from entering the human food chain.”*

CWD is transmitted both directly through animal-to-animal contact and indirectly through food and soil contaminated with bodily secretions including feces, urine, and saliva. Contaminated carcasses or high-risk carcass parts may also spread the disease indirectly through environmental contamination. Prions are very stable in the environment and remain infectious for decades.

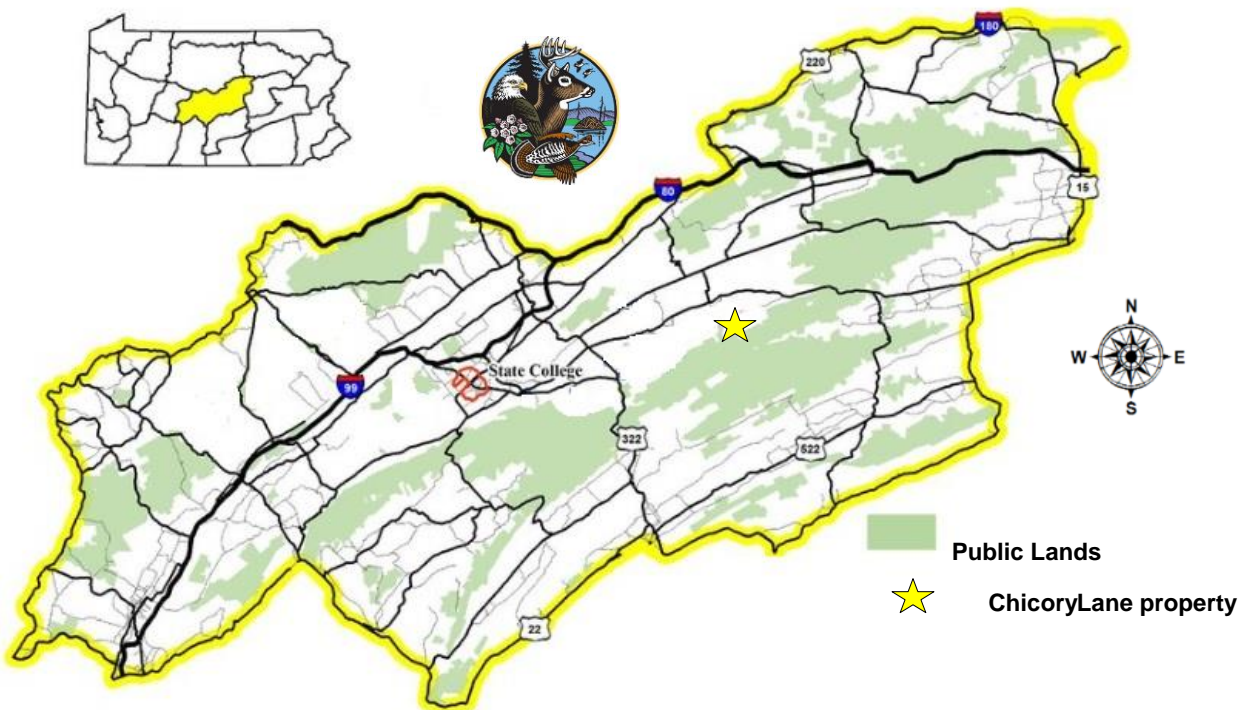
Animals infected with CWD do not show signs of infection for 12 or more months; many infected animals look completely healthy. Late stage symptoms of CWD-infected animals include an extreme loss of body condition; excessive drinking, urination, salivation, and drooling; and behavioral and neurologic changes such as repetitive walking patterns, droopy ears, a wide-based stance, and listlessness. Some animals lose their fear of humans and predators. There is no known cure. It is also important to note that these symptoms are characteristic of diseases other than CWD.

Summary

The amount of forage and browse within the local forested landscape is limited. Nearby agricultural lands and food plots may serve to inflate the carrying capacity of the land through artificial foods (crops) that attract and benefit deer throughout portions of the year. Typically, when those food sources are exhausted, overwintering deer congregate and rely upon interior forest browse. Decades of high deer populations resulted in browse impacts that suppressed desirable new growth from establishing and advancing. In more recent decades, encroachment of undesirable vegetation, most of which is unpalatable to deer, now occupies an increasing amount of growing space. The availability of light reaching the forest floor has and continues to increase, initially resulting from tree mortality associated with the mid-1980's gypsy moth infestation and more recently with increased canopy gaps associated with storm damage and new non-native pest and disease induced tree mortality (e.g., ash and hemlock). Even with lighting conditions being optimal for promoting new growth, desirable vegetation is unlikely to establish without proactively reducing interfering competing plants while simultaneously reducing and maintaining deer numbers at a level (<12 deer per square mile) viewed by area residents and stakeholders as unacceptable and too low.

Deer fencing is a costly investment, however for ChicoryLane – it may need to be a consideration to which will prove a critical tool required in many areas to help ensure a desired forest condition outcome over the long-term.



Pennsylvania Game Commission: Wildlife Management Unit 4D



Deer Management History at ChicoryLane:

The Smiths enrolled in the PA Game Commission’s Deer Management Assistance Program (DMAP) beginning in 2017. DMAP provides an allotment of antlerless tags that can be given to local hunters to increase the opportunity to harvest more deer within a given property. The landowner’s work with a few local hunters who they trust will make an honest effort to fill DMAP tags and hunt the property in a responsible, ethical, and respectful manner.

It is recommended that a custom DMAP Report Card be designed and provided to participating hunters each year to track annual deer hunting efforts and harvest rates.

Coupon #	2019-2020 DMAP Report Card		Please indicate approximate areas where you hunted, sighted and/or harvested a deer.
Name: _____			
Seasons Hunted:			
Archery <input type="checkbox"/> Muzzleloader <input type="checkbox"/>			
Rifle <input type="checkbox"/> Flintlock <input type="checkbox"/>			
No. of days hunted at Chicory Lane: _____			
Did you see deer? Yes <input type="checkbox"/> No <input type="checkbox"/>			
If yes, how many: _____			
Did you harvest a doe? Yes <input type="checkbox"/> No <input type="checkbox"/>			
If yes, date of harvest: _____			
Did you harvest a buck? Yes <input type="checkbox"/> No <input type="checkbox"/>			
If yes, date of harvest: _____			
Points: _____			
Please fill out and return this Hunter Report Card regardless if you harvested a deer or not.			● = area hunted
Please Note: All holders of a DMAP harvest permit MUST also report to the PGC by 2/8/2020			✕ = harvested

The following is a summary of Pennsylvania forest pests and diseases that may affect the health of ChicoryLane:

COMMON NAME	THREAT RATING (ChicoryLane)
<u>Gypsy Moth</u>	High
<u>Hemlock Woolly Adelgid</u>	High
<u>Emerald Ash Borer</u>	High
<u>Armillaria Root Disease</u>	High
<u>Asian Longhorned Beetle</u>	High
<u>Beech Bark/Beech Scale Complex</u>	Moderate
<u>Spotted Lanternfly</u>	Moderate
<u>Eastern Tent Caterpillar</u>	Moderate
<u>Fall Cankerworm</u>	Moderate
<u>Leafrollers</u>	Moderate
<u>Twolined Chestnut Borer</u>	Moderate
<u>White Pine Weevil</u>	Moderate
<u>Maple Anthracnose</u>	Moderate
<u>Leaf Galls</u>	Moderate
<u>Elm Spanworm</u>	Moderate
<u>Scale Insects</u>	Low
<u>Spruce Gall Adelgid</u>	Low
<u>Fall Webworm</u>	Low
<u>Black Knot or Cherry</u>	Low
<u>Thousand Canker Disease</u>	Low

** Select individual species to be linked to a website with Profile Information

DCNR Bureau of Forestry
 Division of Forest Health
 4455 Big Spring Road
 Blain, PA 17006
 Paul Weiss, Forest Health Specialist
 Phone: (717) 536-3961
 Email: paweiss@pa.gov

DCNR Bureau of Forestry
 Centre County
 181 Rothrock Lane
 Huntingdon, PA 16652
 Tim Cole, Service Forester
 Phone: (814) 643-2340
 Email: ticole@pa.gov

Forest Pests and Diseases:

Native to North America and a defoliator of Hardwood trees in Pennsylvania, the **Forest Tent Caterpillar** is a cyclic pest with populations that occasionally reach epidemic proportions. The last significant outbreak in North-Central PA was in 2010 and resulted in 470,000 acres of defoliation in public and private forestlands. Like other butterfly species, the forest tent caterpillar undergoes a complete life cycle. Its egg masses are deposited on upper tree canopy twigs, where they overwinter and hatch as larvae in the early spring. The larval stage is the portion of the life cycle that causes the most damage to trees by way of the caterpillars feeding on foliage. Sugar maple is the preferred tree species for feeding, however ash, birch, cherry, and basswood serve as secondary food sources.



Forest Tent Caterpillar

Forestlands throughout Pennsylvania are prone to periodic forest tent caterpillar outbreaks. Sequential defoliation episodes combined with other stress factors often lead to tree decline and mortality. Predicting epidemic outbreaks and severe defoliation episodes is difficult. Egg masses can serve as an indicator of future defoliation potential; it is difficult to predict how many years a given outbreak will last. Outbreak populations usually collapse after a few seasons due to the buildup of populations of natural enemies like parasitic flies and wasps. Monitoring of caterpillar activity, egg mass prevalence and favorable environmental factors should be the first step in developing management guidelines for control.

Forest tent caterpillar populations can be controlled with the use of commercially available pesticides. Pesticides are usually applied by plane or helicopter in mid spring when the caterpillars are in the first “crawler” stage. The most commonly used pesticide is *Bacillus thuringiensis* (BT), a naturally occurring microorganism that produces chemicals toxic to host insects. Timing is crucial as BT must be ingested early in the developmental stages of targeted insects. When properly applied, BT is highly effective and non-toxic to humans. When outbreaks occur, the Bureau of Forestry’s Pest Management Division may work with county governments to implement spray programs that are administered on private forest lands.

Non-Native Defoliating Insects:

Gypsy Moth:

Accidentally introduced to Massachusetts in 1869, the gypsy moth caterpillar spread throughout New England and the Mid-Atlantic region of the country. By the 1970's, gypsy moth populations ravaged the eastern and central oak forests of Pennsylvania, leading to the loss of many oak trees and other hardwoods. Since the worst outbreaks in the 1970's and 80's gypsy moth populations have generally shifted to endemic levels with periodic outbreaks resulting in moderate to regionally severe defoliation episodes.



Gypsy Moth Caterpillar

Forestlands throughout Centre County are prone to periodic gypsy moth outbreaks. Sequential defoliation episodes combined with other stress factors often lead to tree decline and mortality. Additionally, gypsy moth defoliations can severely impact acorn production. Studies in Pennsylvania have shown a decrease of 50% in per acre acorn production for several years following severe defoliations, which negatively impacts wildlife.

Predicting epidemic outbreaks and severe defoliation episodes is difficult. Egg masses can serve as an indicator of future defoliation potential though future mortality levels will determine eventual caterpillar populations and their impact. Natural mortality will build and collapse populations, depending on a variety of factors including stage of the outbreak, weather patterns and biological control factors. Monitoring of caterpillar activity, egg mass prevalence and favorable environmental factors should be the first step in developing management guidelines for control.



Female Gypsy Moth laying eggs

Gypsy moth populations can be controlled with the use of commercially available pesticides. Pesticides are usually applied by plane or helicopter in mid spring when the caterpillars are in the first "crawler" stage. The most commonly used pesticide is *Bacillus thuringiensis* (BT), a naturally occurring microorganism that produces chemicals toxic to host insects. Timing is crucial as BT must be ingested early in the developmental stages of targeted insects. When properly applied, BT is highly effective and non-toxic to humans. When outbreaks occur, the Bureau of Forestry's Pest Management Division will work with county governments to implement spray programs that are administered on private forest lands.

- Maintain communications with your local DCNR Bureau of Forestry, Service Forester (Tim Cole) to stay aware of such programs.

Current Threats:

Beech Bark Disease is a canker disease caused by a unique relationship between the beech scale insect and a fungal pathogen that infects the living tissue of beech trees and feeds on its sugars and nutrients. Also called Beech Snap Disease because the inner bark of the tree develops cankers that generally expand, weakening the integrity of the wood fibers within the main bole of the tree and often results in breaks or ‘snapping’ of the stem over time. Tree decline and mortality is often a result of beech bark disease, however a small percentage of beech trees (1-5%) throughout the region exhibit natural resistance to the blight. Resistant trees should be preserved to allow its seed to disperse to produce more disease resistant trees. Trees that are susceptible to beech bark disease become stressed, which triggers sucker sprouting. Sucker sprouting of ‘beech brush’ has become a significant forest health issue across the northern tier of Pennsylvania. Beech brush sprouts can often dominate the forest understory and suppress the development of other more desirable tree and shrub species. Chemical options exist to reduce beech brush sucker sprouting (refer to *PSU Herbicides and Forest Vegetation Management Publication in Appendix*).



