

Forest Stewardship Management Plan

for

Athens County parcels #N01-0010018201 and #N01-0010021501

Owned by

Robert Eichenberg and Cecilia Rinaldi

7250 Roundhouse Rd., New Marshfield, OH 45766

October 2016

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Property Information

Location directions from Athens City: SR 56 west, left on CR6 (Old SR 56), approximately 1 mile to CR3 (Marshfield Rd.), left on CR3, approximately 1 mile to Waterloo TR24 (Roundhouse Rd.), right on TR24, 3rd driveway on right, approximately .25 miles from CR3.

Total acreage: 46.127 ac.

Parcel # N010010021501

- Waterloo Township, section 14
- 30.997 ac.
- Homesite, 1 ac.; pasture, 5.6 ac.; woodland, 24.4 ac.

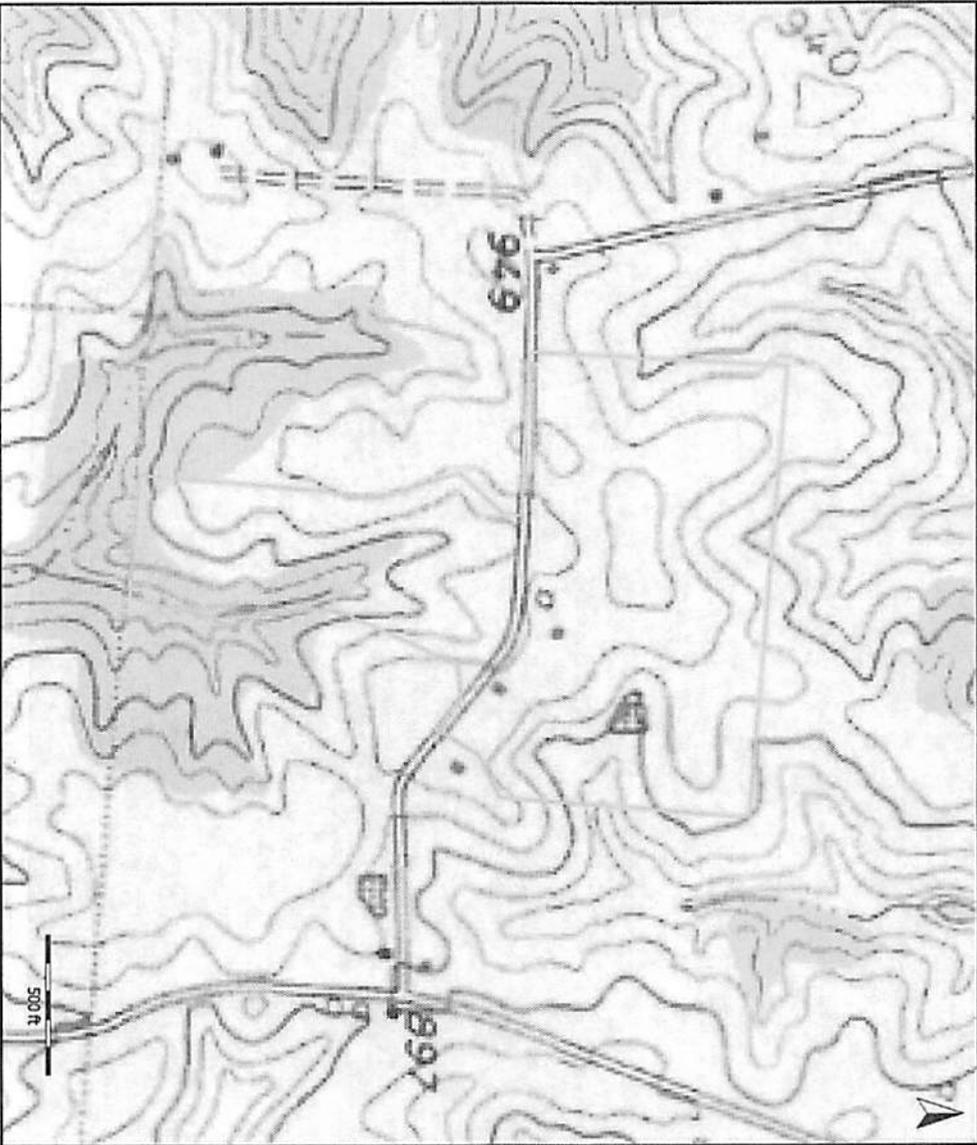
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- Waterloo Township, section 14
- 15.13 ac.
- Woodland, 15.13 ac.

Landowner Objectives

- 1. Maintain and improve the productivity of the woodland. This includes both timber for sale off the farm and for timber to be sawn and used for lumber, posts, and firewood on the farm.**
- 2. Productivity of the woodland also includes the many intangible values of a healthy forest including songbirds and other wildlife, wild flowers, shrubs and herbaceous plants, mushrooms, and nut production.**
- 3. Conserve soil from water and wind erosion by incorporating practices that help to reduce such erosion. This includes installation of water bars and breaks and seeding and mulching on logging roads.**
- 4. Leave the woodland in a better condition for future generations.**
- 5. Manage the property for all the attributes and opportunities that exist in a forest ecosystem including recreation, wildlife management, soil and water management, forest protection, timber products, and other compatible conservation uses.**
- 6. Develop and maintain favorable food and cover conditions for game and other wildlife.**
- 7. Select tree species best suited to the soil and site capability.**
- 8. Remain eligible for the OFTL or CAUV programs.**
- 9. Employ the use of cultural treatments on the better woodland sites and thus shorten the time period necessary to produce high quality sawlog or veneer product.**
- 10. Control the spread of invasive plant species.**

Eichenberg Property



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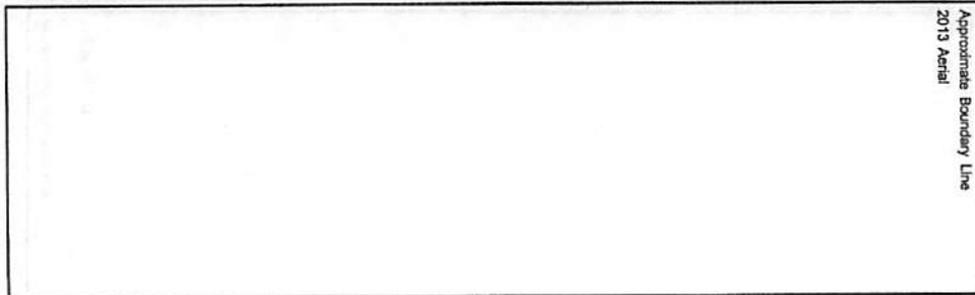


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Eichenberg Property – Forest Stands



Approximate Boundary Line
2013 Aerial



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Forest Stewardship Plan by Stand

Stand 1 (0.7 acres)

This Stand includes a small White Pine planting on the east done in 1982, an area on which an old mobile home was placed and subsequently moved offsite in 1988, and an area planted to several hardwood trees on the southwest. Roundhouse Road traverses the southwest edge of this Stand and trees on the edge of the road help to serve as a buffer for visibility, noise, and dust.

The 2001 plan called for thinning of this stand and for grapevine removal. In 2006 a number of trees were girdled and vines were removed. In 2008, a storm toppled several other living and healthy trees. In 2010, a small area adjacent to the road was cleared to create a landing area for a logging operation done on Stand 2 that year. The cumulative effect of these actions accomplished the necessary thinning and left a density of pine that will allow the remaining trees to grow to commercial size eventually.

Hardwood trees planted on the southwest section include maple, sweetgum, walnut, and poplar. These trees will be allowed to grow to maturity and be harvested for timber.

Additional work that was performed included construction of a property line woven fence on the east to keep the neighbor's trash and debris from encroaching into the woodlot.

Work to be performed for this 10-year plan includes:

- (Periodically) Additional vine and invasive removal

Stand 2 (5.3 acres)

This Stand lies on the eastern boundary and is composed of mixed hardwoods including Sugar Maple, Red Maple, White Ash, Black Cherry, Sassafras, Tulip Poplar, Red Oak, American Elm, Shagbark Hickory, and Black Locust. This Stand also includes the pond which is surrounded by a mix of hardwoods, White Pine, and Red Pine. A select cut of approximately 2,500 BF of Oak, Cherry, and Tulip Poplar took place in 2010. Ten mature White Ash were harvested in 2016. Large White Pines that were growing on the pond dam died from 2011-2012, likely due to fluctuating water levels as the tree roots penetrated the dam and leaks occurred. The wood from these pines was not harvested. Vines were removed on several occasions during the past 15 years. The property line fence on the east was rebuilt in 2012.