Beech Scale Disease w/ Sucker Sprouting

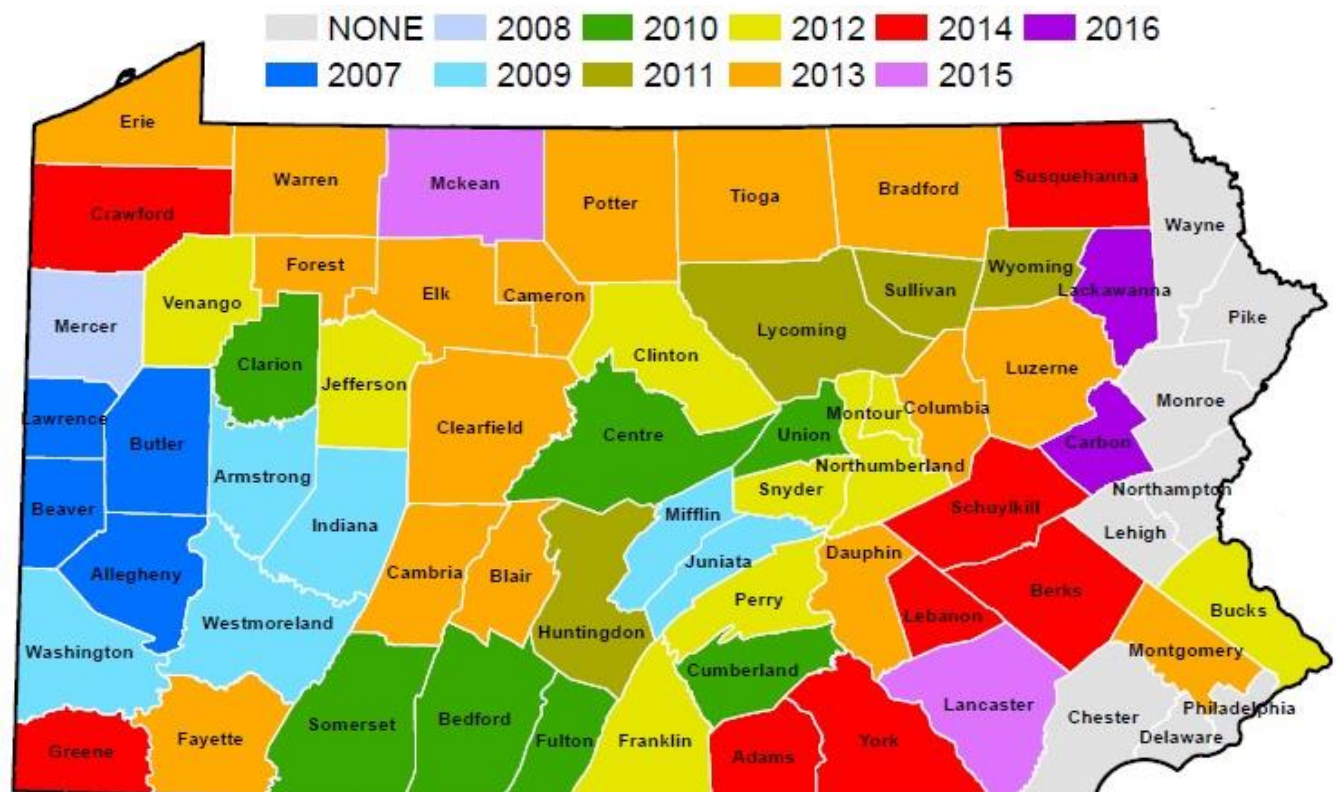
Hemlock Woolly Adelgid (HWA) is a fluid-feeding insect that feeds on hemlock trees throughout eastern North America. It was introduced into the US from Asia and was first discovered in PA in 1967. It has since spread throughout 49 counties in the eastern two-thirds of the state, including Centre and Clinton Counties. Cold winter temperatures can slow the spread and even prevent the establishment of the Hemlock Woolly Adelgid, however once established, hemlocks usually begin to die within four years. Trees that don't die often persist in a weakened state with crowns appearing grayish-green. (Healthy hemlocks naturally have a shiny, dark green colored foliage). Biological controls (e.g., beetles) are being explored for controlling the hemlock woolly adelgid in hopes that they might be a long-term solution to save conserve our native hemlock resources. Chemical treatment options exist, but are short-lived and very costly.



Hemlock Woolly Adelgid

The ***Emerald Ash Borer (EAB)*** is another introduced pest from Asia that first showed up in the Lake States. It was detected in western PA in 2007 and has since expanded. The beetle creates D-shaped holes in the trunk of trees, boring and eating the inner tree cells of Ash species just below the bark, which essentially girdles the stem, killing it within a short time-frame. The PA Department of Agriculture in collaboration with the DCNR Bureau of Forestry and other partners are monitoring the spread of EAB. As of 5/2016, the Emerald Ash Borer has been found within 59 of PA's 67 counties, to which includes Centre County. Chemical control options exist, but are short-lived and very costly. Biological controls are being tested and are currently unavailable for private forest landowners. The 2018 inventory conducted by Moonlight Forestry revealed a moderate number of ash trees as remaining within the forested portions of the property, but were dead and the remaining in poor health and decline. The effects of EAB are pronounced with tree mortality anticipated to be at 100% within the next two years. ***Time and effort to protect any remaining ash stems found to be alive through chemical treatments is not recommended due to the high costs and low likelihood of the tree's long-term survival.***

Pennsylvania Counties with Confirmed Emerald Ash Borer



Potential Threats:

The **Spotted Lanternfly (SLF)**, an invasive planthopper, was first discovered in eastern Berks County, PA during late summer of 2014. Yet another introduced pest, native to China, India, and Vietnam. This insect prefers to attack tree of heaven, but will feed on many other host plants including grapes, apples, stone fruits, and has potential to do great harm to the agriculture and forest products industries.

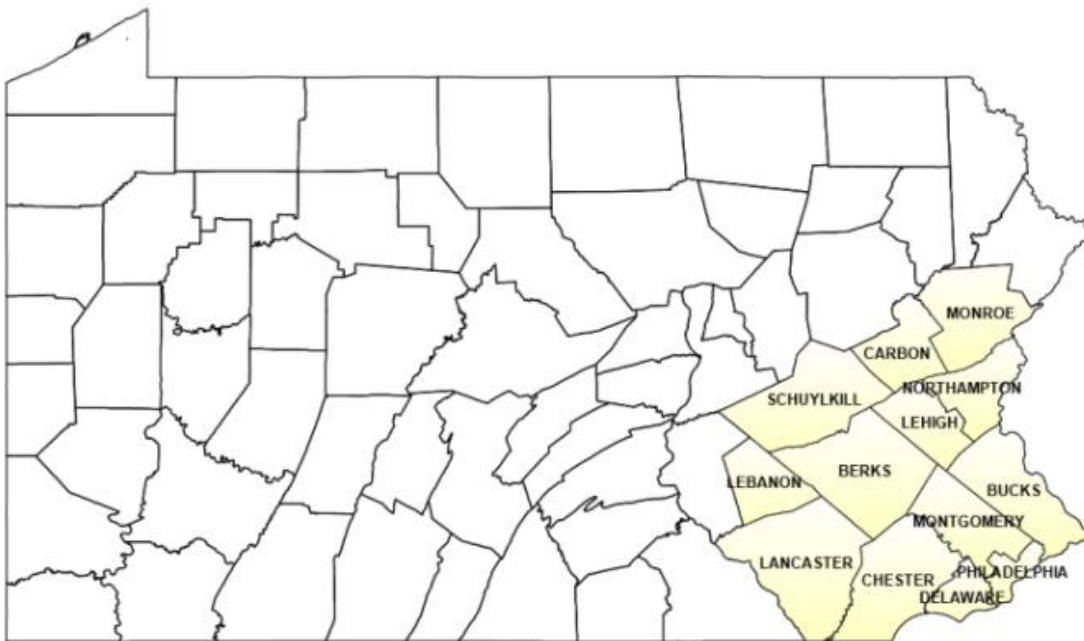
Stages of Development:



Stage 1: Eggs are deposited in groups of 30-50 and covered in yellowish brown waxy deposits which later harden to form a protective casing. *Stage 2:* Similar to the gypsy moth life-cycle, this pest goes through multiple instars or growth processes. SLF has a black body and legs with white spots during the first phase of its life (instars 1-3). *Stage 3:* At the fourth instar the pest retains spots but has a reddish body with distinctive red wing pads. *Stage 4:* As adults the SLF resembles a moth with a wider abdomen and is often confused with other moth species.

Early detection is vital for the protection of Pennsylvania businesses and agriculture.

Pennsylvania Quarantined Counties with Confirmed Spotted Lanternfly
As of September 2018



Monitoring & Early Detection Recommended Practices:

- If you see egg masses, scrape them off, double bag them and throw them away
- Collect a specimen – submit to PA Dept. of Ag. Entomology Lab for verification
- Take a picture – photograph any life stage and submit to badbug@pa.gov
- Report siting's to the Invasive Species Report Hotline: 1-866-253-7189

Additional Resources:

http://www.agriculture.pa.gov/protect/plantindustry/spotted_lanternfly/Pages/default.aspx

<https://extension.psu.edu/spotted-lanternfly-what-to-look-for>

Management Constraints:

Timber harvesting is one of the most useful tools a landowner has to influence the management of his/her forest. By implementing different harvesting strategies, one can manipulate the density, stocking, and structure of the trees within their woodlot along with producing specific conditions to increase the likelihood of growing certain tree, shrub, or other vegetative species. However, one of the greatest challenges that private forest landowners face in their pursuit of sustainable forest management is limitations associated with small property sizes. Today's forestry vendors and professional logging contractors are typically geared for production, meaning they have large, costly, equipment that enables them to move a tremendous volume of wood from the forest to the sawmill in a short time frame. Due to the costs associated with their operations (e.g., fuel, insurance, labor, etc.), they find it more and more difficult to justify harvesting timber, particularly low-grade timber on small tracts (e.g., 50 acres or less) because it is often not economically feasible.

The landowners interests in promoting forest health, species diversity, and enhancing habitat while fostering multiple stages of successional habitats prompts a multi-faceted, approach that may involve a range of activities including passive monitoring to aggressive forestry operations centered on *vegetation* and *brush management*, *invasive species control*, and *timber stand improvement*. With emphasis placed on managing for plant diversity and enhancing structural complexity of existing forest cover of structural attributes, commercial timber harvesting opportunities will be limited and not likely to be a pursuit foreseeable within this initial 10-year time-frame that this plan covers for the ChicoryLane tract, therefore most of the recommended management activities will come at a cost, either in the form of time and labor, or contractual work to qualified vendors to perform a specific management activity.

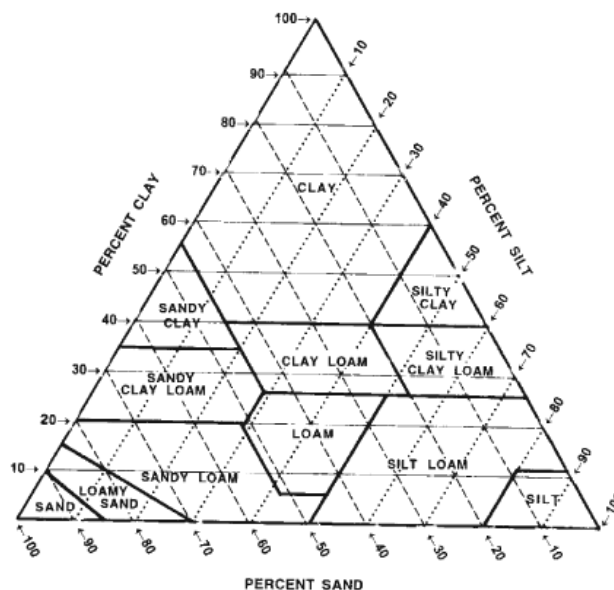
Technical Service Providers:

There are a growing number of technical service providers who specialize in precommercial forestry work that can be contracted to assist you in completing custom forestry treatments, such as installing deer fencing, applying herbicide applications at specified times and rates to selectively reduce targeted plants, as well as other recommended forestry work described in the following pages. Refer to Appendix: Forestry Consulting List.

Applicable Forest Management (Silvicultural) Concepts and Practices:

Soil Testing

Soil Fertility refers to the level of mineral nutrients essential for plant growth and development, and the chemical characteristics that affect nutrient availability to plants. Nutrient deficiencies in the soil can be corrected by applying the proper rates of fertilizers and lime. The only way to really know how much fertilizer and lime to apply is to have the soil tested. In a field or food plot setting, soil tests should be made several months before planting to allow enough time to receive test results and then apply lime before planting. Test results will determine the nutrient needs of a site for a particular planting, as well as help contain costs associated with over-fertilization and liming. Information and help on how to collect soil samples and interpret results can be obtained from Penn State Cooperative Extension (<http://extension.psu.edu/centre>) or by contacting the Penn State Agricultural Analytical Services Laboratory (<http://agsci.psu.edu/aasl>).

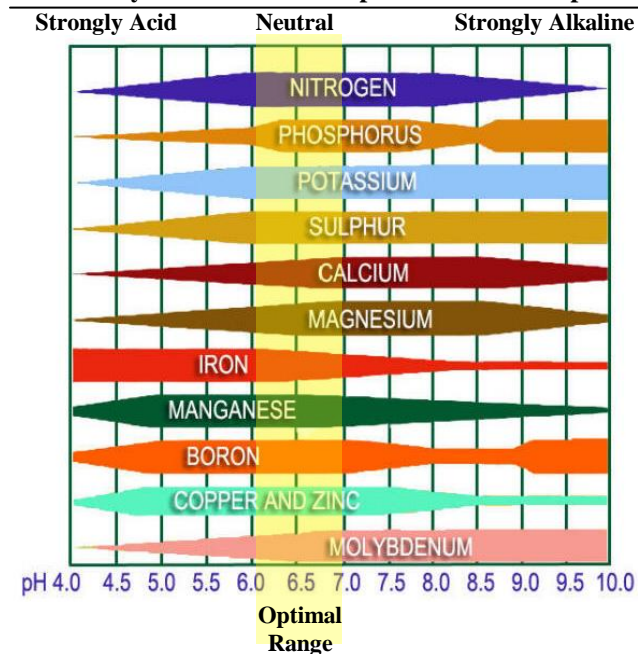


Penn State Cooperative Extension

Soil Amendments (Lime & Fertilizer)

Although managing soil fertility by the application of inorganic fertilizers and/or organic matter is not very common in forestry practices, strategic applications of fertilizer (13-13-13) to targeted native vegetation such as greenbrier and grapevines thickets, seed-producing shrubs (dogwood, sumac) and high value, hard and soft-mast producing trees can yield good wildlife beneficial results (refer to How to Manage Native Plants for Deer by J. Wayne Fears).

Availability of soil elements to plants at different pH levels

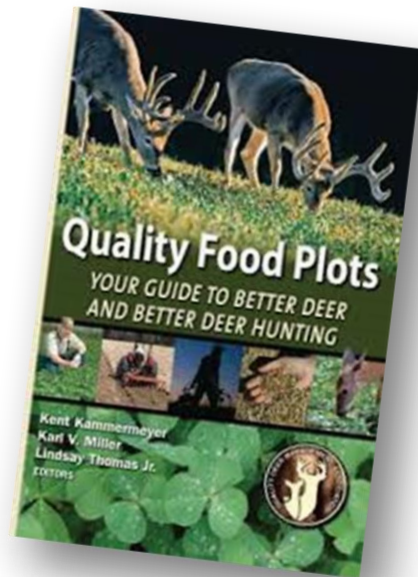


Herbicide Applications

Typically used where understory competing vegetation has become so established it interferes with establishment of preferred species. Typical species that are addressed with herbicide include rhizomous ferns such as hayscented and New York fern, beech sprouts, striped maple or sweetfern. Herbicides are applied by a certified applicator using equipment that can include skidder mounted mist blowers, backpack sprayers, or bark injection or application. Chemicals approved for forestry applications at prescribed concentrations and under proper weather conditions pose little environmental risk. Typical herbicides used in these forestry applications include glyphosate (ROUNDUP), sulfometuron methyl (OUST), and triclopyr (PATHFINDER). Several scientific papers on environmental risks are included in the Appendices. When evaluating impacts, the surfactant or “sticker” used to improve the effectiveness of the herbicide also needs to be considered as it can be a larger issue than the active ingredient. This is especially true around wetlands and open water. It should be pointed out that forestry applications for herbicide use only occur on a small subset of total forest management acres (refer to PSU Extension *Herbicides and Forest Vegetation Management Pub*).

Food and Cover Plots

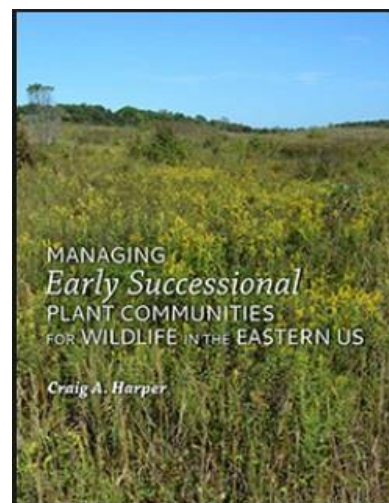
Food plots are a wildlife management tool that can improve forage opportunities, sightings, and hunting opportunities of game species and add diverse habitat characteristics for non-game species. Cover plots establish taller grass species which provide escape and nesting cover for birds and small mammals. Old log landings, access road corridors, old fields and disturbed areas such as retired sand and gravel pits all present opportunities for establishing planted plots. Any planting should be adapted to the soil and sunlight conditions and based on soil tests to address any needs for lime and fertilizer applications at planting and for ongoing maintenance. Mowing or burning may be needed periodically to maintain plantings and "no-till" agricultural techniques can be used to re-establish plots with minimal soil disturbance. Purchase the book *'Quality Food Plots – Your Guide to Better Deer and Better Deer Hunting'* by Kent Kammermeyer, Karl Miller, and Lindsay Thomas Jr. (\$35)





Fields, Grasslands, and 'Early Succession'

Early successional plant communities are important for many wildlife species in the eastern US. Both habitat generalists (e.g., deer, turkey) and specialists (e.g., bobwhite quail, eastern cottontail) benefit from early successional plant communities. The best opportunity to manage for these valuable habitats are in open areas that were once cropped, pastured, or hayed but no longer in production. These sites, referred to as 'Old Fields' are quite abundant throughout central Pennsylvania based on its land use history of agriculture. Old Fields that are not cropped or hayed can be very productive for many wildlife species. However, few are as productive as they could be for several reasons. Many fields are dominated by plants that are not desirable for wildlife, whether for cover or food. Most fields are not managed properly for wildlife nor are they the proper size to attract targeted species of interest.



A complementary hard copy of the Guide '*Managing Early Successional Plant Communities for Wildlife in the Eastern US*' by Craig A. Harper is provided and will provide perspective on the successional process by defining seral stages, evaluates management strategies to achieve targeted plant communities, and includes a variety of useful diagrams, full-color photos, and resource references; all of which will help you to formulate viable strategies to achieve early successional habitat objectives.

Prescribed Fire

An old tool which fell out of favor as the forestry community sought to control wildfires. Prescribed fire is emerging as a critical missing component of management within several of our regional forest communities. It can play at least three distinct roles in regeneration of vegetation:



1. *Ecological Restoration to reestablish vegetative communities adapted to the presence of fire.* Used in this manner, a prescribed burn is designed to consume much of the vegetation in a fairly mature community and stimulate sprouting, seed germination and recycling of nutrients to reestablish a new community adapted to the presence of fire. This can have benefits in maintaining critical habitats necessary for plants and animals adapted to these ecosystems and can also benefit game management for hunters as the quality of food and cover and the matrix of game habitat is improved through prescribed burns.
2. *Create receptive seedbeds* conducive to germination of forest seed. Acorns germinate best when the duff layer of dead leaves and debris is not excessive. Other seed is stimulated to germinate by warming soils or chemical changes brought on by a fire which consumes the leaf litter, vegetation and debris which builds up on the forest floor.
3. Prescribed burning also has utility in *manipulating the composition of forest regeneration.* Once forest seedlings and saplings are well established following a disturbance or harvest, a well-timed prescribed fire could have a major impact on the species represented in the future forest. This situation probably existed over much of the eastern forest last century where periodic burning of forest regrowth maintained a thicket type composition which shifted drastically to the species such as oak, chestnut and hickory adapted to fire and capable of resprouting after each burn. Other species such as white pine, birch, cherry and red maple may have germinated after a harvest or fire but will be effectively removed in a subsequent fire. To execute this treatment, the oak seedlings should be several years old, well established and able to withstand a moderate fire. Additional benefits could include encouraging pockets of herbaceous regrowth and prolonged periods in the seedling establishment stage recommended for the golden winged warbler and certain game species. Another benefit of prescribed fire not related to silviculture or ecological management is the removal of fuel build-up and the risk of more catastrophic fires during severe droughts or excessive winds when control is very difficult. By maintaining firebreaks and burning excessive fuel buildup in blocks within the landscape, wildland firefighting has better options to attack wildfires when they do occur.



4' High Woven-Wire Deer Exclosures: Protecting stump sprouts (left) monitoring food plot consumption (right)

Small-Scale Deer Exclosures

Recent evaluations indicate that low fence exclosures are an economical, logistically feasible method to protect up to 500 square feet of growing space from deer browse impacts. Installing multiple 100 foot long rolls of 4 to 5-foot high woven-wire (hog wire) within targeted areas of a forest or field helps in monitoring deer impacts on tree regeneration and promotes understory vegetation development without disrupting wildlife movement.

Traditional Deer Fencing

An exclosure fence at least 7 feet tall functions best to protect developing seedlings from excessive browse pressure exerted by local deer herd. Deer fencing is typically woven wire fencing attached to residual trees or fence posts and installed immediately before or during the regeneration harvest sequence. Costs include \$2.50-3.50/lineal foot to construct, ongoing maintenance costs and another \$0.50-0.75/lineal foot to dismantle. Fences normally need to remain in place for anywhere between 6-12 years depending on the success of the seedlings establishment. Longer periods can increase quality and diversity of growth within the fence but are offset by increasingly problematic maintenance challenges. Since the costs could total \$375-\$600/acre or more, forest managers should thoroughly evaluate the need, shorten the critical period of fencing to minimize maintenance costs, focus on controlling the deer herd to avoid the need, and increasing alternate food supplies/habitat quality to bring better balance to the deer population and its habitat. This becomes increasingly challenging in mixed landscapes with residential developments where deer find refuge and food, including food provided by people who enjoy seeing and protecting the local herd.

Supplemental or Enrichment Plantings

The purpose of enrichment plantings is to diversify the composition of tree and shrub species that are lacking in a forested area to provide wildlife habitat and reestablish a resilient community of native species. Successful planting projects identify priority areas that support good growth potential and select species well suited to local site conditions. Investments in site preparation (e.g., herbicide), protection (e.g., stakes or shelters), and annual maintenance are often required to ensure adequate survival.

Grapevine Arbors/Greenbrier Thickets

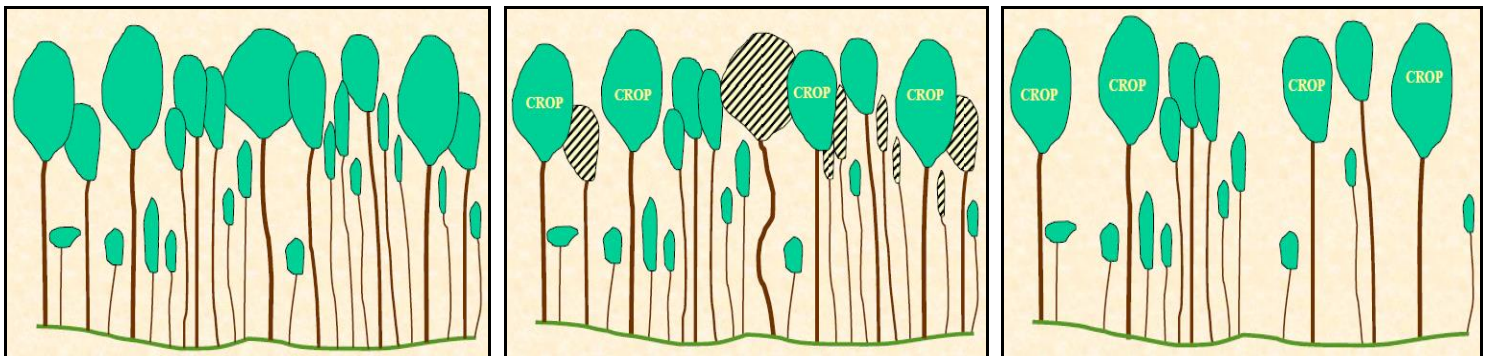
Elimination of vines, particularly grapevines is a major tenet of timber stand improvement and performed to reduce susceptibility to ice damage of high value crop trees. However, if you are managing for both timber and wildlife, you'll want to selectively manage vines. Like all decisions, the pros and cons must be carefully examined before undertaking any action. The management challenge is to create vine tangles that provide readily accessible food and cover for wildlife but do not manifest and negatively impact desirable tree growth. Managing grapevines, greenbrier, and Virginia creeper may be done by cutting surrounding trees and shrubs to enable more sun onto anemic, shaded surface vines. Another scenario to take advantage of is to drop a tree with vines in its crown to create horizontal vine arbors. Similarly, if vines are growing among mid-story canopy trees, directly fell the trees to create a brush pile encompassed by grapevine tangles. Brush piles and vine tangles are relatively easy and inexpensive to maintain. Keep in mind that all of the mentioned vine species are more vigorous in partial shade or sunlight. In fact "shading" is a method of grapevine control. Lastly, excessively rocky areas that are often deemed inoperable or unmanageable can benefit from establishing and maintaining vine thickets to enhance sites to be more attractive and beneficial to wildlife.

Crop Tree Release (& Brush Management)

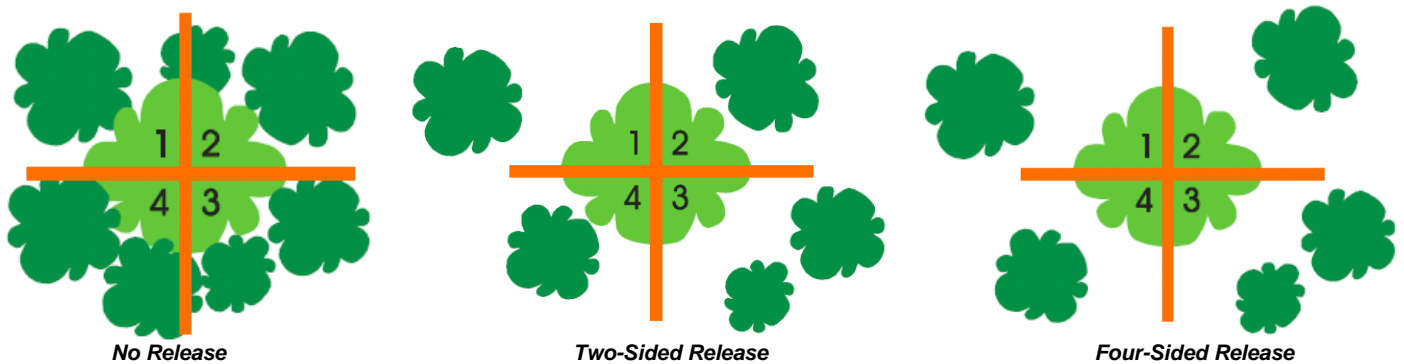
Crop tree release (CTR) is a widely applicable silvicultural technique used to enhance performance of individual trees through the removal of crown competition. The practice offers flexibility in that it can be applied on small or large properties, and with certain modifications, it can be applied as a precommercial or commercial operation. The overall concept is to favor the development of selected trees by harvesting nearby competing trees whose crowns are touching the crop tree. Selection criterion for crop trees may differ based on landowner objectives. For example, wildlife crop trees may consist of an assortment of hard and soft-mast producing species of varying quality, whereas crop trees designated for timber income generation may consist of only one or two high value species of specific form and quality. In general, trees selected as Crop Trees should be in good health and condition, with full crowns, an indicator that they should respond favorably to increased sunlight, referred to as a 'release'.

Crop Tree Release Species Guidelines

1. Wildlife beneficial hard and soft mast producing trees should be favored as crop trees. Species to target include hickory, northern red oak, white oak, chestnut oak, and black cherry, all of which were detected within ChicoryLane during the 2018 forest inventory.
2. Because of their limited economic and ecologic value, work to reduce the stocking of red maple, black birch, hophornbeam, and striped maple, especially if they are competing with preferred crop trees.
3. Retain major Legacy Trees, which are identified as older trees of desirable species with larger diameters and big crowns (e.g., trees >16 inches in diameter at breast height) – with emphasis on oak species.



Visual example of how Crop Tree Release principles can be integrated into a thinning



Bird's Eye View of Crop Tree Release Principles

Firewood Processing through Crop Tree Release Activities

With increasing energy prices, forest landowners are starting to realize the potential monetary values that can be obtained through firewood cutting. Equally important, firewood cutting, if performed appropriately, can produce many ecological benefits. Careful harvesting of poorly formed, undesirable growing stock can and should be removed from your woodlot over time to free up growing space for better quality, more desirable tree and shrub species. Refer to Appendix “Forest Stewardship Chapter 7: Timber Harvesting – An Essential Management Tool)

General Firewood Cutting Recommendations:

- Use an ATV or Farm Tractor to skid out firewood in appropriate sized lengths which will reduce the amount of manual labor and increase the productivity of your operation.
- Concentrate firewood skidding on designated atv or remnant skid trails to limit negative impacts such as compaction and residual tree damage often experienced when dragging trees against other stems.
- Be sure to wear all the appropriate personal safety equipment, which should include hard hat, gloves, chaps, and ear and eye protection.
- Particular attention should be paid to “high hazards” such as powerlines or grapevines that add complexity to directional tree felling techniques.

Enhance Wildlife Cover through Crop Tree Release Activities

Use the crowns and stems of trees harvested from crop tree release operations to enhance ground cover to benefit wildlife.