Work to be performed for this 10-year plan includes:

- (2016-2017) Remove tops of logged trees for firewood.
- (2017-2019) Invasives removal as Multiflora Rose, Shrub Honeysuckle, and Privet remain a problem in the understory. This will continue to be a problem particularly where mature trees have been removed and sunlight gets in to the understory. Dense shade trees such as Sugar Maple will continue to be favored as the shade will help to eliminate the invasives.
- (2023-2024) Cull undesirable hardwoods to reduce competition of more desirable species.
- (2025-2026) Harvest trees for a sale of approximately 3,000 BF (including Stands 2, 4b, and 7).

Stand 3a (3.52 acres)

This Stand is a young White Pine plantation that was established in 2005. Some replanting occurred in 2006 based on the poor condition of approximately 25% of the original planting. Replacements were planted next to the original trees and most of the original trees ended up surviving so there is too much competition in this plantation. The old fence row to the east of this plantation is overgrown and in need of boundary marking.

Work to be performed for this 10-year plan includes:

- (2016-2019) Utilizing EQIP, remove hardwood competition and approximately ½ of the White Pines based on proximity and tree health.
- (2019-2020) Remove invasives and vines along the fence row and remove declining fencerow trees for firewood.
- (2020-2021) Rebuild fence on northern and eastern property lines.

Stand 3b(0.57 acres)

This Stand is a young White Pine plantation that was established in 2005. Some replanting occurred in 2006 based on the poor condition of approximately 25% of the original planting. Replacements were planted next to the original trees and most of the original trees ended up surviving. This Stand was thinned in 2015.

Work to be performed for this 10-year plan includes:

- (2020-2021) Remove hardwoods and conduct additional thinning if necessary.
- (2020-2021) Rebuild fence on northern property line.

Stand 4a(2.23 acres)

This Stand is composed of mixed hardwoods and is targeted for Oak and Hickory crop tree release in 2016. During the past 15 years, this Stand has been utilized primarily for firewood gathering from storm-damaged trees and light thinning to promote Oak, Hickory, and Tulip Poplar. Larger Ash trees were removed in spring 2016 for a sale. This helped to promote the Oak and Hickory regeneration and removed many trees that will eventually die from the Emerald Ash Borer. There are still many White Ash trees in the 6-10 inch dbh range. Vine removal (cutting with a hatchet) was conducted three times during the past 15 years. The western fence line was marked with metal fence posts.

Work to be performed for this 10-year plan includes:

- (2016-2017) Conduct Oak and Hickory crop tree release by removing competition, particularly hardwoods with limited future commercial value or with limited wildlife value. Additional Ash can be cut for firewood sales or custom lumber sales.
- (2017-2018) Remove invasives.
- (2019-2020) Rebuild fence on the northern and western property line.
- (2023-2024) Cull undesirable hardwoods to reduce competition of more desirable species.
- (Periodically) Remove vines and invasives.

Stand 4b(6.85 acres)

This Stand is composed of mixed hardwoods. It is mostly a northerly aspect. The moist ravine on the northern property line has a nice stand of 10-12 inch dbh Black Walnut trees. Approximately twelve White Ash trees ranging in diameter from 12-22 inch dbh were removed in 2015 and 2016. Other species harvested included several Sassafras, Black Walnut, and Tulip Poplar. There are several pole size Oaks and Hickories and these species will be favored along with Black Walnut and Cherry. Vine removal (cutting with a hatchet) was conducted three times during the past 15 years. An old farm dump/burn pit on the northeast corner was cleaned up in 2013. Not all the material could be removed so some was buried in place. The buried material was glass and metal that could not be pulled for recycling. Invasives are taking over the eastern edge of this Stand and a concentrated effort is needed for their removal. This was an old pasture that has reverted to woodland.

Work to be performed for this 10-year plan includes:

- (2016-2017) Several additional White Ash in the 10-12 inch diameter range can be removed for lumber.
- (2017-2018) Remove invasives.
- (2016-2018) Poplar salvage cut for sale.

- (2020-2021) Rebuild fence on northern property line.
- (2023-2024) Cull undesirable hardwoods to reduce competition of more desirable species.
- (2025-2026) Harvest trees for a sale of approximately 1,000 BF (including Stands 2, 7, and 9).
- (Periodically) As remaining White Ash dies it can be harvested for firewood.
- (Periodically) Remove vines.

Stand 5(0.9 acres)

This Stand is a small White Pine stand that was expanded in the early 1980's. The stand has been maintained in Pine by periodically culling encroaching hardwoods both within it and on the edges. However, the hardwood competition has grown more intense and the Pines had also become crowded so in 2016 approximately ¼ of the Pines were thinned out by girdling the trees to be removed. Hardwood competition was also removed from the interior.

Work to be performed for this 10-year plan includes:

- (Periodically) Remove vines
- (Periodically) Remove hardwood competition

Stand 6a(1.9 acres)

This Stand is composed of mixed hardwoods that include Sassafras, Sugar Maple, Red Maple, Red Oak, Tulip Poplar, Hickory, American Elm, Black Locust, Black Cherry and White Ash. It has several large Ash trees that can be salvage cut for sale. In 2016 invasives were removed with assistance from NRCS's EQIP. The understory had an almost impenetrable growth of Multiflora Rose, Shrub Honeysuckle, Privet, and Japanese Honeysuckle. In 2016 the western edge of this Stand was cut to allow for a powerline R/W to be installed to a neighbor's property across the road to the south. The area cut had been a pasture 20 years ago and early hardwood succession had taken over. Removed were Black Locusts, Sassafras, and several Cherry. These will be used for firewood. The R/W will be mowed in order to keep invasives (particularly Ailanthus) to a minimum. This Stand 6a will be managed to favor Oak, Tulip Poplar, and Hickory.

Work to be performed for this 10-year plan includes:

- (2017-2018) Remove several large White Ash for sale.
- (2017-2018) Perform additional invasives control if there is any regrowth.
- (2021-2022) Cull undesirable hardwoods to reduce competition of more desirable species.

This area is primarily composed of large White Pines approximately 50 years old. Several Pines were harvested for lumber (approximately 1,000 BF) in 2004 and hardwoods, particularly Red Maple, have been culled to keep the stand in Pine. It is slowly losing out to the hardwoods but remains an attractive feature on the property and will be available for an occasional White Pine harvest when some softwood lumber is needed.

Work to be performed for this 10-year plan includes:

- (Periodically) Harvest trees for softwood lumber use or sale.
- (Periodically) Cull hardwoods to reduce competition with the Pines and for firewood.
- (Periodically) Remove invasives, particularly Ailanthus.

Management Activity Schedule

Year	Unit	Task	Notes
2016-2017	2, 4a, 4b, 7	Remove tops of logged trees for firewood	Remove competition, particularly hardwoods with limited future commercial value or with limited wildlife value. Additional Ash can be cut for firewood sales or custom lumber sales
	4a	Conduct Oak and Hickory crop tree release	2,000 BF
	6a, 7, 9	White Ash salvage cut for sale	1,000 BF
	4b, 9	Poplar salvage cut for sale	Remove hardwood competition.
	3a, 8b	Thin pines to reduce competition.	Basal bark herbicide
2017-2018	9, 10	Remove Ailanthus	Remove hardwood competition.
	3a, 8b	Thin pines to reduce competition.	various herbicides and methods
	2, 4a, 4b, 9	Remove invasives	1,000 BF
	4b, 9	Poplar salvage cut for sale	500BF
2018-2019	6a, 6b	Perform additional invasives control if there is any regrowth.	
	6a, 7, 9	White Ash salvage cut for sale	
	2	Invasives removal and select cutting on edges to favor Maple.	
2019-2020	3a, 8b	Thin pines to reduce competition.	Remove hardwood competition.
	9	Rebuild fence on southern property edge.	
	3a	Remove Invasives and vines along the fence row and remove declining fence row trees for firewood.	
2020-2021	7	Remove Invasives	various herbicides and methods
	4a	Rebuild fence on the northern and western property line.	
2021-2022	7	Rebuild fence on the western property line.	
	3a, 3b, 4b	Rebuild fence on northern and eastern property lines.	
2022-2023	3b	Remove hardwoods and conduct additional thinning if necessary.	
	6a, 9	Cull undesirable hardwoods to reduce competition of more desirable species.	
2023-2024	1	Remove vines and invasives.	various herbicides and methods
	8b	Thin pines further and remove hardwood competition.	
2024-2025	2, 4a, 4b	Cull undesirable hardwoods to reduce competition of more desirable species.	
	7	species.	
2025-2026	9	Select and cut trees for a sale.	3,000 BF
	6a	Cull undesirable hardwoods to reduce competition of more desirable species.	
Periodically	2, 4b, 7, 9	Select and cut trees for a sale.	1,000 BF
	All	Remove vines and Invasives.	various herbicides and methods
	4b	As remaining White Ash dies it can be harvested for firewood.	
	All	Cull damaged or crowded trees for firewood.	
	All	Harvest Black Locust for firewood and posts.	
	10	Harvest trees for softwood lumber use or sale.	
	10	Cull hardwoods to reduce competition with the Pines and for firewood.	

Before entering a timber sale agreement, or conducting other forestry work that is not listed in your activity schedule, contact your forester first to ensure compliance with your approved woodland stewardship management plan.

NOTE: Any reference to selecting trees for a sale or a select cut is intended to imply that the cut will be silvicultural in nature and intended to benefit the woodlands.

Addenda

Woodland Resource Descriptions

General Soils Information

- **Soil Type(s):** See Soils Map
- **Soil Drainage Class:** Guernsey is moderately well drained and Westmoreland is well drained
- **Site Class: (using Woodland Productivity):** Good
- **General Description of Main Soils:**

GsC: Guernsey silt loam, 8-15 percent slopes. This strongly sloping, deep, moderately well drained soil is on ridgetops, crests of knolls on hilltops, side slopes, and on benches on hillsides. Most slopes are smooth and slightly convex. Some side slopes are concave. Most areas are long and narrow, but more rounded on knolls, and are 5 to 40 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, firm silty clay loam; the middle and lower parts are dark yellowish brown and yellowish brown, mottled, firm and brown, mottled, very firm clay. Light brownish gray, siltstone bedrock is at a depth of about 50 inches. Some areas are redder in the subsoil, and a few areas have a thicker silt mantle.

Permeability is slow or moderately slow. This soil has a moderate available water capacity, rapid runoff, and good tilth. It has a deep root zone and a high shrink-swell potential in the lower part of the soil. The subsoil is strongly acid to slightly acid in the upper part and strongly acid to mildly alkaline in the middle and lower parts. This soil has a moderately low organic matter content and medium natural fertility. A seasonal high water table is between depths of 24 and 42 inches in winter, early spring, and other extended wet periods.

This soil is well suited to woodland. Plant competition can be reduced by spraying, mowing, or disking. This soil is in capability subclass IIIe. It is in woodland suitability subclass 20.

WhD: Westmoreland-Guernsey silt loam, 15-25 percent slopes. This soil consists of a well drained Westmoreland soil and a moderately well drained Guernsey soil on hillsides and on some benches. Most areas of these deep, moderately steep soils are on the upper third of the steeper and longer slopes. A few areas of this complex are on ridgetops and knolls on ridgetops. The slopes are mostly smooth with some dissection along a few small drainageways.

Typically, the Westmoreland soil has a dark brown, friable, silt loam surface layer about 5 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 20 inches thick. The upper part is dark yellowish brown, friable loam; the middle and lower parts are yellowish brown, friable and firm channery silty clay loam. Light brownish gray, siltstone bedrock is at a depth of about 45 inches.

Typically, the Guernsey soil has a dark yellowish brown, friable, silt loam surface layer about 7 inches thick. The subsoil is about 32 inches thick. The upper part is dark brown, firm silty clay loam; the middle part is yellowish brown, mottled, firm clay and silty clay; and the lower part is grayish brown, mottled firm silty clay loam. The substratum is yellowish brown, mottled, firm channery silty clay loam. Light brownish gray, siltstone bedrock is at a depth of about 50 inches. In some areas the silt mantle is thicker. In a few areas the subsoil is redder. Some areas have bedrock between depths of 40 and 50 inches.

Permeability is moderate in the Westmoreland soil and moderately slow or slow in the Guernsey soil. Both soils have moderate available water capacity, very rapid runoff, and good tilth. Both soils have a deep root zone. The shrink-swell potential is low in the Westmoreland soil and high in the middle and lower parts of the subsoil of the Guernsey soil. The subsoil of the Westmoreland soil is very strongly acid to medium acid. The Guernsey soil is strongly acid to slightly acid in the upper part and strongly acid to mildly alkaline in the lower part. Both soils have a moderately low organic matter content and medium natural fertility. A seasonal high water table in between depths of 24 and 42 inches in the Guernsey soil in winter, early spring, and other extended wet periods.

Many areas are in woodland. These soils are well suited to woodland. Erosion can be reduced by such practices as placing logging roads and skid trails on or near the contour and using water bars. The north and east-facing slopes are better woodland sites than south and west-facing slopes because they are cooler and not as dry. The better sites are less exposed to the drying effects of the prevailing winds and the sun.

These soils are in capability subclass IVe. They are in woodland suitability subclass 2r on the north aspect and 3r on the south aspect.

Timber Information

Timber production is practical and possible for this property. The woodlands are stocked with a variety of marketable timber species that can produce valuable wood products now and into the future. Timber stand improvement (TSI) management practices such as grapevine control, cull tree & undesirable hardwood species control, and crop tree release

will certainly enhance the quality and value of your timber resources over time, and are important tasks to implement in order to maximize the timber potential in your woodland.

Wildlife

Your forestland provides valuable habitat for wildlife, including mammals, birds, and amphibians. Many of the tree species are used by this wildlife for food, cover and nesting sites. Some of the more valuable wildlife food trees species include oaks, beech, cherry, dogwood and hickory. Many other tree species are critically important to certain species of wildlife. Grapevines also are an important food and cover for birds.

Cover, food and water are all necessary to attract wildlife. Different species use different cover types, and maintaining a diversity of cover is key to attracting a wide variety of wildlife. A mixture of sapling areas, pole areas and sawtimber areas will help meet the need for habitat diversity. Small openings in the forest and/or open areas along woodland roads help provide areas for birds and their young to come and catch insects. Openings can also be seeded to grass and clover mixes to provide an additional variety of food.

Please note all habitats don't necessarily have to be present on your property... your neighbor's land may offer a habitat type different than what is available at your forest. You can extend habitat benefits using complimentary cover types beyond your boundaries... the wildlife don't mind.

Water

Soil and water conservation practices can be applied to this property. Perennial streams should always be buffered with trees. Livestock should be kept out of streams. Water control structures should be used in areas where access trails and roadways are present.

The water and soil resources on your property should be protected and enhanced. Using the information in this plan and information available through your local Soil and Water Conservation District you can implement sound soil and water conservation practices on your property.

Best Management Practices

Basic protection measures used to guard your forest soils against problems related to soil/site limitations and equipment usage - rutting, excessive disturbance and compaction, erosion, and sedimentation - are commonly referred to as Best Management Practices (BMP'S). One very easy BMP landowners may use is simply to limit heavy equipment access to dry weather periods.

Hilly to steeply sloped terrain is more subject to site disturbance and subsequent soil erosion and sedimentation. Forest management often may still be accomplished on these steep areas with the use of BMP's. Even when the forest terrain is nearly level to gently rolling, and where slope does not present a hindrance to access for management activities, it is important to keep the trails up away from the small drainages where possible. This helps protect water quality by providing a buffer strip of undisturbed soil and leaf litter where any sediment can be trapped before reaching the drainage, if some should get washed off the path.

During timber harvest activities, follow the Best Management Practices outlined in the Ohio State University Bulletin #916 – BMPs for Erosion Control for Logging Practices in Ohio. This booklet is available online at www.ohiodnr.gov/forestry/ or at your local Division of Forestry office.

Practically speaking, the use of BMP's to prevent soil loss is a sound agricultural practice that helps maintain site & timber productivity . Also, implementing BMP's helps you comply with Ohio's Agricultural Pollution Abatement Law (HB 88) standards for Silvicultural Operations.

Forest Health

No problematic insect pests or diseases were noted during the woodland review. This woodland shows good overall health and vigor. Control of grapevines on selected crop trees will guard those crop trees from the damage risks posed by this woody native vine. However, native grapevines are part of the forest ecosystem; keeping selected vines may be considered a part of maintaining overall forest health.

Oak species are preferred food sources for the Gypsy moth. The good news is that after the initial wave of Gypsy moths showed up in Ohio, a fungus showed up that keeps these critters in pretty good check. The fungus is named *Entomophaga miamaiga*... "Em" for short. Still, it's a good idea to keep tabs on any oaks present in the forest to see if any egg masses start to show up in July-August - identified as a characteristic tan fuzzy oval mass that looks like Velcro. If you see eggs masses, and can count more than 50 during a five minute walk around the oaks, then your trees are at risk of being partially or completely defoliated if the Spring is very dry and therefore not conducive to development of the Em fungus for natural control. There are options for control of Gypsy moth using aerial application of pesticides to the tree leaves, so that larvae ingesting such pesticides then die. One such pesticide is actually a "biocide" - the bacteria *Bacillus thuringiensis* (Bt).