1. Strategically orient and pile materials to create horizontal ground cover
2. Buck select trees into 5 foot lengths and stack log cabin style to about 3 feet in height
3. Pile limbs and debris on top of the stacked logs to create an enclosure

Enhance Stand Structure through Crop Tree Release Activities

Most hardwood tree species will produce stump sprouts when their primary stem is severed. These sprouts (coppice regeneration) contribute to creating a new forest. The new growth and their associated buds are a valuable food source for a myriad of wildlife and especially valuable to deer during the winter. Hinge-cutting trees is a modified harvesting method that can be applied during Crop Tree Release operations to promote increased availability of browse by maintaining nutrient flow to trees and diversifying stand strata layers.



Successfully ‘Hinged-Cut’ Tree

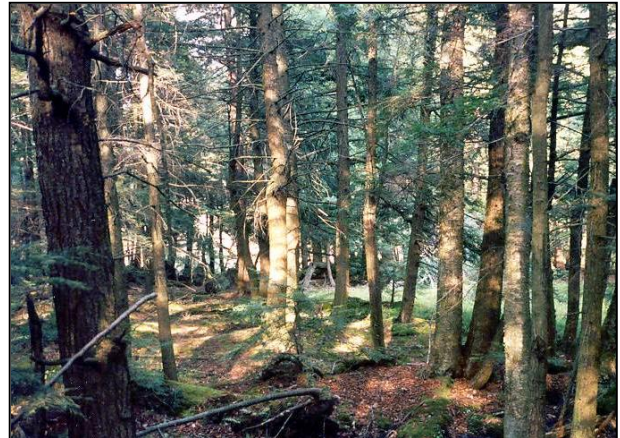
DESCRIPTIONS AND RECOMMENDATIONS:

STAND 1

Acres: 7.0

Forest Type: Hemlock/White Pine/Northern Hardwoods Forest (**FB23**)

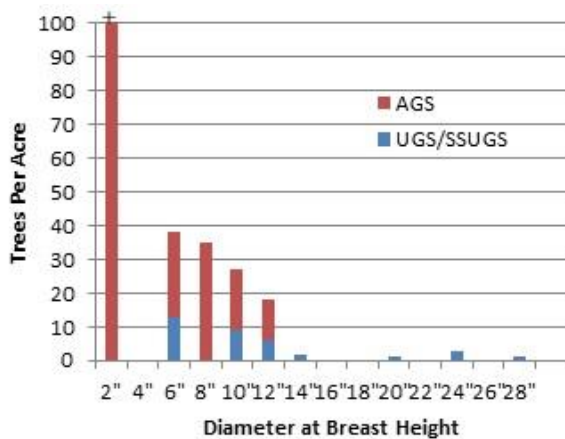
Hemlock/WhitePine/Northern Hardwoods are represented by stands composed of Eastern hemlock and/or white pine contributing more than 25% relative cover. These forests generally occur on moist, north or east facing slopes. Common hardwood species include American beech, sugar maple, red maple, black and yellow birch.



Rhododendron, witch-hazel, spicebush, serviceberry, shadbush, hornbeam and hophornbeam are the typical shrub species found in the understory of this type. A sparse herbaceous layer (mostly of fern) and a rich bryophyte (mosses) layer are common. These stands are further characterized by soils that are moist but well drained in nature.

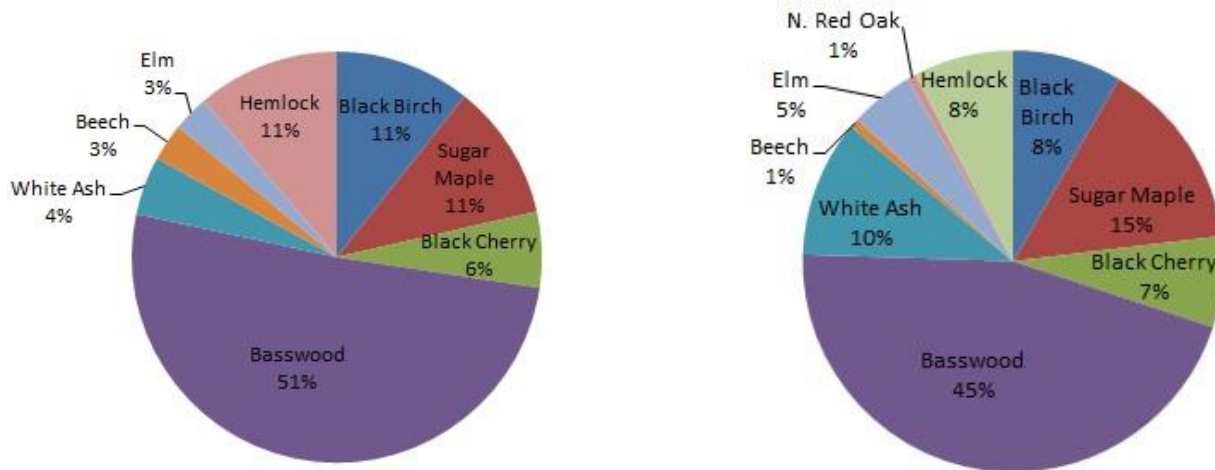
Age: Two-Aged Stand (Eastern half of unit > 90 years old
Western half of unit a younger age-class estimated to be between 25-45 years old)

Size: Western half of the unit is predominantly small pole-size trees that transitions to a more pronounced larger size class mixture within the Eastern half of the unit

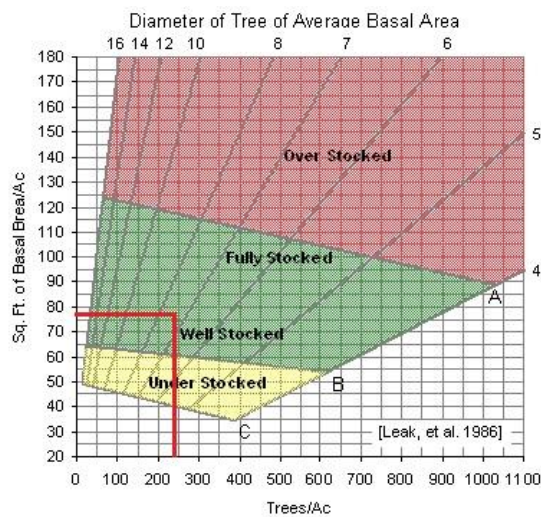


Quality: Poor to Good

Percentage of - Tree Species by Total Volume: Tree Species by Density (TPA):



Stocking Chart:



- Stocking:** 72% Well Stocked
- Voll/acre/Int.1/4"** 1,872 board feet (Estimate derived by 4 sample points)
- Tons/acre:** 30
- Trees/acre:** 246
- Basal Area/acre:** 77 square feet
- Growth Rate:** Variable - Poor to Good
- Soil/Water:** Northern one-third of the unit is comprised of Atkins silt loam encompassing stream bottom. The upper hillside portions of the unit are dominated by Berks and Weikert soils.
- Topography:** Relatively flat to gently rolling terrain along the lower third of the unit with terrain becoming steep exceeding 40% slopes on the upper hillside section of the stand.
- Wildlife Habitat:** Stream channel and immediate riparian buffer provide some micro-site conditions that may support a narrow band of habitat attractive to small mammals, birds, and amphibians. The mature northern hardwood timber within the upper eastern section of the stand has abundant snag and cavity

trees that function for roost, perch, and nesting opportunities.

Non-Native Invasives: Autumn olive, oriental bittersweet, and nearby Japanese stiltgrass

Competing Plants: None detected

Species of Interest: Spicebush, planted redbud, maiden-hair fern

Recreation/Aesthetics: Southern ridgeline of unit affords scenic views of the farm's lowlands and stream corridor.

Fire Risk: Moderate fire risk associated with nearby flashy fuels, steep terrain, and a high frequency of human activities that occur on adjoining properties.

Micro-Site Areas: Remnant Forest (27), North Facing Shaded Slope (26), and portions of Riparian East (25) and Successional Forest (12)

Summary:

The management unit encompasses the east-central portions of the farm. It can be described as a narrow forested strip located between the 'Red Oak Reforestation Field' to the south and the unnamed intermittent channel that flows along its northern boundary. The ground is predominantly northwest-facing, with moderate to steep slopes. Mature northern hardwood timber species occupy the eastern growing space. The western half of the unit has more gentle slopes that were cutover and used for farming in the past. Remnant legacy black locust trees, some of which are larger in diameter, are scattered across the hillside with a mix of pole timber sized black walnut, locust, and dying white ash. Invasive plants have been tended to by the landowner and do not dominate the site; however more work is to be done to fully control the spread of autumn olive, bittersweet, and the potential stiltgrass to escape the trails and encroach into the interior forest. Regeneration is limited to a few patches of sugar maple seedlings that are being heavily browsed by deer.

Recommendations:

Much of this unit could benefit from continued low-intensity 'tending' activities such as reducing encroachment of undesirable competing plants, shrubs, trees, and vines to promote further establishment and advancement of desirable regeneration.

Understory & Midstory Tending: Invasive Species Control

Effort should continue to reduce the encroachment of non-native invasive shrubs either through mechanical removal or selective treatment with a forestry approved herbicide. This activity should be the first priority and can be accomplished by doing the work yourself or by contracting a licensed pesticide applicator to basal spray or to provide a foliar application to targeted species with an appropriate herbicide. (Refer to enclosed PSU Vegetation Management Publication by Dave Jackson and Forestry Vendor List)

1. Assess the stand to determine where the concentrations of invasive and undesirable competing vegetation species exist to map out priority treatment areas.
2. Be mindful of riparian areas by designating appropriate buffers to protect sensitive species and water quality from risk of chemical overspray, etc.

3. Contract a licensed forest pesticide applicator who is experienced with projects of your complexity – refer to vendor list.
4. Annually monitor the treated areas to ensure control efforts are successful
5. Repeat applications (spot treatments) will likely be required

Protect Natural Regeneration

- At a minimum, use 4' x 100' galvanized fencing and metal posts available at Lowes or your local feed store to install around cohorts of desirable seedlings that establish naturally to protect against deer browse.
- Refer to article entitled *Can small deer exclosures work?* (Appendix).

Enrichment Plantings

Once non-native invasive shrubs are removed, considerations could be given to expanding enrichment plantings. Spot planting wildlife beneficial trees and flowering shrubs particularly within small fenced areas can greatly enhance the aesthetic qualities, species diversity, and overall habitat of a property over time. With the amount of time and money invested in such activities, it's important that the landowner carefully plan out all phases of a planting to ensure the highest probability of survival and a successful outcome.

- Species selected for planting need to be well suited to the site (soil conditions).
- Plantings should occur in the spring and great effort should be taken to ensure proper seedling care and planting methods.
- Refer to enclosed DCNR Brochure, *Landscaping with Native Plants* (Appendix).

These proposed activities should result in understory improvements, but could be compromised by deer browse impacts without deer exclosure fencing.

Mitigate Deer Browse Impacts

Serious efforts must continue to be made to reduce deer browse impacts; otherwise advancements in regeneration will be compromised and the return on this financial investment lost.

- Work closely with your local DMAP hunters to ensure they are achieving targeted harvest goals
- Northern Hardwood species have a tendency to be able to establish much quicker than Mixed Oak Hardwood forest types and advance in height growth to get above deer browse levels.

'Edge' Habitat Improvement:

While cutting and/or poisoning non-native invasive shrubs along the northern portions of this unit, work to improve edge habitat and wildlife cover along the perimeter of the CREP field by hinge-cutting pole-timber sized hardwood trees of poor form and quality. Target a 50-100' buffer along the edge of the field. Consider the same approach along the northern boundary perimeter within the narrow riparian buffer area.

- Buck trees into 5 foot lengths and stack log cabin style to about 3 feet in height
- Pile limbs and debris on top of the stacked logs to create an enclosure
- Hinge-cut red maple trees along the field edge to create better horizontal cover.
- Contract crews are available to complete the tasks described above

Logs and snags (dead standing trees) are important for cavity-nesting birds and for grubs and insects, which are prey for animals from woodpeckers to black bears. Leaving trees cut to lie on the forest floor functions as habitat for insects, small mammals, reptiles, and amphibians. Existing ash trees that are dead or dying from the Emerald Ash Borer will help to recruit more downed coarse woody debris in the future.

Post Treatment Monitoring & Tending Activities

Continue annual monitoring and tending activities to promote health and vigor of both planted and naturally regenerated growing stock. Increase efforts to manually remove large invasive shrubs and follow up with spot treatments of herbicide to eliminate resprouting or new germinants.

Enroll in EQIP Cost-Share

NRCS Code	Conservation Practice	Pay Schedule Description	EQIP Payment	Acres Enrolled
315	Herbaceous Weed Control	Chemical Treatment of Undesirable Competing Vegetation	TBD	1-5
314	Brush Management	Mechanical & Chemical Treatment of Undesirable Competing Vegetation	TBD	1-5
382	Fence	Fence, Woven-Wire	TBD	500-700'
612	Tree/Shrub Establishment	Planting Trees/Shrubs, includes light to medium site preparation	TBD	1-5
645	Wildlife Corridors	Orient slash from brush management to create corridors	TBD	1-5

TREE & SHRUB SPECIES TO CONSIDER FOR ENRICHMENT PLANTINGS:

- Northern Red Oak
- White Oak
- Swamp White Oak
- Flowering Dogwood**
- Red Osier Dogwood
- Eastern Redbud**
- Elderberry**
- Sugar Maple
- Chinese Chestnut
- American Chestnut
- American Hazelnut
- American Sweet Crabapple
- Chokecherry**
- Arrowwood Viburnum**

**** represents a species that has both wildlife and aesthetic qualities that are ideal for planting along field edges**

NURSERIES AND TREE SALE VENDORS

Centre County Conservation District

414 Holmes St., Suite 4
Bellefonte, PA 16823
Ph: 814-35506817
www.centrecountypa.gov/conservation

PA Game Commission: Howard Nursery

197 Nursery Road
Howard, PA 16841
Ph: 814-355-4434
www.pgc.state.pa.us

Musser Nursery

1880 Route 119 Hwy
Indiana, PA 15701
Ph: 724-465-5684
www.musserforests.com

Ernst Conservation Seeds

8884 Mercer Pike
Meadville, PA 16335
Ph: 1-800-873-3321
www.ernstseed.com

DESCRIPTIONS AND RECOMMENDATIONS:

STAND 2

Acres: 9.5

Forest Type: Mixed Hardwood (Palustrine) Forest (**UB18**) exhibiting pioneering Mixed Mesaphytic attributes (**MM18**)

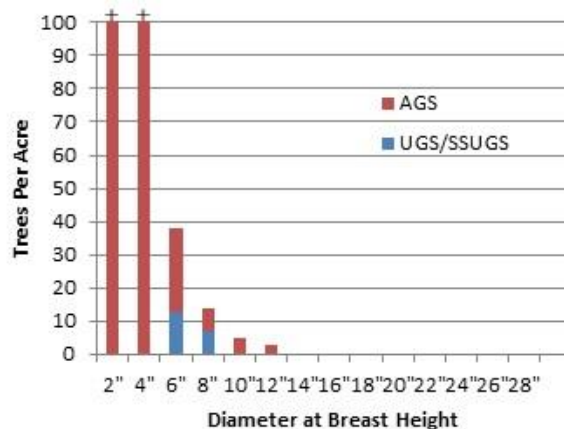
Mixed Hardwood Palustrine Forest: This describes a group of wetland forests that are dominated by a mixture of conifers and hardwood species. The substrate is usually mineral soil or muck over mineral soil. There is generally some groundwater enrichment in these systems. Eastern hemlock may contribute between 25% and 75% of the canopy. Other conifer species that may occur with hemlock include white pine, red spruce, and tamarack. The most common hardwood species are yellow birch, red maple, white ash, and blackgum. Rhododendron often forms a dense understory with other shrubs including blueberry and winterberry. Herbaceous species like skunk-cabbage, violets, false hellebore, and cinnamon fern often grow sporadically within the forest floor.