Another woodland pest of great concern is the emerald ash borer (EAB), an invasive insect from Asia that only attacks ash trees. The larvae eat the living tissue of ash trees just underneath the bark. With a large enough infestation, this process essentially chokes off the flow of water and nutrients within the tree which leads to the tree's mortality. This insect can spread naturally from tree to tree, as well as artificially through the movement of ash material such as firewood.

You can reduce the risk of losses by gradually reducing the ash component of your woodlot. When doing a forest thinning or a crop tree release, if you have a choice between an ash and another desirable species, you may choose to cut the ash and let the other species grow. By gradually doing this ash reduction throughout your woods, you can avoid any serious impact on your woods if the emerald ash borer does eventually get there

The best thing you can do now is to stay informed. The following websites should be checked periodically for the most up to date information on the emerald ash borer:

<http://www.agri.ohio.gov/eab>

<http://www.emeraldashborer.info/>

<http://ashalert.osu.edu/>

<http://www.ohiodnr.com/forestry/health/eab.htm>

Wetlands

Wetlands are extremely important for water quality, and they provide unique habitats for fish and wildlife. These are an important forest resource component for overall health of the forest system. Ephemeral or seasonal wetlands – also called vernal pools - are typically small in size, and tucked within the forest cover. Vernal pools periodically dry up and do not contain fish. This drying may occur annually or just during drought years. However, these ephemeral pools provide unique habitat for amphibians like salamanders and frogs, as well as many other species of wildlife. Many landowners find that wetlands improve the aesthetics and overall enjoyment value to their land. It is very important to protect permanent and ephemeral wetland areas for the health of the forest and the environment.

Threatened & Endangered Species

No specific threatened or endangered species were noted within your forestland, but I did not conduct a complete biological survey. Some threatened or endangered species found in Ohio include the Timber rattlesnake, the Northern Harrier, the Indiana bat, and the American Burying Beetle. Habitat requirements for threatened and endangered species may or may not be found on this forestland; such species have certain habitat requirements. Specific information on threatened or endangered species may be obtained by contacting the Ohio Department of Natural Resources Division of Wildlife directly to access the "Ohio Biodiversity Database":

ODNR - Division of Wildlife

2045 Morse Road, Bldg. G-3,

Columbus, OH 43229-6693

Phone: (614) 265-6452

Archeological/Historical Resources

Historical and cultural resources are nonrenewable and can never be replaced once destroyed. These resources provide us a unique glimpse into the past and a look at the people and how they cared for the land. Good stewardship involves recognizing these resources and protecting them. These resources should be conserved whenever possible when they are present on the property. No historical sites were noted during the visit.

Recreation

Each forest has a unique history and character...and this continues to build under your stewardship. This forest could be used for hunting, picnicing, or wildlife watching. Many landowners find enjoyment in doing improvement work in their woods. Others find pleasure in watching the birds. Some folks gain gourmet foods from the woods, gathering fruits, nuts, or wild mushrooms. Flowering trees like dogwood, redbud and serviceberry, whenever present, add to the beauty of the forest. Maintaining some trails will improve access and your opportunities for use of the area. A walk in the forest provides a time of learning but also a time to relax. The woodlands can be a quiet place of solitude after a busy day at work, or anytime for that matter.

Aesthetics

Forest aesthetics is often associated with older, more mature forests. However, it also has been said that beauty is in the eye of the beholder. Many folks enjoy mature forests with big trees...yet other folks find beauty in a young forest vibrant with the songs of early successional forest songbirds, or where they can take their favorite bird dog for an autumn hunt for ruffed grouse. Forest stewardship management addresses these and other various aesthetic tastes, and may weigh in visual goals of the neighbors. When you are weighing aesthetic goals, consider as a "group" 1) visual aesthetics, 2) the aesthetics of a dynamic functioning forest ecosystem, and 3) the particular wildlife species you hope to encourage at your property.

Other Resources

Associated forest resources vary somewhat from forest to forest, but typically include a variety of herbaceous plants present within the woodlands or old fields within a property. Spring, summer, and fall wild flowers provide non-timber benefits to anyone who takes the time to enjoy the blossoms. Along with the flowers, there is a vast array of insect life – pleasant and sometimes unpleasant – that is essential to good ecosystem function. Native

and non-native honey bees and butterflies are examples of beneficial insects. Medicinal shrubs and herbs and maple syrup are more examples of other beneficial forest resources.

Fire

Properties and homes in Ohio are not immune to the risks of fire and fire-related damage. Spring and fall are Ohio's main "fire seasons". A step one may take to protect one's forest is to have a system of paths that may double as fire breaks. For the home site, maintain good access for fire vehicles, create a defensible space around your home and outbuildings by removing flammable materials such brush, leaves, sticks, and twigs; remove these from roofs and gutters too. Landscape around buildings with less flammable plants and materials, avoid evergreens by or near the home, keep an outdoor water source, and avoid outdoor burning. For more information on outdoor fire safety and fire safety around your home, Firewise brochures are available from the Ohio Division of Forestry (toll-free 877-247-8733). You may also contact your local fire department with questions about Firewise and home safety regarding wildfire.

Ohio Fire Laws: ORC 1503.18 regarding kindled fires prohibits outdoor open burning statewide in unincorporated areas during the months of March, April, May, October, and November between the hours of 6:00 am and 6:00 pm. ORC 1503.18 is administered by the Ohio Division of Forestry; call toll-free 877-247-8733 with questions. OAC 3745.19 regarding outdoor burning is administered by the Ohio Environmental Protection Agency (EPA); EPA notification is required for many types of open burns in Ohio. Call 614-644-2270 with questions, or visit www.epa.ohio.gov/dapc/general/openburning.aspx.

Carbon Cycle

When you as a forest landowner choose to maintain your forest land rather than convert it a non-forest use, you are making a significant contribution to the carbon cycle equation; healthy forests generally take in (sequester) more carbon than they release. Forest landowners that hold an interest or focus upon the carbon cycle have opportunities to enhance carbon sequestration on the property by conducting various silvicultural practices that enhance the forest's ability to capture and hold carbon, and by re-establishing woodlands on non-forested land.

Efforts to reduce carbon dioxide emissions have resulted in carbon now being a priced environmental commodity in the global marketplace. Active forest managers may find

opportunities for carbon trading under participation in “ecosystem services” markets. For further information about carbon sequestration and voluntary carbon markets, plus other potential forest ecosystem services, visit the US Forest Service web site at <http://www.fs.fed.us/ecosystems-services/>.

Forestry Terms

Consistent forestry terminology is essential to anyone interested and involved in the science, management, and conservation of forests. The Society of American Foresters (SAF) offers a great resource for such forestry terminology: “The Dictionary of Forestry”. This dictionary is an excellent tool available for anyone to learn more about the language used in forestry. The dictionary provides precision, clarity, and consistency in communication of forestry terms. You may access “The Dictionary of Forestry” for free at SAF at www.dictionaryofforestry.org. If internet access is not available, one may purchase a printed version from SAF (toll free 866-897-8760).



Extension FactSheet

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School of Natural Resources, 2021 Fyffe Rd., Kenny Road, Columbus, OH

Harvesting and Reproduction Methods for Ohio Forests

Randall B. Helligmann
State Forestry Specialist
Ohio State University Extension

Eric R. Norland
State Natural Resources Specialist
Ohio State University Extension

David M. Hix
Associate Professor, Forestry
Ohio State University

Nearly eight million acres of Ohio are forested. These forests provide a variety of benefits including timber, pulpwood, and veneer products; wildlife habitat; a high-quality water supply; recreational experiences; aesthetics; and others.

The mix of benefits and products produced by a particular forest depends on the characteristics of the forest and how it has been managed. Ohio's forests are diverse. They vary in acreage, species composition, age, size structure, and past uses. Ninety-three percent of Ohio's forest land is owned by private individuals or companies, and their goals of ownership and intensity of management vary greatly. Except where strict preservation is the primary ownership objective, the periodic harvest of trees can play an important and often necessary role in accomplishing many ownership objectives.

The theory and practice of controlling the establishment, composition, growth, and quality of forest stands to achieve management objectives is termed silviculture. Various kinds of management practices are used by foresters including timber harvesting, tree planting, prescribed burning, and the use of specific chemicals such as pesticides and fertilizers. Timber harvesting is the most common practice used by land managers to manipulate existing forest stands to meet their objectives.

There are two types of treatments that involve timber harvesting. Intermediate treatments are conducted with the objective of improving the potential of the remaining stand (the residual stand) to meet ownership objectives. If, for example, objectives include the production of high-value timber products, some of the poorer, less desirable trees may be harvested to improve the stand's overall species composition and quality. If, on the other hand, wildlife habitat were an important objective, an intermediate treatment might consist of removing competing trees in the vicinity of good mast-producing trees to allow them to expand their crowns, thereby increasing the amount of mast produced.

In contrast to intermediate treatments, the primary objective of harvesting in a mature stand is to regenerate or reproduce a new forest stand. Depending on the regeneration method used, large or small openings may be created in the stand. If the stand is regenerated using one to three harvests spaced over a short period of time, the new stand will consist of one age class of trees. Such a stand is even-aged. If the stand is regenerated using a series of harvests spaced over many years, the new stand will consist of trees of many age classes. Such a stand is uneven-aged. The remainder of this article discusses regeneration methods commonly used in Ohio.

Choosing a Regeneration/Harvest Method

Selection, clearcutting, and shelterwood (occasionally) are the regeneration methods commonly used in Ohio. All three methods are not equally applicable to every forest. The appropriateness of a particular regeneration method depends on the forest ownership objectives and the characteristics of the forest, particularly its species composition, age structure, and overall quality.

It is essential that ownership objectives be identified before considering whether trees are to be harvested, and if so, by which method. Ownership objectives define the goals of management—the type of forest that will best satisfy the owner's desires. Each regeneration method produces a forest with distinctly different characteristics—different in species composition, age and size structure, appearance, etc. If, for example, grouse habitat was an important management objective, small clearcuts or large group selection openings might be needed to create required habitat. If, on the other hand, periodic income were an important ownership objective for an uneven-aged maple-beech woodland, individual-tree selection or small group selection might be the appropriate method.

From an ecological perspective, the predominant tree species present or desired in a forest is a major factor in the choice of method. Tree species differ in their ability to establish and grow successfully in different environments. Some species, such as sugar maple and beech, will reproduce and grow in almost complete shade under a dense forest canopy. Such species are termed shade-tolerants because of their ability to establish and grow in the shade of larger trees. Other species, such as yellow-poplar and aspen, are shade-intolerants, requiring essentially full sunlight to survive and continue growing. Still other species, including many of the oaks, are intermediate in shade tolerance, establishing and growing in partially shaded conditions. Shade tolerance ratings of a number of common Ohio tree species are presented in Table 1.

The different regeneration methods create distinctly different environments that best fit the environmental requirements of different tree species. Clearcutting will be needed to create the open conditions required for species like yellow-poplar and aspens that require full sunlight. Species that thrive in essentially full shade, like sugar maple and American beech, may be managed utilizing any of the regeneration methods. Other factors such as the stand age structure, economic criteria, or aesthetic considerations will determine the choice. Species with intermediate light requirements, such as white ash or northern red oak, will commonly be managed using group selection, shelterwood, or clearcutting. Again, other considerations will determine the choice among the alternatives.

Uneven-aged forests can be maintained by either single-tree or group selection. Even-aged stands can be maintained with clearcutting or shelterwood, but can only be converted to an uneven-aged structure with some difficulty and perhaps economic loss. Ownership goals partially determine the desirability of such a conversion.

The overall quality of the trees in a forest may also influence the regeneration method chosen. Some ownership objectives, such as the desire for an undisturbed woodland for recreational



Figure 1. A clearcut two years after harvest.

activities, may be satisfied by a forest containing essentially any species of tree in almost any condition. Most ownership objectives, however, will be enhanced by the presence of healthy, vigorous, high-quality trees of particular species that result from properly applying any one of the three main regeneration methods. When a forest consists mostly of less-desirable species or trees of low vigor or poor quality, harvests may need to be prescribed that reduce the amount of less-desirable species, while creating conditions essential for the establishment and growth of more desirable species.

Regeneration Methods

Clearcutting Method

As the name suggests, clearcutting is the removal of all the trees from a forested area at one time, without regard to species, quality, age, or spacing (Figure 1). Clearcutting may be prescribed for a variety of reasons including: (1) to reproduce even-aged stands of intermediate or shade-intolerant tree species; (2)

Table 1. Shade Tolerance Ratings of Some Ohio Tree Species.

INTOLERANT	INTERMEDIATE	TOLERANT
black locust	American elm	American beech
bigtooth aspen	black oak	American basswood
black cherry	baxelder	black gum
black walnut	chestnut oak	eastern hemlock
cottonwood	eastern white pine	flowering dogwood
pin oak	green ash	red maple
red pine	hickories	slippery elm
scarlet oak	northern red oak	sugar maple
sycamore	white ash	
sweet gum	white oak	
yellow poplar		

to create openings and early-successional vegetation for wildlife habitat; (3) to create vistas, campsites, roads, etc.; or (4) to clear the area for tree planting or seeding.

Clearcutting is the most dramatic regeneration method. Some people object to it because temporarily unattractive areas are created. However, the initial visual impact of clearcutting is quickly reduced in Ohio. The rapid establishment and growth of vegetation, including tree seedlings and sprouts, causes the harvested site to take on the appearance of a young forest in a relatively short time. The visual impact of clearcuts can be further lessened by: (1) exercising care in their location; (2) leaving borders of uncut trees as visual buffers where appropriate; (3) planning harvest areas that conform to the natural topography; and (4) designing irregular-shaped areas in a range of sizes, up to some acceptable maximum. Some commonly cited advantages and disadvantages of clearcutting are given in Table 2.

Where necessary to accomplish ownership objectives, clearcutting is an important and valuable regeneration method. As with all harvesting, care must be exercised so that it is properly prescribed and carried out. One form of clearcutting, called commercial clearcutting, is rarely appropriate. In a commercial clearcut, all merchantable trees are cut and removed, while the rest are left standing. Such a cut normally does not create the type of full-sunlight environment desired when a clearcut is prescribed. Further, the trees remaining after a commercial clearcut do not commonly develop into a desirable forest stand. The only situation where a commercial clearcut would commonly be appropriate is where the forest land is being converted to some other land use.

Shelterwood Method

The shelterwood method also produces an even-aged stand, but in contrast to clearcutting, this method commonly consists of a series of two or more partial cuts spaced over several years (Figure 2). The major ecological objective of a shelterwood is to create a partially shaded and protected environment in the understory where young trees can become established and grow. This is particularly beneficial for species that initially do not compete well with other trees and shrubs. Once the desired reproduction is well-established, the remaining larger trees are harvested. One advantage of the shelterwood method is that it produces far less negative visual impact than a clearcut because

the harvested area always is dominated by trees, while the debris (branches, tops, etc.) generated by the harvest is less visible.

Throughout the United States, two- or three-cut shelterwoods have been used to reproduce a variety of coniferous and hardwood species. In a three-cut system, the first cut removes enough of the stand to stimulate the crowns to increase seed production and hastens the decomposition of soil surface organic matter to form a suitable seedbed. Several years later (commonly five to 20), a second cut removes approximately half of the remaining stand to create conditions suitable for the establishment and early growth of young trees. Finally, several years later when adequate regeneration has become established, the remaining trees are harvested. Some care is necessary during the final harvest to minimize damage to the young, even-aged stand that is developing.

Most shelterwoods in Ohio use a two-cut rather than a three-cut system. In a two-cut system, 40-70 percent of the stand (depending on the species) is removed; several years (perhaps five to 20) pass until adequate reproduction is achieved; and then the remaining trees are harvested.

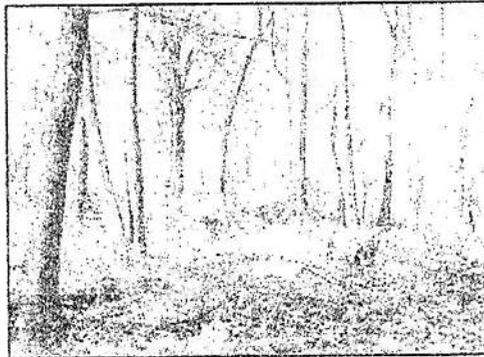


Figure 2. A two-cut shelterwood shortly after the first cut.

Although suitable for most Ohio forest types, the shelterwood method is uncommon for several reasons. First, the short-term planning horizons and brief land tenure of many Ohio forest landowners does not lend itself to a harvesting method that extends over several years. Second, use of the shelterwood method requires a market for the relatively small amounts of lower quality trees that are removed in the first cutting—something that has not been common in Ohio. However, with increasing public concern over widespread use of clearcutting, the shelterwood method may become more common in

situations where it can successfully achieve landowner objectives. Table 2 summarizes some of the commonly cited advantages and disadvantages of the shelterwood cutting method.

Selection Method

Selection is a regeneration method in which individual trees or small groups of trees are periodically (commonly every 10-15 years) harvested based on their size, species, quality, condition, and spacing. Selection is used to create and maintain an uneven-aged stand. As noted previously, selection can only be used to convert an even-aged stand to an uneven-aged with some difficulty, economic loss, and often with a major change in species composition.

Table 2. Advantages and Disadvantages of Forest Regeneration Methods.