Pioneering - Mixed Mesophytic Forests are an extremely rich community types represented by stands with high species diversity, commonly associated with lower slopes and productive soils. Dominant trees include yellow poplar, sugar maple, basswood, American beech, northern red oak, black cherry, white ash, black walnut, shagbark hickory, and cucumber-tree. Eastern hemlock, white pine, and pitch pine can occasionally show up, but is not characteristically dominant.

Herbaceous flora can be extremely rich and diverse, often including white trillium, wild blue phlox, wood anemone, dutchman’s-breeches, speckled wood-lily, wild leek, bloodroot, and wild ginger to name a few. Shrub species that are commonly found in the understory of this forest type are witch-hazel, striped maple, witch-hobble, serviceberry, and ironwood.

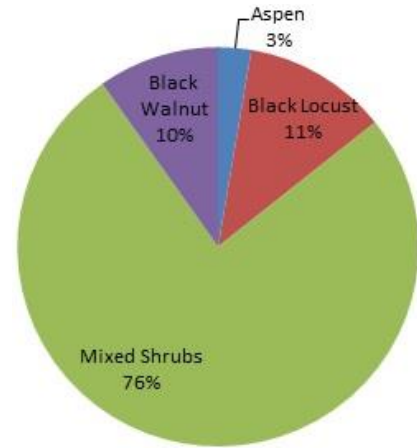
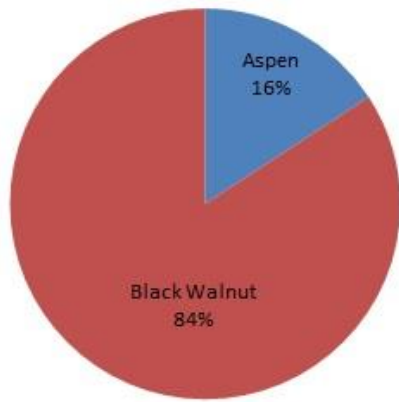
Age: Younger age-class cohorts estimated to range between 20 and 45 years old

Size: Dominated by saplings and small pole-timber

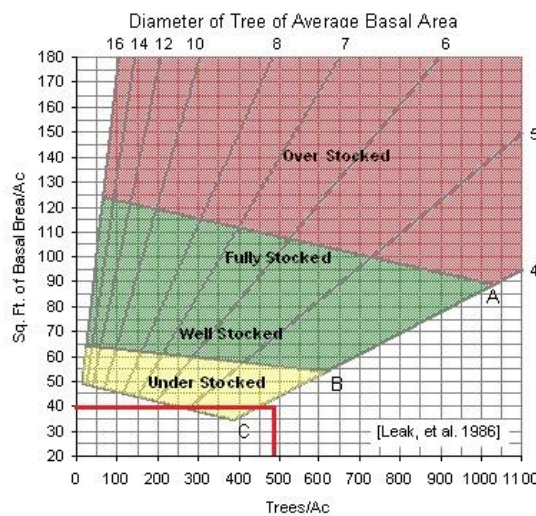


Quality: Fair to Good

Percentage of Tree Species by Total Volume: Tree Species by Density (TPA):



Stocking Chart:



Stocking:	50% Under-stocked
Voll/acre/Int.1/4"	0 board feet (Estimate derived by 4 sample points)
Tons/acre:	7
Trees/acre:	490
Basal Area/acre:	40 square feet
Growth Rate:	Fair to Good
Soil/Water:	The vast majority of the stand is comprised of Atkins silt loam with a narrow sliver of Brinkerton silt loam accounting for the northern most portion of the unit.
Topography:	Flat 0-3% slopes
Wildlife Habitat:	Optimal habitat for woodcock and other bird, small mammal, and amphibian species that prefer moist and shrubby site conditions.
Non-Native Invasives:	Autumn olive, multi-flora rose, oriental bittersweet, honeysuckle
Competing Plants:	Grapevine

- Species of Interest:** Pokeweed, clonal aspen patches, willow, alder
- Recreation/Aesthetics:** Boardwalk offers unique access into marsh habitat for observation and aesthetic enjoyment
- Fire Risk:** Low threat with mesic site conditions
- Micro-Site Areas:** Cattail Marsh (15), Wet Meadow (16), Knoll Hillside, West Facing (17), Crack Willow (18), Riparian South/West (9), Front Meadow and Calamus Stand (10), Aspen and Alder Groves (13)



Willow & Alder Riparian Buffer (Southern end of Unit)



Boardwalk within Cattail Swamp (Northern end of Unit)

Overview:

The health and productivity of bottomland forests are considered at serious risk across the central Appalachian region. Biological stressors in the form of exotic insects, plants, pests and diseases are collectively having a profound impact on our deciduous hardwood forests, their effects most pronounced in our bottomland forests.

Even modest changes in climate may cause substantial increases in the distribution and abundance of many insect pests and pathogens, potentially leading to reduced forest productivity or increased tree stress and mortality. Impacts may be exacerbated where site conditions, climate, other stressors, and interactions among these factors increase the vulnerability of forests to these agents. Actions to manipulate the density, structure, or species composition of a forest may reduce susceptibility to some pests and pathogens. However, potential changes in climate could increase habitat for many of these species, which may be poised to outcompete native species. Management of highly mobile nonnative invasive species may require increased coordination across property boundaries and over larger geographic areas, and is likely to require an increasing budget for eradication efforts. Over the long term, limitations in available resources may require landowners to prioritize which species to eradicate and which species to allow occupying a site. For more information on managing forests to adapt to a changing climate, refer to the enclosed publication entitled, 'Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers'.

Summary:

Much of the northern half of this unit exhibits marsh-like characteristics defined by mesic plant species and saturated soils. A strategically placed and well-designed board walk affords visitation throughout the heart of cattail swamp allowing for observation and full body immersion into a vivid ecosystem that is not well represented throughout the local landscape. The southern half of this unit functions more as a traditional riparian forest/shrub buffer along the farm's unnamed perennial streams. Both northern and southern sections of the stand are rich in species diversity, support unique habitat types, and offer structural complexity derived by a blend of shrubs, concentrations of wetland plants, and narrow pockets of large crowned willows. These features should be carefully tended in an effort to maintain or improve their values for aesthetics, wildlife, and biodiversity.

Recommendations:

Tending' Activities (Herbaceous Weed Control & Brush Management)

Continue with current routine of.....

1. Annual mowing of trails, targeting the activity to occur outside of peak nesting season to enhance structural complexity within the intersection of grass and shrubland
2. Vegetation management in the form of invasive species monitoring and control of newly detected undesirable plants, trees, and shrubs
3. Enrichment plantings protected by deer cribbing
4. Brush management activities to create heterogeneity within the shrublands that encompass much of the riparian area within the southern half of the unit
5. Expand the creation of 'green' brush piles, no more than 3 feet tall and 4 feet wide, oriented in linear strips that connect features such as the riparian area to the central portions of the unit. The piles can function as habitat enhancements, yet afford the opportunity to burn them to mimic the effects of prescribe fire at a micro-scale. Burning the piles during a safe period of time, such as during the growing season will eliminate the woody debris, topkill immediately adjoining vegetation, and potentially stimulate new plant species that lie dormant in the seed bank.
6. Monitor the stands annually to make sure new invasive plants, pests, or diseases don't establish and respond appropriately to control new 'pioneering' invaders.

Enroll in EQIP Cost-Share

NRCS Code	Conservation Practice	Pay Schedule Description	EQIP Payment	Acres Enrolled
315	Herbaceous Weed Control	Chemical Treatment of Undesirable Competing Vegetation	TBD	20-49
314	Brush Management	Mechanical & Chemical Treatment of Undesirable Competing Vegetation	TBD	20-49
645	Wildlife Corridors	Orient slash from brush management to create corridors	TBD	1-5
612	Tree/Shrub Establishment	Planting Trees/Shrubs, includes light to medium site preparation	TBD	1-5

DESCRIPTIONS AND RECOMMENDATIONS:

STAND 3

Acres: 9.0

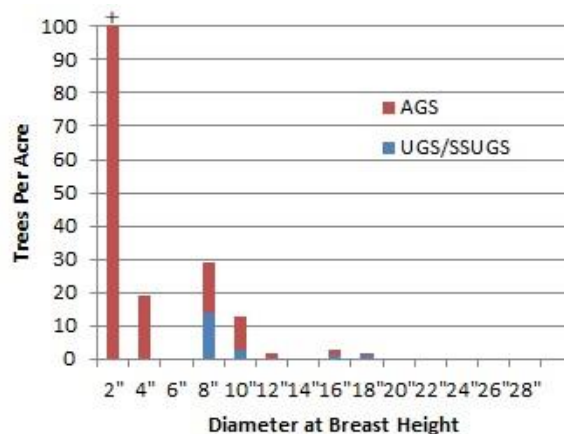
Forest Type: Pioneering – Mixed Mesophytic Forest (**MM18**)

Mixed Mesophytic Forests are an extremely rich community type represented by stands with high species diversity, commonly associated with lower slopes and productive soils. Dominant trees include yellow poplar, sugar maple, basswood, American beech, northern red oak, black cherry, white ash, black walnut, shagbark hickory, and cucumber-tree. Eastern hemlock, white pine, and pitch pine can occasionally show up, but is not characteristically dominant.

Herbaceous flora can be extremely rich and diverse, often including white trillium, wild blue phlox, wood anemone, dutchman's-breeches, speckled wood-lily, wild leek, bloodroot, and wild ginger to name a few. Shrub species that are commonly found in the understory of this forest type are witch-hazel, striped maple, witch-hobble, serviceberry, and ironwood.

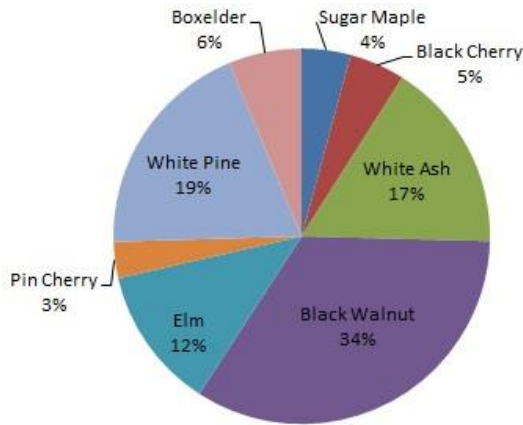
Age: Multiple-Age Stand (occasional remnant of older trees > 90 years old intermixed with one to two younger age-classes estimated to range between 10 and 45 years old)

Size: Dominated by saplings and small pole-timber with a few remnant trees of larger diameter classes

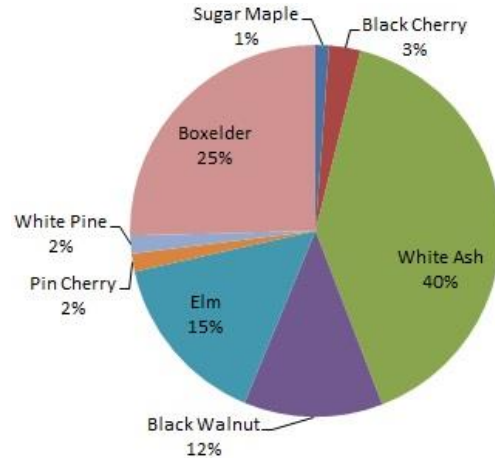


Quality: Poor to Fair

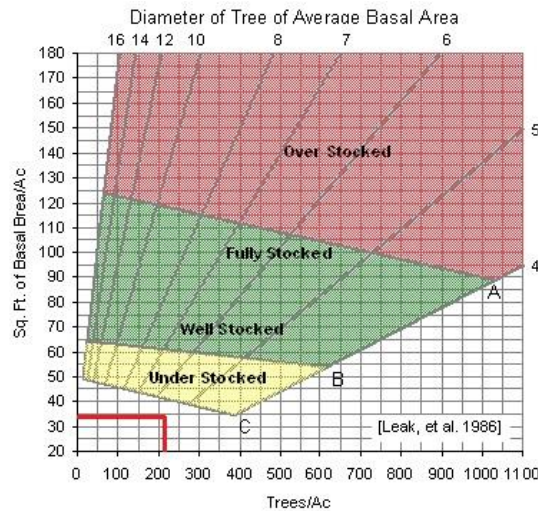
Percentage of Tree Species by Total Volume:



Tree Species by Density (TPA):



Stocking Chart:



Stocking:

50% Under-stocked

Vol/acre/Int.1/4"

682 board feet (Estimate derived by 6 sample points)

Tons/acre:

15

Trees/acre:

204

Basal Area/acre:

34 square feet

Growth Rate:

Fair to Good

Soil/Water:

Three primary soils defined by Atkins silt loam comprising the northern one-third of the unit along the lower stream channel that transitions to a narrow linear seam of Milleim silt loam midslope and the upper portions of the unit defined by Berks and Weikert soils.

Topography:

Gently rolling along the northern boundary of the stand and becoming progressively steeper as one traverses upslope to the southern portions of the stand; slopes exceed 40%.