CLEARCUTTING

Advantages

- Provides necessary environmental conditions for shade-intolerant species.
- Usually the most economical method.
- Relatively easy to implement.
- Allows site preparation for seeding or planting.
- New species or genetically improved seed or seedlings may be planted.
- May create needed habitat for many wildlife species (e.g., grouse, deer).

Disadvantages

- Usually considered to be aesthetically less desirable.
- Greater risk of soil erosion and stream sedimentation if done improperly.
- Regeneration of some desirable species may be uncertain.
- May lead to invasion of undesirable vegetation.

SHELTERWOOD

Advantages

- Reproduction of desirable species may be more certain than with clearcutting.
- Slash disposal less of a problem than with clearcutting.
- May be more effective with heavy-seeded species such as oaks.
- Less invasion of undesirable vegetation than with clearcutting.
- Opportunity for genetic improvement in the regenerated stand.

Disadvantages

- Requires a market for small and low-quality trees.
- Remaining trees must be wind-firm.
- Requires more technical skills of forester and logger than clearcutting.
- Removal cutting damages some young trees.
- Epicormic branching on trees in final harvest may result in decreased quality.

SELECTION

Advantages

- Maintains continuous forest cover on land.
- Usually perceived as having less visual impact.
- Forest usually less susceptible to wind, insect, and disease damage.
- Reproduction not exposed to heavy competition from herbs and shrubs.
- Shorter harvest intervals mean more frequent income for landowner.
- Easier to alter harvest intervals in response to market conditions.
- Can combine intermediate and regeneration harvests into one treatment.
- Long-term management favors shade-tolerant species.
- Some form of natural reproduction will occur.
- Beneficial to some forms of wildlife.

Disadvantages

- Takes more skill to implement than other regeneration methods.
- More expensive in terms of inventory, marking, and harvesting.
- Trees harvested are variable in size.
- Some damage to residual trees may result.
- Some residual trees may develop epicormic branching.
- Long-term management for intermediate and shade-intolerant species requires group selection.
- May be detrimental to some wildlife species requiring openings and early successional vegetation.

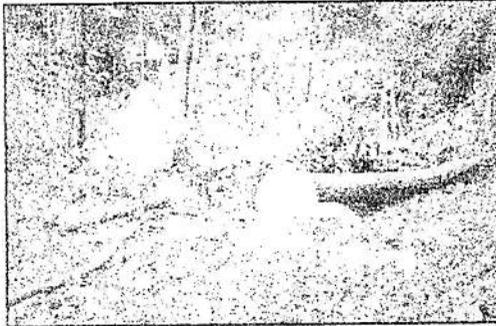


Figure 3. A single tree selection cutting.

When individual trees are selected for harvest (individual-tree selection), they are replaced either by new seedlings or by small trees already present (Figure 3). Individual-tree selection is best suited for shade-tolerant species such as sugar maple and American beech. When small groups of trees are selected for harvest at the same time (group selection), a larger opening is created (Figure 4). Depending on the size of the opening, group selection areas may favor the successful reproduction of intermediate or shade-intolerant tree species.

Aesthetically, selection has the least visual impact of any regeneration method. Periodically, a number of trees are selected for harvest approximately equal in volume to the growth of the stand since the last harvest. The openings created by the removal of individual trees or small groups are small and scattered throughout the forest. The overall integrity and appearance of the forest is only slightly modified, and after a few years much of the residue from the harvest will have decomposed.

Selection can also be economically attractive to many private woodland owners with small acreage. Most uneven-aged forests managed with selection can be economically harvested every 10–15 years. There are many advantages and some disadvantages to the selection method (Table 2).

Two important cautions must be kept in mind when using the selection method. First, extreme care must be exercised in selecting the logging company to perform the harvest. One of the strong advantages of the selection method is that a forest remains after the harvest. It is important that the harvest be carried out by a professional logger with the skills to minimize damage to the trees that remain.

The second caution involves the need to work with a professional forester to determine the need for and extent of a selection harvest. Two all-too-common and undesirable cutting practices occasionally encountered in Ohio are high-grading and diameter-limit cutting. In high-grading, all of the trees with any economic value are removed from the stand. In diameter limit cutting, all

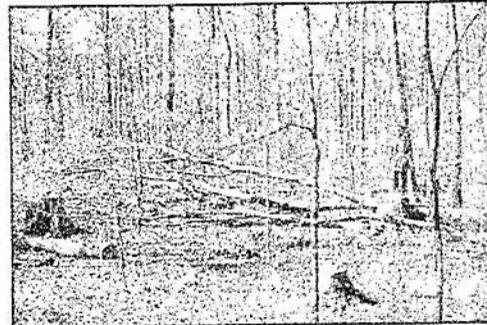


Figure 4. A group selection cutting.

of the trees above a certain diameter, usually specified at stump height, are cut. While both high-grading and diameter-limit cutting are often promoted as acceptable forms of "selective harvesting," both cutting methods as commonly applied ignore the sound ecological principles on which the selection method is based. Both practices will generally leave a forest composed of poor-quality, low-vigor trees with very little value or limited ability to meet most landowner objectives.

An Important Concern

Protecting the soil and water resources is an important concern during forest regeneration activities. The removal of trees typically requires the use of heavy equipment that disturbs the porous organic layer of the forest floor. The mineral soil is then exposed to the erosive forces of raindrops and surface runoff. Soil may move downslope off the area and become sediment in streams, rivers, and lakes. The implementation of best management practices (BMPs) can substantially reduce soil erosion and its negative effects. BMPs include such activities and considerations as the proper location and construction of skid trails and logging roads; preservation of forested buffer strips along streams; diversion of runoff into the forest from roads and trails; and seeding of landings, roads, and trails upon completion of the harvest. Landowners should discuss best management practices with their professional forester and with the logger who will perform the harvest. To promote discussion with the logging operator and to avoid future disagreements, the best management practices to be utilized during the harvest should be specified in the timber sale contract.

Conclusion

Forests can provide many benefits on a sustained basis, and many of these benefits can be created and enhanced by properly harvesting trees. A close working relationship between the

woodland owner, a professionally trained forester, and the logger is critical. Personal assistance in planning for the regeneration of a stand can be obtained from many sources, including

an ODNR Division of Forestry Services Forester, a self-employed consulting forester who will not only plan but also supervise a timber harvest, or a forester employed by a forest products company.

Visit Ohio State University Extension's WWW site "OhioLink" at:
<http://ohiolink.ag.ohio-state.edu>

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TDD No. 800-889-9292 (Ohio only) or 614-292-1366

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Map Unit Legend

Athens County, Ohio (OH009)			
Map Unit Symbol	Map Unit Name	Acres In AOI	Percent of AOI
GsC	Guernsey silt loam, 8 to 15 percent slopes	14.9	30.7%
WeB	Westmore silt loam, 3 to 8 percent slopes	4.1	8.4%
WhD	Westmoreland-Guernsey silt loams, 15 to 25 percent slopes	21.8	44.8%
WbE	Westmoreland-Guernsey silt loams, 25 to 40 percent slopes	7.8	16.1%
Totals for Area of Interest		48.6	100.0%

Forestland Productivity

This table can help forestland owners or managers plan the use of soils for wood crops. It shows the potential productivity of the soils for wood crops.

Potential productivity of merchantable or common trees on a soil is expressed as a site index and as a volume number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forestland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

The volume of wood fiber, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service, National Forestry Manual

Report—Forestland Productivity

Forestland Productivity--Athens County, Ohio				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber Cu ft/ac	
GsC--Guemsey silt loam, 8 to 15 percent slopes				
Guemsey	Northern red oak	78	58.00	Northern red oak, Tuliptree
	Tuliptree	95	99.00	
WeB--Westmore silt loam, 3 to 8 percent slopes				
Westmore	Black walnut	—	—	Black walnut, Eastern white pine, Northern red oak, Red pine, Tuliptree, White ash, White oak
	Northern red oak	68	57.00	
	Tuliptree	91	86.00	
	White ash	—	—	

Forestland Productivity—Athens County, Ohio				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber Cu ft/ac	
WhD—Westmoreland-Guemsey silt loams, 15 to 25 percent slopes				
Westmoreland	Eastern white pine	75	143.00	Eastern white pine, Northern red oak, Red pine, Tuliptree, White ash, White oak
	Northern red oak	81	57.00	
	Tuliptree	90	86.00	
Guemsey	Black cherry	—	—	Eastern white pine, Northern red oak, Red pine, Tuliptree, White ash, White oak
	Black walnut	—	—	
	Northern red oak	78	57.00	
	Sugar maple	—	—	
	Tuliptree	95	100.00	
	White ash	—	—	
	White oak	—	—	
WhE—Westmoreland-Guemsey silt loams, 25 to 40 percent slopes				
Westmoreland	Eastern white pine	75	143.00	Eastern white pine, Northern red oak, Red pine, Tuliptree, White ash, White oak
	Northern red oak	81	57.00	
	Tuliptree	90	86.00	
Guemsey	Black cherry	—	—	Eastern white pine, Northern red oak, Red pine, Tuliptree, White ash, White oak
	Black walnut	—	—	
	Northern red oak	78	57.00	
	Sugar maple	—	—	
	Tuliptree	95	100.00	
	White ash	—	—	
	White oak	—	—	