Wildlife Habitat:

An abundance of 'Legacy' trees provide adequate hard and soft mast attractive to wildlife. Multiple white pine sapling

thickets provide modest thermal cover and roosting sites, however high deer browse impacts have resulted in a degraded understory condition that lacks desirable vegetation.

Non-Native Invasives: Oriental bittersweet, autumn olive, honeysuckle, Japanese stiltgrass

Competing Plants: Grapevine

Species of Interest: Apple trees, boxelder, sumac

Recreation/Aesthetics: Maintained trail network provides adequate access for enjoying scenic views and recreational activities.

Fire Risk: Moderate threat with drier site conditions, steeper slopes, and moderate fuel loads that could promote increased fire behavior.

Micro-Site Areas: South-West Corner (1), Open Herbaceous and Shrub Area (7), Hill Shoulder (11), Successional Forest (12)



White Pine & N. Spruce Seed Source adjoining Stand to SW



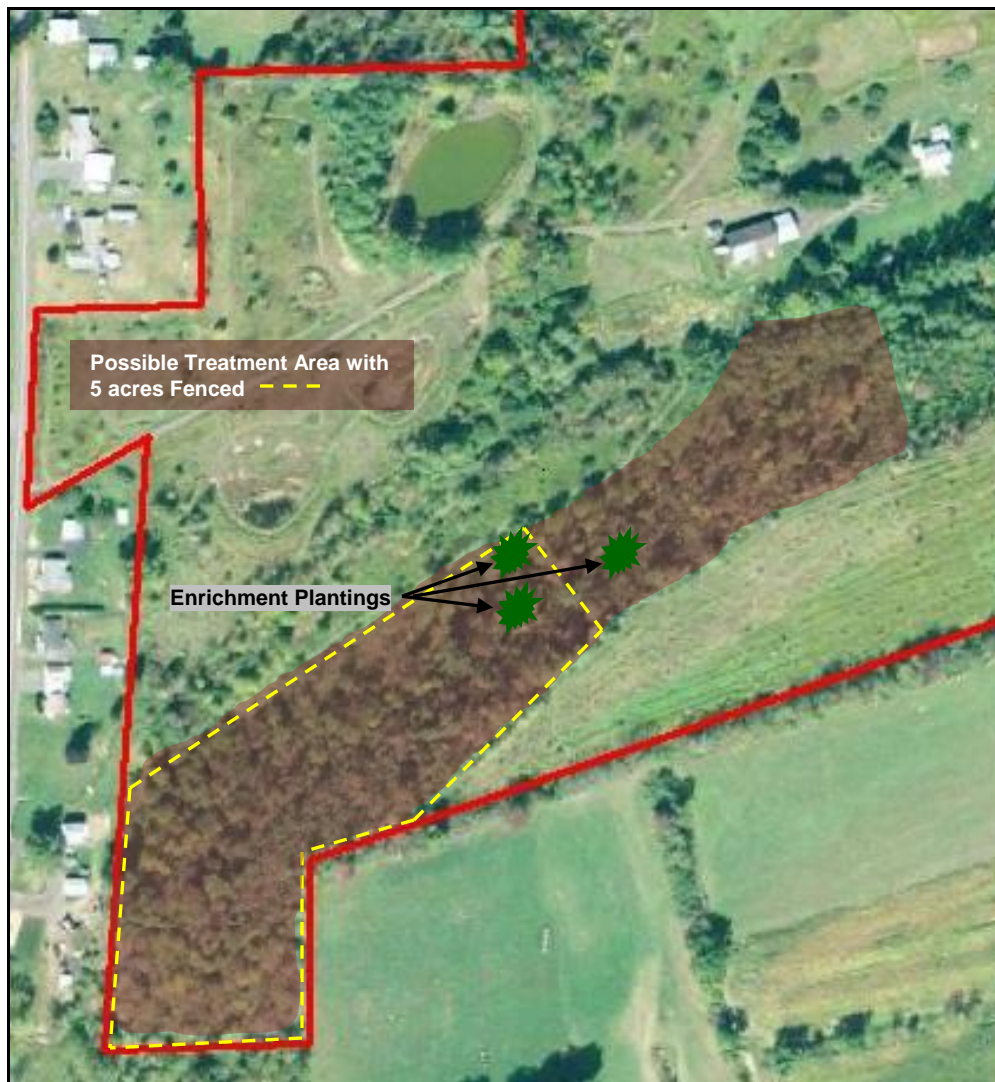
Oriental Bittersweet Vine Expanding into Shrub Canopy

Summary:

This unit was utilized extensively for agricultural purposes, likely hayed, partially cropped, and cattle grazed throughout the early twentieth century. Upon purchase of the farm by John and Catherine Smith in 1974, the growing space was taken out of production and allowed to go fallow. Over the past 45 years the productive, yet compacted soils have slowly transitioned from grassland to a mixed mosaic of grass, shrub, and young pioneering forest. The landowners have devoted significant time and financial resources to establishing and maintaining trails along with some level of vegetation management and enrichment plantings to speed up the successional processes within the lower elevational section of the stand. Elimination of non-native invasive shrubs remains the greatest challenge further exacerbated by pronounced tree mortality in the elm and ash resources that dominated much of the upper forest canopy. The current conditions of the stand are attractive to a diversity of wildlife, but especially useful for white-tailed deer bedding. Deer bedding and loafing is concentrated along the southern half of the unit. Corresponding deer browsing impacts remain high

throughout the growing space (nocturnal movement) and are a subtle, yet significant issue that further complicates the potential for achieving desired future conditions.

Because of the stand's history, horizontal cover in the form of dead and downed woody debris is deficient. Black Walnut and boxelder are two species that are naturally establishing within portions of the stand. Nearby white pine and Norway spruce seed sources are located along the southwestern boundary of the stand on the adjoining neighbor's property.



Stand-Level Map Depicting Possible Management Scenario

Recommendations:

Based on current forest conditions, accessibility, and site growth potential, major portions of this unit should be considered a top priority for implementing a carefully designed sequence of treatments to improve wildlife habitat and restore forest health and diversity attributes. The objective is to reduce undesirable competing plants and shrubs, essentially cleaning the understory and midstory of the forest to create optimal site conditions to recruit the establishment of acceptable seedling cohorts.

1. Delineate a treatment area. Consideration might be given to the most degraded portions of the stand which were detected as being the southern half of the unit.
2. Once treatment locations are determined, the immediate focus must be on invasive grass, shrub, and vine control along with protecting the growing space from deer browse impacts. Deer enclosure fencing may be a required investment in order to proceed with the following management activities.

Control Competing Vegetation (Herbaceous & Brush Management)

- Contract a licensed forest pesticide applicator who is experienced with projects of your complexity to broadcast spray and/or basal stem targeted plants with an appropriate herbicide (e.g., Oust, Escort, & Accord) – refer to Appendix: Forestry Consulting Vendor list.
- Annually monitor the treated areas to ensure control efforts are successful.
- Follow up tending work is likely to occur annually over the following 5 years in which you’ll want to chemically treat missed patches of undesirable species or newly developing cohorts that seed in afterward.

Woven-Wire Deer Enclosure Fencing

To prevent deer from inhibiting regeneration, 8’ tall woven-wire fencing should be constructed around the perimeter of a sizeable amount of the acres that have been treated.

- The approximate price for fencing is averaging between \$3.00 - \$3.50 a linear foot.
- Total investment cost to construct a 5 acre deer fence without EQIP Funding - \$7,000 to \$8,500 depending on sites selected.

Deer fencing will help to restore the degraded understory conditions and allow for controlled and protected tree and shrub plantings. Furthermore, the fenced areas can serve as educational stops to facilitate discussion and visually portray a noticeable increase in overall abundance and diversity of herbaceous plant, tree, and shrub species compared to unfenced areas.

Enroll in EQIP Cost-Share

NRCS Code	Conservation Practice	Pay Schedule Description	EQIP Payment	Acres Enrolled
315	Herbaceous Weed Control	Chemical Treatment of Undesirable Competing Vegetation	TBD	20-49
314	Brush Management	Mechanical & Chemical Treatment of Undesirable Competing Vegetation	TBD	20-49
612	Tree/Shrub Establishment	Planting Trees/Shrubs, includes light to medium site preparation	TBD	1-5
382	Fence	Fence, Woven-Wire	TBD	2,000’ to 3,000’

DESCRIPTIONS AND RECOMMENDATIONS:

STAND 4: 4 NORTH & 4 SOUTH & 4A

Acres: 8.5 3 3 2.5

Forest Type: Mixed Hardwood (Palustrine) Forest **(UB18)** exhibiting pioneering Mixed Mesaphytic attributes **(MM18)**

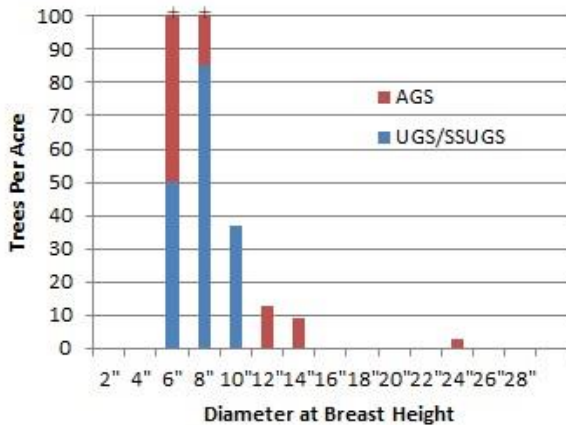
Mixed Mesophytic Forests are an extremely rich community type represented by stands with high species diversity, commonly associated with lower slopes and productive soils. Dominant trees include yellow poplar, sugar maple, basswood, American beech, northern red oak, black cherry, white ash, black walnut, shagbark hickory, and cucumber-tree. Eastern hemlock, white pine, and pitch pine can occasionally show up, but is not characteristically dominant.

Herbaceous flora can be extremely rich and diverse, often including white trillium, wild blue phlox, wood anemone, dutchman’s-breeches, speckled wood-lily, wild leek, bloodroot, and wild ginger to name a few. Shrub species that are commonly found in the understory of this forest type are witch-hazel, striped maple, witch-hobble, serviceberry, and ironwood.

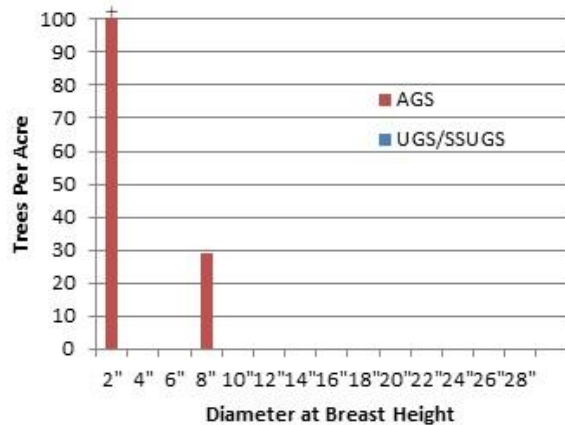
Age: Two-Aged Stand - a cohort of white pine and aspen > 20 years old around the farm pond (4a) adjoined by growing space that is recruiting a younger age-class (natural and planted seedlings) estimated to range in age from 5 to 10 years old)

Size: Dominated by saplings and small pole-timber with a few remnant trees of larger diameter classes

(4A - Adjoining Pond)

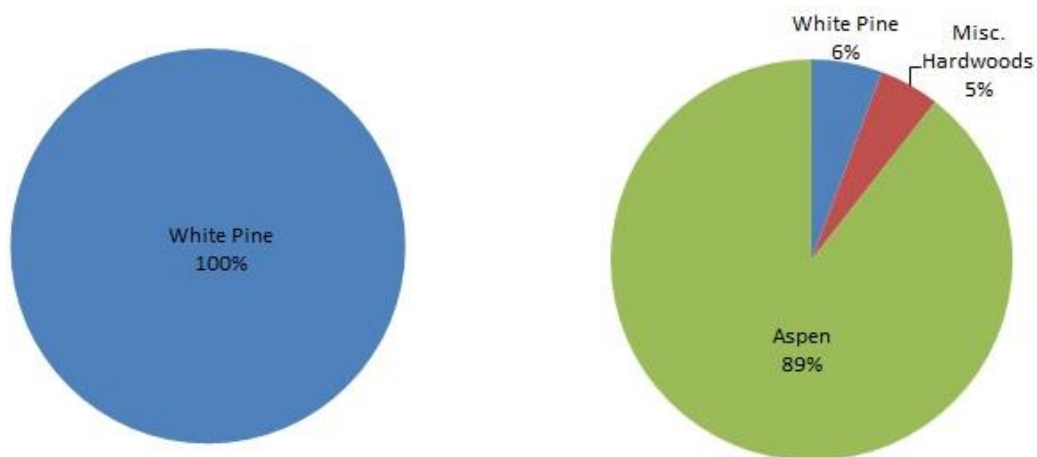


(4 North & South)

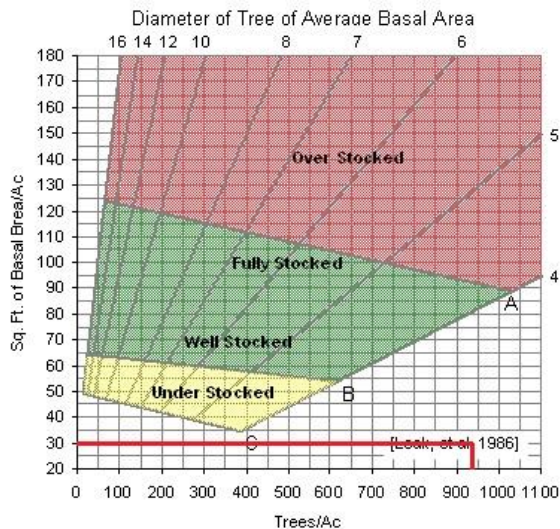


Quality: Fair to Good

Percentage of Tree Species by Total Volume: Tree Species Density (TPA):
 (4A - Adjoining Pond)



Stocking Chart (4A):



- Stocking (4A):** 50% Under-stocked
- Vol/acre/Int.1/4" (4A):** 1,493 board feet (Estimate derived by 1 sample point)
- Tons/acre (4A):** 4
- Trees/acre (4A):** 945
- Basal Area/acre:** 30 square feet
- Growth Rate:** Fair to Good
- Soil/Water:** Dominated by Brinkerton silt loam with a narrow seam of Ernest channery silt loam located along the unit's northwestern boundary and a sliver of Millheim silt loam defining the units southwestern boundary.
- Topography:** Flat to gently rolling terrain with 0-3% slopes.