Data Source Information

Soil Survey Area: Athens County, Ohio
 Survey Area Data: Version 16, Sep 24, 2015

Harvesting & Selling Timber

Selling timber can be one of the biggest financial decisions you make in your life. It's not something to enter into lightly. If you want a successful timber sale, you should:

- 1) Work with a professional forester who is committed first and foremost to serving **YOU**.
- 2) Have your forester—with your input—select, mark, tally, and estimate volume of trees for sale.
- 3) Sell **ONLY** the trees marked for sale by your forester. Don't make any side deals with the logger or timber buyer.
- 4) Advertise your timber sale to as many timber buyers as possible.
- 5) Sell your timber by way of a sealed-bid process. A sealed-bid sale sets timber buyers up in competition with each other, thereby maximizing the amount you receive for your timber.
- 6) Sell timber **ONLY** by way of a written contract presented by **YOU** to the timber buyer.
- 7) Require payment in full before the logging crew arrives on your property.
- 8) Require proof of workers' compensation and liability insurance coverage from the timber buyer and/or logger.
- 9) Visit the area where logging is going on at the outset of the operation and at least twice a week afterwards.
- 10) Require the logger to implement best management practices (BMPs) for water quality and soil conservation during and at the close of the logging operation.
- 11) Follow up timber harvesting with timber stand improvement (TSI) under the direction of a forester. TSI is designed to improve growing conditions for the best, most promising trees in your woods. Cutting to improve your woods is an investment in the future and helps guarantee better returns at the next harvest.
- 12) **BY NO MEANS HIGH-GRADE YOUR WOODS!** High-grading is an all too common practice whereby the best, most valuable timber is cut while leaving trees with little value in the woods. A high-grade cutting goes by many disguises:
 - **A diameter-limit cut**—In a diameter-limit cut, every tree of any value over a certain diameter—usually 12 to 20 inches—is cut. Diameter-limit cutting is a form of high-grading. **DON'T diameter-limit cut your woods.**
 - **Logger's choice**—Allowing a logger or timber buyer his choice of trees to cut usually results in high-grading. **DON'T allow the logger his choice when deciding what trees to cut.**
 - **High-grading by species**—Some species of trees—white oak, red oak, walnut, cherry—are in general more valuable than others. If a forester or logger wants to cut trees of these species while leaving beech, gum, locust, elm, sycamore, and other low value species in your woods, he is looking to high-grade your woods. **DON'T high-grade by species.**
 - **A so-called "select cut" or "select harvest"**—If someone uses the term "select cut" or "select harvest," **BEWARE!** What he wants to "select" for cutting are your best, most valuable trees. **DON'T cut timber by a so-called "select cut."**

- **High-grading by timber quality or value**—As the landowner, one of your objectives should be to improve growing conditions for your best, most promising trees, that is, for your future forest. That means cutting trees that are either: a) mature, or b) in decline, diseased, damaged, stunted, or otherwise defective. **DON'T leave these trees in the woods while cutting your best, most valuable timber.**

DON'T HIGH-GRADE YOUR WOODS!

Herbicides for Controlling Woody Invasive Species

Herbicides effective against most woody invasives include products with the active ingredients triclopyr, imazapyr, dicamba, metsulfuron, picloram, or glyphosate. Of all these chemicals, herbicides in which the active ingredient is glyphosate (examples: Roundup®, Rodeo®, Accord™) may be the easiest to use safely and may have the least effect on non-target species.

For *Ailanthus* control, herbicides with the active ingredient triclopyr are recommended. Basal bark applications in July, August, or September are most effective. Basal bark applications in late February or March may also be effective. Injection treatments should be done in mid-to-late summer. Herbicides with the active ingredients imazapyr, dicamba, metsulfuron, picloram, or glyphosate are sometimes effective for controlling *Ailanthus*. However, some studies have found that glyphosate products were less effective on *Ailanthus* than triclopyr, picloram, or imazapyr. Other studies have found that imazapyr and picloram are more likely than triclopyr or glyphosate to affect non-target trees.

Often the easiest method of controlling woody invasives without harming desirable trees nearby is a basal-bark application of a triclopyr herbicide. One product that is often used in forest stand improvement is Garlon 4. The active ingredient in Garlon 4 is triclopyr in an oil-based formulation that penetrates through the bark at the base of the tree. Garlon 4 is usually sold in rather large quantities, such as 2 ½ gallons or more. It is highly concentrated, and it needs to be mixed with a carrier oil (sold separately) to dilute it to the proper concentration for a particular application. The mixing that is necessary and the expense of the large quantities to buy are disadvantages of Garlon 4. On the other hand, you tend to get more triclopyr for the money, compared to some other triclopyr products, which is an advantage for large infestations.

In many cases, a ready-to-use triclopyr product is a better option. Pathfinder II is an example of a product that comes ready-to-use for basal-bark treatments for invasive species control. No mixing is required. Pathfinder II is usually sold in 2 ½ gallon jugs, but the cost per jug is a lot less than Garlon 4, because the concentration of active ingredient is lower. Other products comparable to Garlon 4 include Element 4, Tahoe 4, Relegate, and generic products Triclopyr 4 and Triclopyr 4EC. Examples of brand name carrier oils include Ax-It, Penevator, and Arborchem Basal Oil. The labels of many basal bark herbicides allow you to use diesel fuel as a carrier oil.

For seedlings and sprouts, many effective products are available in the nursery section of local retail stores. These products are often marketed as “brush killer” or “poison-ivy killer”. Examples of such products include Ortho MAX Poison Ivy Tough Brush Killer, Roundup Concentrate Tough Brush Plus Poison Ivy Killer, and Bayer Advanced Brush Killer Plus. Those products can be diluted in water according to the directions on the label and applied to the leaves and growing tips of seedlings and sprouts. Following up other treatments by spraying the leaves of seedlings and sprouts is a good way to keep invasive weeds from coming back into your woods.

HERBICIDE DISTRIBUTORS LIST

The companies listed below sell herbicides labeled for forestry uses, including products that may be used to control non-native weeds species. This list is provided as information only. Appearance on this list does not constitute an endorsement by the Ohio Department of Natural Resources.

Red River Specialties Greg Ressler 9211 East Jackson Street, Selma, IN 47383 (765) 675-8784 for information (800) 616-4221 to place an order	Noxious Vegetation Control, Inc. P.O. Box 21757 3136 Trabue Rd., Columbus, OH 43221 (614) 486-8994 (800) 669-0018	
	Laurelville Grain & Milling Co. 18769 Main St., Laurelville, OH 43135 740-332-2491	
NaturChem 2518 Plum St., Nashville, TN 37207 615-228-5440 Brent Bertram: 859-230-9921 (cell)	CWC Chemical, Inc. 214 Simmons Drive Cloverdale, VA 24077 540-992-5766 Fax: 540-992-5601	Forestry Suppliers, Inc. 205 West Rankin St. Jackson, MS 39201 (800) 647-5368

- (2025-2026) Cull undesirable hardwoods to reduce competition of more desirable species.

Stand 6b(0.5 acres)

This Stand includes the Buckeye Rural Electric R/W and a small portion of mixed hardwood, early successional species on the northern edge. It is all good wildlife cover but is overgrown with vines and invasives and needs a more active management approach. In 2016 invasives were removed in the area outside of the powerline R/W. This Stand will be managed for wildlife and occasional firewood culling.

Work to be performed for this 10-year plan includes:

- (2017-2018) Continue monitoring and removal of invasives.
- (Periodically) Cull damaged or crowded trees for firewood.

Stand 7(2.6 acres)

This Stand is composed of mixed hardwoods that has had quite a few trees removed for firewood over the past three decades and approximately a dozen White Ash in the 12-24 inch dbh size for log sales over the past two years. This Stand has additional White Ash in the 8-15 inch dbh range for future log or lumber sales or for firewood. This Stand will be managed for Oak and Hickory in the long term. The understory has a number of invasive species that require removal.

Work to be performed for this 10-year plan includes:

- (2017-2018) Remove White Ash for sale or lumber for personal use.
- (2019-2020) Remove invasives.
- (2019-2020) Rebuild fence on the western property line.
- (2024-2025) Cull undesirable hardwoods to reduce competition of more desirable species.
- (2025-2026) Harvest trees for a sale of approximately 3,000 BF (including Stands 2, 4b, and 9).
- (Periodically) Remove vines.

Stand 8a(0.5 acres)

This Stand consists of two small tracts of Pine plantation. The eastern tract is a small 0.09 acre piece of land planted with White Pine to serve as a future visual and noise buffer of adjoining property to the east and south. The western tract is a 0.41 acre piece of land planted to White Pine and Pitchlolly Pine cross species to serve as a visual and noise buffer

of adjoining property to the west. Selected commercial harvest is always an option with these two tracts also. These pines were planted in 2005.

Work to be performed for this 10-year plan includes:

- (Periodically) Thin pines to reduce competition and cull hardwood competition.

Stand 8b(1.5 acres)

This Stand consists of a White Pine plantation established in 2005. It has done quite well with a high survival rate and it is in need of a thinning of approximately 50% of the trees. Lower limbs should also be trimmed to produce a higher grade of timber.

Work to be performed for this 10-year plan includes:

- (2016-2019) Utilizing EQIP, thin pines to reduce competition. Remove hardwood competition.
- (2022-2023) Thin pines further and remove hardwood competition.

Stand 9(9.4 acres)

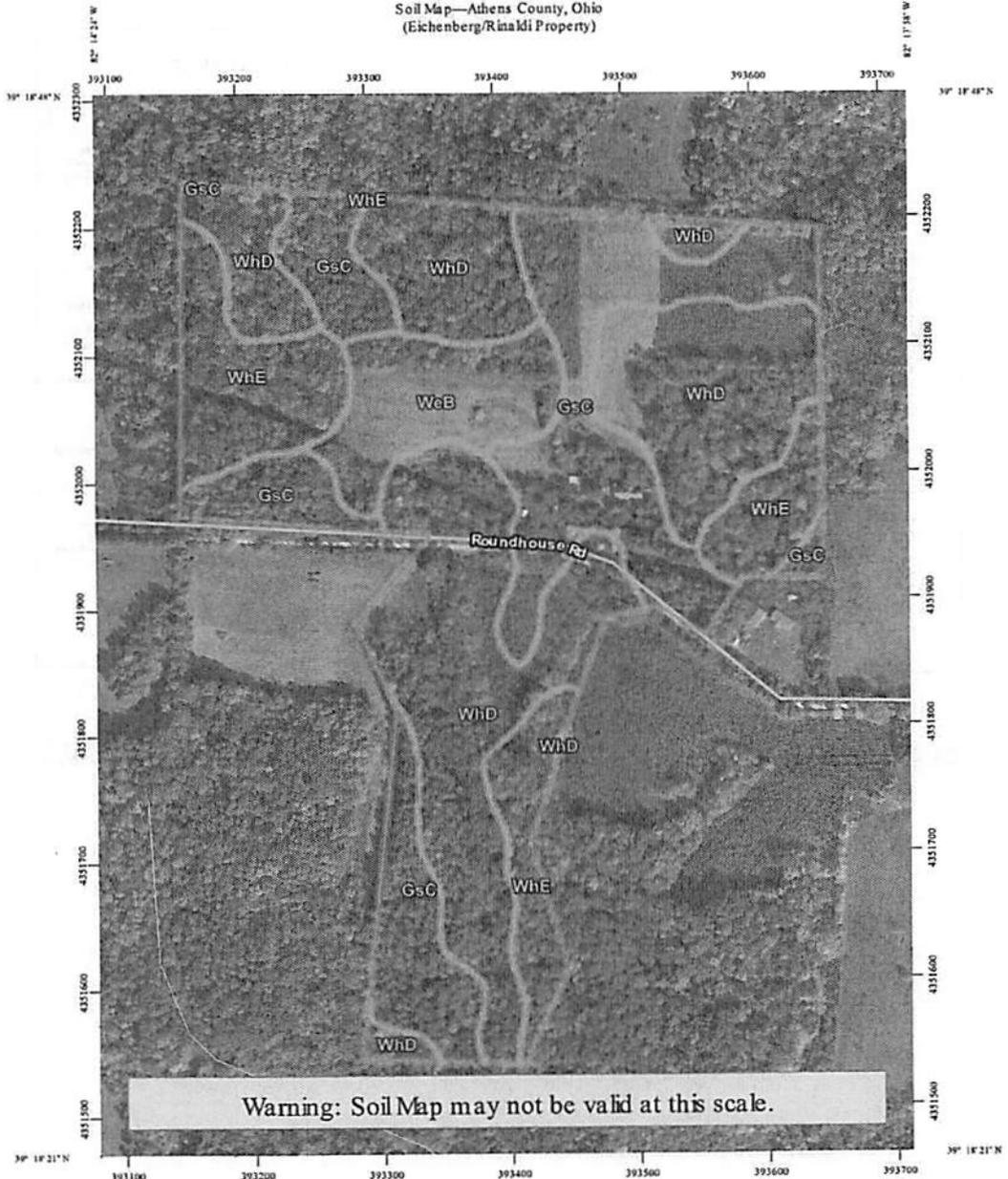
This Stand is composed of mixed hardwoods with a nice diversity of species and is the most mature hardwood tract on the property. It has supplied firewood and fence posts over the past three decades as Black Locust were removed. In 2016, several White Ash were removed for inclusion in a salvage sale. Mature Tulip Poplar near the southern property line appear to be in decline and this is likely a good time for some Poplar harvest. The southwestern property line was marked in 2015 by driving in a number of metal fence stakes. Ailanthus is becoming a problem in this Stand. An old farm dump on the northwest edge just south of Stand 8a was cleaned up in 2014.

Work to be performed for this 10-year plan includes:

- (2016-2017) Remove Ailanthus with herbicides (basal bark method).
- (2017-2018) Cull White Ash and Tulip Poplar for sale.
- (2018-2019) Rebuild fence on southern property edge.
- (2021-2022) Cull undesirable hardwoods to reduce competition of more desirable species.
- (2024-2025) Select and cut trees for a sale of approximately 3,000 BF.
- (Periodically) Remove vines and harvest Black Locust for firewood and posts.

Stand 10(3.8 acres)

Soil Map—Athens County, Ohio
(Eichenberg/Rinaldi Property)



Map Scale: 1:4,070 if printed on A portrait (8.5" x 11") sheet.
 0 50 100 200 300 Meters
 0 150 300 600 900 Feet
 Map projection: Web Mercator Corner coordinates: WCS84 Edge ticks: UTM Zone 17N WCS84

USDA Natural Resources Conservation Service

Web Soil Survey National Cooperative Soil Survey

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Soil Map—Adams County, Ohio
(Eckenberg/Rhoads Property)

MAP LEGEND		MAP INFORMATION	
<p>Area of Interest (AOI)</p> <p>□ Area of Interest (AOI)</p> <p>Soils</p> <p>▭ Soil Map Unit Polygon</p> <p>— Soil Map Unit Line</p> <p>• Soil Map Unit Point</p> <p>Special Point Features</p> <p>○ Bluestem</p> <p>○ Decid. Fh</p> <p>○ Clay Spot</p> <p>○ Closed Depression</p> <p>○ Gravel Pt.</p> <p>○ Gravelly Spot</p> <p>○ Landfill</p> <p>○ Lava Flow</p> <p>○ Marsh or swamp</p> <p>○ Mine or Quarry</p> <p>○ Miscellaneous Water</p> <p>○ Perennial Water</p> <p>○ Rock Outcrop</p> <p>○ Saline Spot</p> <p>○ Sandy Spot</p> <p>○ Severely Eroded Spot</p> <p>○ Sinkhole</p> <p>○ Slide or Slip</p> <p>○ Soils Spot</p>	<p>○ Spoil Area</p> <p>○ Steep Spot</p> <p>○ Very Steep Spot</p> <p>○ Wet Spot</p> <p>○ Other</p> <p>○ Special Line Features</p> <p>Water Features</p> <p>Streams and Canals</p> <p>Transportation</p> <p>— Rail</p> <p>— Interstate Highways</p> <p>— US Routes</p> <p>— Major Roads</p> <p>— Local Roads</p> <p>Background</p> <p>— Aerial Photography</p>	<p>The soil surveys that comprise your AOI were mapped at 1:15,000.</p> <p>Warning: Soil Map may not be valid at this scale.</p> <p>Enlargement of maps beyond the scale of mapping can cause misinterpretation of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.</p> <p>Please rely on the bar scale on each map sheet for map measurements.</p> <p>Source of Map: Natural Resources Conservation Service Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov Coordinate System: Web Mercator (EPSG:3857)</p> <p>Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.</p> <p>This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.</p> <p>Soil Survey Area: Adams County, Ohio Survey Area Date: Version 16, Sep 14, 2015</p> <p>Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.</p> <p>Date(s) aerial images were photographed: Oct 6, 2011—Oct 7, 2011</p> <p>The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.</p>	