Wildlife Habitat:	White pine and aspen thicket provides good thermal cover, roosting, and nesting sites in close proximity to water resources.
Non-Native Invasives:	Japanese barberry, Japanese honeysuckle, multi-flora-rose, autumn olive
Competing Plants:	None detected
Recreation/Aesthetics:	Extensive trail network and primary farm road provide adequate access for enjoying scenic views, monitoring and managing micro-site habitats, and recreational activities.
Fire Risk:	Moderate threat with sub-xeric site conditions and flashy fuels loads that could promote increased fire behavior.
Micro-Site Areas:	West Boundary – Transitional Woods (2, 3 & 4), Palustrine Woods (5), Farm Pond (6), Open Herbaceous and Shrub Area (7), and Vernal Pools (8).

Summary:

This unit encapsulates multiple man-made water features that were designed and constructed on open pasture land to enhance the farm's wildlife habitats. These projects were realized through partnerships formed by the Smiths with regional, state, and local agencies and non-profits that resulted in a combination of professional guidance, engineering assistance, and funding support.

In addition to the construction of a pond and two vernal pools, tree and shrub planting efforts have been instituted within the growing space to help accelerate the development of forest cover. Annual small-scale patch mowing and piling of brush has helped to create 'edge' cover and improve the structural complexity of advancing habitat, particularly attractive to song birds, small mammals, amphibians, and non-game species.

Recommendations:

'Tending' Activities (Herbaceous Weed Control & Brush Management)

Continue with current routine of.....

1. Annual mowing of trails, targeting the activity to occur outside of peak nesting season to enhance structural complexity within the intersection of grass and shrubland
2. Vegetation management in the form of invasive species monitoring and control of newly detected undesirable plants, trees, and shrubs
3. Annual maintenance of currently planted and tubed tree seedlings along with expanding enrichment plantings protected by deer cribbing
4. Brush management activities to create heterogeneity within the shrublands that encompass much of the riparian area within the southern half of the unit (4S)
5. Expand the creation of 'green' brush piles, no more than 3 feet tall and 12 feet wide, oriented in linear strips that provide connectivity between water features

such as the vernal pool complex to the adjoining seeps or the farm pond forest buffer to the adjoining cattail marsh. The piles can function as habitat enhancements, yet afford the opportunity to burn them to mimic the effects of prescribed fire at a micro-scale. Burning the piles during a safe period of time, such as during the growing season will eliminate the woody debris, topkill immediately adjoining vegetation, and potentially stimulate new plant species that lie dormant in the seed bank.

6. Consider felling recently girdled Black Walnut trees and using the stem and limbs for creating increased downed woody debris, such as brush piles.
7. Monitor the unit's growing space annually to make sure new invasive plants, pests, or diseases don't establish and respond appropriately to control new 'pioneering' invaders.

Enroll in EQIP Cost-Share

NRCS Code	Conservation Practice	Pay Schedule Description	EQIP Payment	Acres Enrolled
315	Herbaceous Weed Control	Chemical Treatment of Undesirable Competing Vegetation	TBD	1-8
314	Brush Management	Mechanical & Chemical Treatment of Undesirable Competing Vegetation	TBD	1-8
645	Wildlife Corridors	Orient slash from brush management to create corridors	TBD	1-2
612	Tree/Shrub Establishment	Planting Trees/Shrubs, includes light to medium site preparation	TBD	1-2

DESCRIPTIONS AND RECOMMENDATIONS:

STAND 5

Acres: 12.5

Forest Type: Field – Planted Red Oak Mixed Hardwood Forest (**AR38**)

Red Oak – Mixed Hardwood Forests are a broadly defined type that includes much of Pennsylvania's hardwood-dominated forests occurring on fairly mesic sites and therefore is quite variable in composition. Northern red oak is usually present, often with red maple, black oak, white oak, black and yellow birch, along with white ash, American beech, yellow poplar, along with hickory species.

Shrub species that are commonly found in the understory of this forest type include viburnums (maple-leaved viburnum), serviceberry, mountain laurel, witch-hazel, spicebush, striped maple, hophornbeam, and musclewood. The herbaceous layer is highly variable and often represented by Solomon's-seal, may-apple, teaberry, blue cohosh and ferns to which wood and hayscented fern are the most common.

Age: Two-Aged Stand – defined by a planted cohort of trees 15 years old with some natural regeneration establishing throughout the growing space ranging in age from 1 to 14 years old

Size: Seedlings and saplings

Quality: Fair to Good

Soil/Water: Northern half of the field is comprised of Berks channery silt loam and southern half of the unit is comprised of Millheim silt loam.

Topography: Relatively flat to gently rolling terrain

Wildlife Habitat: An abundance of 'Legacy' trees adjoin the perimeter of the unit (field edge) that provides adequate hard and soft mast attractive to wildlife. Conifer sapling thickets planted at both ends of the field may soon provide thermal cover and roosting sites, however high deer browse is preventing the development of natural regeneration and slowing succession.

Non-Native Invasives: Multi-flora-rose, autumn olive, honeysuckle

Competing Plants: None detected

Recreation/Aesthetics: Extensive trail network and farm road system provide adequate access for enjoying scenic views, maintaining plantings, and recreational activities.

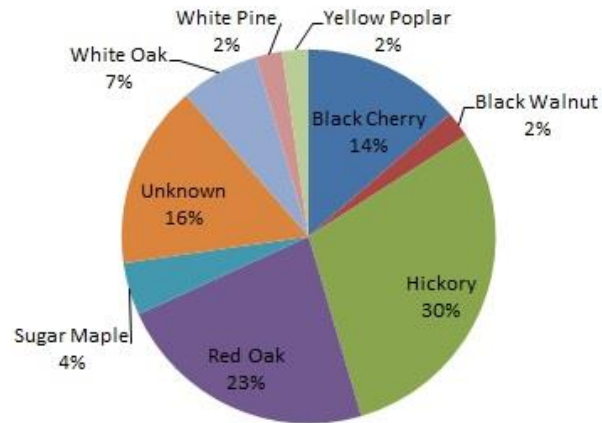
Fire Risk: Moderate threat with drier site conditions, flashy fuels, and nearby farming activities posing increased risk of wildfire.

Micro-Site Areas: Red Oak Reforestation Game Protection Areas (28), Red Oak Reforestation Area (29), Knoll Up Top (30), and Red Oak Reforestation Edges (31)

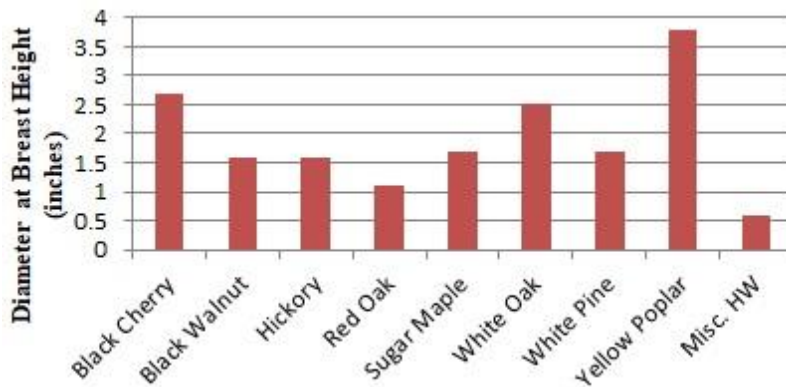
During the winter of 2018, Moonlight Forestry Consulting instituted a sampling procedure to quantify seedling survival and density along with determining an estimate of average planted species diameter and height. In summary, a sub-set of trees (n=44) were randomly sampled throughout various sections of the management unit and there are an estimated 123 trees occupying the growing space on average per acre.

These data are used to extrapolate area-wide statistics that follow:

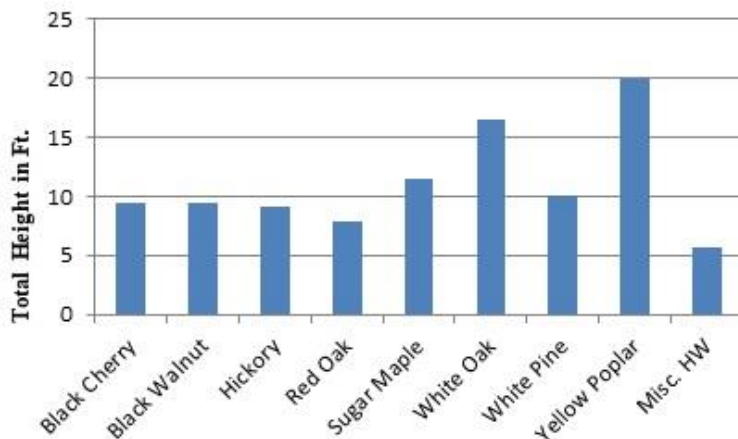
Species	# Tallied
Black Cherry	6
Black Walnut	1
Hickory	13
Red Oak	10
Sugar Maple	2
Unknown	7
White Oak	3
White Pine	1
Yellow Poplar	1
9 Species	44



Planted Tree Species by Average Diameter at Breast Height (DBH) 2018:



Planted Tree Species by Average Height 2018:



Site conditions can be characterized as higher elevation, predominantly west facing slopes, with dry soils that are most conducive for supporting mixed oak timber growth. Mixed oak seedling establishment has proven highly successful however annual maintenance remains critical. Tree shelters have been adequately installed and tended to, offering the mixed hardwood seedlings improved protection; however deer browse impacts remain problematic once stem heights grow above the shelter. Competing vegetation is adequately managed through annual mowing.

Recommendations:

Tree Planting Maintenance

Tree planting efforts within this unit and throughout the property should be tended to annually to ensure the highest probability of long-term survival.

1. Visit planted trees and shrubs during the early growing season each year to visually assess emerging growth and overall condition of the planted stock
2. Properly prune lateral branches that exhibit poor form, damage, or decay
3. Repair or replace damaged tree tubes, mesh netting, weed cloth, stakes, or associated materials used to protect the plantings from damage agents (i.e., deer, rodents, etc.).
4. Continue to control competing vegetation around the planting stock, either through annual mowing or by way of spot treatments with an appropriate herbicide

Expanding Afforestation Efforts

With a high percentage of the growing space within this stand continuing to function as fallow cool season grassland, future consideration could be given to expanding tree planting efforts to further advance the establishment forest cover, with emphasis on continued plantings of hard and soft mast producing tree and shrub species where gaps exist between current tree rows.

Consideration could also be given to investing in the construction of a 1-acre deer enclosure to better protect current or future planting stock from high deer impact and significantly reduce annual maintenance associated with tending of tree tubes and their associated props.

Enroll in EQIP Cost-Share (Tree/Shrub Establishment & Brush Management Activities)

NRCS Code	Conservation Practice	Pay Schedule Description	EQIP Payment	Acres Enrolled
612	Tree/Shrub Establishment	Planting Trees/Shrubs, includes light to medium site preparation	TBD	1-12
315	Brush Management	Chemical Treatment of Undesirable Competing Vegetation	TBD	1-12
382	Fence	Fence, Woven-Wire	TBD	2,000' to 3,000'

DESCRIPTIONS AND RECOMMENDATIONS: TREE LINES & HEDGE ROWS

STAND	CHICORYLANE HOUSE & LIVING AREA
Acres:	4.0
Land Types:	Mixed Shrubs, Tree Lines, House Site, and Infrastructure
Soil/Water:	Millheim silt loam
Topography:	Relatively flat and gently rolling terrain; 0-8% slopes
Wildlife Habitat:	This unit and its mosaic of hardwood treelines, scattered legacy trees, and shrubs hedgerows interspersed with nearby grass and shrublands is attractive for wildlife because of the diversity of “edge” habitat, increased cover, forage, and browse.
Non-Native Invasives:	Occasional patch of honeysuckle, multi-flora rose, and autumn olive
Competing Plants:	Grapevine
Recreation/Aesthetics:	ChicoryLane provides direct access to the house site, barn, and parking area. Adjoining the house and parking area is a junction point where multiple mowed paths can be taken that traverse to adjoining management units.
Fire Risk:	Potential threat with a concentration of flashy fuels and high frequency of human activities.



View of Smith Family House (looking Northwest)



Raised Bed Gardens adjoining Apple Orchard

Summary:

John, Catherine, & James author this section.

Recommendations:

John, Catherine, & James author this section.

DESCRIPTIONS AND RECOMMENDATIONS:

STAND	GRASSLAND FIELD
Acres:	17.5
Forest Type:	Old Field (OM) : Early Successional Habitat
Soil/Water:	The northern half of the unit is comprised of Berks channery silt loam and a narrow block of Hazleton extremely stony sandy loam located along the western boundary. The southern half of the unit is dominated by Millheim silt loam.
Topography:	Flat to gently rolling terrain.
Wildlife Habitat:	A mixed mosaic of golden-rod and cool season grass with an occasional clump of pioneering sapling-sized trees all of which serve as attractive habitat, especially where they adjoin transition features such as streams or forest edges. The riparian buffer transition located along the southern boundary of this unit includes scattered hard and soft mast producing tree and shrub species along with multiple den trees that further add to the value of this portion of the farm for wildlife.
Non-Native Invasives:	Occasional patch of honeysuckle, multi-flora rose, and autumn olive
Competing Plants:	Sod-forming cool season grasses
Recreation/Aesthetics:	Rolling terrain and open field provides scenic views of surrounding landscape.
Fire Risk:	Moderate threat of wildfire due to higher frequency of traffic and human activities along with flashy surface fuel loads, especially at risk during the early spring.
Summary:	
	John, Catherine, & James author this section.



Stand-Level Map Depicting Possible Management Scenarios

Recommendations:

Consideration could be given to institute a variety of practices to demonstrate how to enhance old field sites for the benefit of wildlife habitat, improved pollination, and aesthetics.

Consider making use of the following Tools & Practices

1. Disking
2. Mowing
3. Spraying
4. Burning
5. Planting

Reference the Guide *'Managing Early Successional Plant Communities for Wildlife in the Eastern US'* by Craig A. Harper

Converting Cool Season Grass Areas to Pollinator Habitat or Warm Season Grasses
(Discuss status of activity and eligibility with NRCS representative)

To promote improved hard and soft mast production on nearby trees and shrubs and to enhance wildlife habitat supporting greater wildlife viewing opportunities, consideration could be given to establishing pollinator plants within one or two areas of this unit. Repurposing a portion of the non-forested land within the ownership with early and late season pollinator plant species can significantly reduce the amount of time and money annually spent mowing or tending to this growing space, while also improving the aesthetic qualities within the immediate viewshed of the family’s house.

The intent of this practice is to establish seed nectar and pollen producing plants in non-cropped areas such as field borders, vegetative barriers, and herbaceous buffers to increase habitat for pollinators to improve fruit set, size and quality. The project area will attract a diversity of animal species, including butterflies, and may increase populations of other beneficial insects, reducing the need for pesticides.

1. Refer to enclosed Pollinator Habitat brochure by Ernst Conservation Seeds
2. Ask the NRCS for contact information of other nearby landowners who have successfully completed Pollinator Habitat projects so that you can obtain their advice and maybe visit their property to assess their planted species mix
3. Jim Walizer of Centre County, PA implemented a successful pollinator project through no-till-drill planting of Kentucky Blue grass, along with warm season grasses including Buffalo, Indian, and Big Blue Stem. Out of interest in potentially attracting and benefitting a rare species of butterfly, Lupine was integrated into the project, which also contributed to the aesthetic quality through its purple flowers. Jim can be reached at the following numbers:
814-574-9792 (cell) 814-383-2622 (home)
4. NRCS representatives will help guide the processes for this activity which may include specific site preparation activities such as mowing followed by broadcast herbicide applications to eliminate competing cool season grasses.
 - Take soil samples within immediate project area to determine if soil amendments are required to grow targeted pollinator species of interest

Enroll in EQIP Cost-Share

NRCS Code	Conservation Practice	Pay Schedule Description	EQIP Payment	Acres Enrolled
315	Herbaceous Weed Control	Chemical Treatment of Undesirable Competing Vegetation	TBD	1-3
314	Brush Management	Mechanical & Chemical Treatment of Undesirable Competing Vegetation	TBD	1-3
645	Wildlife Corridors	Orient slash from brush management to create corridors	TBD	1-3
647	Early Successional Habitat Management	Forest Edge Cutting – may include Brush Piles	TBD	1-2
612	Tree/Shrub Establishment	Planting Trees/Shrubs, includes light to medium site preparation	TBD	1-2
327	Conservation Cover	Establish Native Pollinator Habitat	TBD	1-5

GENERAL INFORMATION & RECOMMENDATIONS

Annually monitor each management unit for forest health related issues.

Specific Guidelines:

- Annually assess the development of regeneration establishing throughout the property along with monitoring the health of upper canopy trees; particularly in areas receiving forestry treatments.
- Document the establishment of undesirable tree, plant, and shrub species
- Work to detect and eliminate new pests and diseases before they become catastrophic.
- Consider contracting a forester or ecologist to perform this task and require he or she produce a written report for 3 to 5 consecutive years following any investment in recommended treatments. This activity will quantify condition changes, specifically informing you of the composition and stocking of developing seedlings and shrubs within various treatment units or areas experiencing high tree mortality.
 - Moonlight Forestry Consulting can offer these services
- This information will help you to determine if follow up actions are warranted, such as spot treatment of herbicide to kill developing non-native invasive shrubs or if it may be necessary to perform enrichment plantings of mixed conifer species to fill voids where nothing seems to be growing

FOREST ROADS AND TRAILS:

A well designed and located forest road and trail system has been established and is maintained by the Smith family with assistance from the farm's Landscape Architect, James Leshner. These roads and trails are an asset to the property, functioning to provide long-term access for a variety of recreational activities, such as hiking, bird watching, and hunting; all of which the Smith family and their friends enjoy. They also provide critical access into various portions of the property to allow for general forest management activities such as firewood cutting, tree planting, vegetation management, and enable easier monitoring of the farm for current and emerging pests and diseases. Such trails and roads can also provide an avenue to fight/suppress a forest fire and can serve as a natural barrier to reduce the spread of a wildfire if one were to occur.



**Mowed forest trail along transition from Stands 3 to 5
(Looking East)**

PROPERTY BOUNDARIES:

A forest landowner's first management step is to clearly mark the boundaries. Although fences and past farming activities occur near property lines, they are not often the property line. If the property lines are vague or unknown, consult a surveyor. This is crucial if there is not agreement between adjacent landowners concerning property boundaries. Notify adjoining landowners before any boundary marking to avoid misunderstandings. Painting "witness trees" is a durable and convenient method of marking the boundary line. The paint has a limited life and remarking is necessary on a regular basis.



Evidence of property boundary with old woven wire fence
(Southern Line Stand 3)

Trees growing on the property line are borderline trees and they belong to both landowners. Notify adjacent landowners when harvesting of timber along joint boundaries occurs. Leave borderline trees uncut to maintain the property line. When all landowners agree, it is possible to sell the borderline trees, divide the income, and reestablish the property line.

The foot print of old fence lines, corner pins, posted signs, and witness trees exist throughout the property and help to signify the location of the property lines. As a landowner, for your own benefit, that of you neighbors, and those who will follow you, it is imperative that the ChicoryLane property lines stay established and always well maintained.

- It is recommended that custom signage and/or carsonite posts be purchased and installed to reinforce the integrity of the property boundary corners and lines (*refer to Berntsen Catalog online*).

Moonlight Forestry Consulting has a relationship with Voss Signs to which custom boundary signage can be produced on aluminum 0.012 gauge placards. Artwork and logos can also be integrated into the sign to which adds a unique dynamic to enhancing boundary postings. The material is durable and long-lived. Should you be interested in ordering this type of product, Moonlight Forestry Consulting can help obtain price quotes, arrange design options, and determine approximate quantities required to post all or select portions of your property boundaries. In addition, Moonlight Forestry Consulting can be contracted to perform the posting or guide the posting of your property.



Example of Custom Boundary Signage by Voss Signs

COST-SHARE ASSISTANCE PROGRAMS

Cost-share assistance programs may be available to help defray forest management project costs. Some programs pay 35-50% of all costs involved in certain projects while others provide a flat return rate on an annual basis over a 3 to 5 year period. Funds are at times available on a first-come, first-served basis or awarded to those who score high based on various criteria established by state and federal land management service agencies. The CAP 106 Forest Management Plan is a prerequisite to obtaining certain cost-share monies, and can benefit you by improving your competitiveness for certain cost-share programs that have a scoring system based on certain criteria's. Within the Forest Management Plan is a list of recommended project activities and potential cost-share practices that you may be eligible to obtain. I would encourage you to continue to work with your local Technical Service providers, which include:

USDA Natural Resource Conservation Service
Centre/Clinton Counties
216 Spring Run Road
Mill Hall, PA 17751
Lexis Ryan – Soil Conservationist
570-749-3078
Email: Lexis.Ryan@pa.usda.gov

DCNR Bureau of Forestry
Centre County
181 Rothrock Lane
Huntingdon, PA 16652
Tim Cole – Service Forester
Phone: (814) 643-2340
Email: ticole@pa.gov

HISTORIC AND CULTURAL RESOURCES

Historic and cultural resources are a vital link to past land-use practices in Pennsylvania. The Pennsylvania Historical and Museum Commission (PHMC) has been collecting information concerning archaeological sites and historic resources for the greater part of a century. They offer programs which survey, catalog, and encourage the preservation of such resources. Currently there are 26,072 archaeological sites and 137,454 historic properties in their files. Access to these paper records is free and open to the public by appointment at the BHP office in Harrisburg.

Moonlight Forestry Consulting performed an extensive search on The PA Historical and Museum Commission Bureau for Historic Preservation (PHMC)'s Cultural Resource Geographic System (CRGIS). The CRGIS is a three tiered GIS program consisting of state-wide historic and geologic site data combined with PA Natural Diversity Inventory (PNDI) information. The result of that assessment showed that there are no known sites of significance within the property regarding indigeneous peoples' or any other historic or cultural resources. ChicoryLane is located within the Penns Valley & Brush Valley Rural Historic District. The Smith Family maintains their 19th-century Log Home in a manner that contributes to preserving the rich cultural and historic heritage of this local region.

To check on periodic database updates or to request a survey of an area of interest, please contact Noël Strattan – CRGIS, Bureau for Historic Preservation; Commonwealth Keystone Bldg, 2nd Floor; 400 North Street; Harrisburg PA 17120-0093 (phone) 717-214-6572 or email: RA-CRGIS@state.pa.us.

THREATENED OR ENDANGERED SPECIES

No rare, threatened, or endangered species were observed on the property during the 2018 site visits. To adequately assess the ChicoryLane tract for known threatened or endangered species, Moonlight Forestry Consulting is requesting a PA Natural Diversity Inventory (PNDI) report be produced by the USDA Natural Resources Conservation Service to verify that no such species are known to exist on the specified property.

For more information regarding threatened and endangered species, or any regulations involved with them please contact the Pennsylvania Natural Heritage Program; PO Box 8552; Harrisburg, PA 17105-8552; (phone) 717-772-0258; or log onto: www.naturalheritage.state.pa.us/

FIRE

Prescribed burning can be a highly effective method to prepare an area for reforestation or enhance wildlife habitat however, protection of your property from wildfire is essential. Wildfire can rapidly destroy valuable timber, wildlife, and property. The Department of Conservation and Natural Resources, Bureau of Forestry, Bald Eagle District Office should be contacted immediately in the case of a wildfire by telephoning 814-643-2340 or contact your local fire dispatch (911).

Forest: ChicoryLane Tract (John & Catherine Smith – Centre Co)

Proposed Management Activity Schedule and Tracking

**NRCS Practice Code needed if practice will be submitted for cost share, otherwise leave blank.*

Mgmt. Unit	Acres/feet	NRCS Code	Treatment Activity Short Description	Dates		Cost Share Used ?	Net Cash Flow	
				Planned	Completed		Cost	Income
4 South	3	315	Herbaceous Weed Control	2020-21		TBD		
4 South	3	612	Deer Exclosure Fence	2020-21		TBD		
2 (Entire)	4-9	315	Herbaceous Weed Control	2020-21		TBD		
2 (Entire)	4-9	314	Brush Management	2020-21		TBD		
2 (Entire)	4-9	612	Deer Exclosure Fence	2020-21		TBD		
3 (Entire)	9	315	Herbaceous Weed Control	2020-21		TBD		
3 (Entire)	9	314	Brush Management	2020-21		TBD		
3 (Entire)	9	612	Deer Exclosure Fence	2020-21		TBD		
1 (West Half)	3-4	315	Herbaceous Weed Control	2020-21		TBD		
1 (West Half)	3-4	666	Forest Stand Improvement	2020-21		TBD		
1 (West Half)	3-4	612	Deer Exclosure Fence	2020-21		TBD		
Entire Property			Enrollment in PGC DMAP	2019-29				
Entire Property			Annual Monitoring	2019-29				

Landowners' Summary: Forest Stewardship Management Plan

John B. & Catherine F. Smith

May 13, 2019

We thank NRCS for making this planning and stewardship analysis possible and Mike Eckley for his extraordinary effort in performing this work. We especially recognize his skill and knowledge in analyzing our unusual property and in incorporating some of our particular perspectives and priorities. We expect to find this report useful for years to come in guiding our ongoing effort to make ChicoryLane an ecologically significant site.

A major take-away for us is a clear 5-point summary of our current ecological situation and what we need to do to improve our land's ecological quality. Imagine 5 points in a triangle or pyramid:

- The apex of the triangle is our main goal: Create and maintain a sustainable (forest) environment, supported by a regenerative layer of native seedlings.
- The second level includes two points identifying conditions needed to achieve the main goal:
 - Establish a seedling layer throughout composed of a richly diverse collection of native species.
 - Establish a more complex, multi-layer forest structure that both supports the seedling layer and signals the overall health of the environment
- The third level includes two points identifying important instrumental measures that will be needed to establish both the more complex structure and the regenerative seedling layer:
 - Control deer population to prevent over-grazing.
 - Control invasive species to prevent crowding out of desired native species

This high-level view fits comfortably within the longer term plan we are working on to guide the legacy of ChicoryLane. We have completed a Conservation Easement that will preserve the property intact and will insure that the majority of it will remain an ecological reserve. We are currently working on plans regarding, first, future ownership and management of the property and, second, financial support for its maintenance and operation, including continuing its education, research, and aesthetic activities.

This Forest Stewardship and Management Plan moves physical maintenance and ecological enhancement into legacy planning. For example, changing forest complexity and structure is a long-term goal that will take many years to achieve, but it will provide a significant improvement in ChicoryLane's ecological health. Once established, it will need to be maintained, but the enabling steps of reducing and controlling deer population and invasive species will make maintenance much more tractable versus the all-out assaults that would be required were these issues ignored and conditions allowed to become critical.

Another aspect of the study that fits into legacy planning is viewing forest ecology within the context of global warming. The plan includes identification of species now within our area that are likely to be adversely affected in the future by a warmer and wetter climate; it also identifies those not usually found here now that are likely to thrive in the future. In selecting shrubs and trees to achieve various current landscaping objectives from those expected to thrive under future conditions is a step toward a healthier and more sustainable forest, and thereby can fit comfortably within a more comprehensive legacy plan.

Whereas we believe this Forest Stewardship and Management Plan is an important step toward the future, we recognize it is not sufficient. We and those that will follow us cannot assume that we can complete this or any other plan and think that our work is done. The job will never end, but that is the point of *stewardship*: the careful and responsible management of something entrusted to one's care. The important point is to keep moving in the right direction.

Landowners' Recommendations: Forest Stewardship Management Plan
(Plan Author: Mike Eckley, Certified Forester)

John B.& Catherine F. Smith
May 13,2019

The recommendations listed here are directions to ourselves but, perhaps more importantly, directions we hope future landowners will follow - perhaps literally, but more importantly, adapted to the future needs and conditions into which ChicoryLane evolves.

1. Continue emphasis and efforts to make ChicoryLane a sustainable, dynamic ecologically significant reserve that evolves in accord with principles of ecological quality.
2. Continuing actions to control invasives – both animal (e.g., deer) and vegetative (e.g., honeysuckle and multiflora).
3. Continue efforts to strengthen a layer of native seedlings.
4. Continue efforts to develop a more varied and structural forests with multiple layers.
5. Develop and implement a multifaceted Legacy Plan that includes:
 - a. Land use and subdivision
 - b. Ownership and management
 - c. Financial self-sufficiency
 - d. Physical plant able to meet maintenance and program needs
 - e. Succession of focused projects to increase ecological diversity and quality
 - f. Strategy for adapting to and perhaps capitalizing on global warming, turned into action programs
6. Seek to make ChicoryLane a demonstration reserve by sharing knowledge, providing motivation, and offering a place of natural beauty and solace