Forest Stewardship Management Plan

Current Agricultural Use Value (CAUV)
Athens County, Ohio

Prepared for: **Geoffrey M. & Michelle Greenfield**
16751 Hooper Ridge Road
Millfield, OH 45761
(740) 448-6103

Michelle Greenfield 2-10-12
Signature and date

Note: A current, valid, signed forest stewardship plan approved under the Forest Stewardship Program is required for enrollment in various programs, including the Ohio Forest Tax Law (OFTL) program and the Environmental Quality Incentives Program (EQIP). By signing, you are signifying your intent to implement this plan, to the best of your knowledge and ability, for purposes of the Forest Stewardship Program. **If you are enrolling in the Current Agricultural Use Value (CAUV) program, use the signature page following this one.**

Prepared by: **Terence E. Hanley**
Professional Forestry LLC
P.O. Box 5622
Athens, OH 45701
(740) 592-5152

Terence E. Hanley Jan. 18, 2012
Signature and date

Note: By signing, the forester affirms that he is a professional forester qualified to prepare forest stewardship plans and that this plan meets the requirements of the Forest Stewardship Program. Additionally, the forester affirms that all recommendations made in this plan are sound in terms of land management and forest management, to the best of his knowledge and experience.

Date prepared: **January 17, 2012**

Ohio Division of Forestry Case Record Number: 05-_____

Term: This plan is valid for the period beginning **January 17, 2012** and ending **December 31, 2022**.

Plan Status: This is a new plan, superseding the previous plan prepared by service forester Dave Schatz, dated 12-13-95.

Forest Stewardship Management Plan

Current Agricultural Use Value (CAUV)

Athens County, Ohio

Prepared for: **Geoffrey M. & Michelle Greenfield**
16751 Hooper Ridge Road
Millfield, OH 45761
(740) 448-6103

Signature and date

Note: A current, valid, signed forest stewardship plan approved under the Forest Stewardship Program is required for enrollment in various programs, including the Ohio Forest Tax Law (OFTL) program and the Environmental Quality Incentives Program (EQIP). By signing, you are signifying your intent to implement this plan, to the best of your knowledge and ability, for purposes of the Forest Stewardship Program. **If you are enrolling in the Current Agricultural Use Value (CAUV) program, use the signature page following this one.**

Prepared by: **Terence E. Hanley**
Professional Forestry LLC
P.O. Box 5622
Athens, OH 45701
(740) 592-5152

Signature and date

Note: By signing, the forester affirms that he is a professional forester qualified to prepare forest stewardship plans and that this plan meets the requirements of the Forest Stewardship Program. Additionally, the forester affirms that all recommendations made in this plan are sound in terms of land management and forest management, to the best of his knowledge and experience.

Date prepared: **January 17, 2012**

Ohio Division of Forestry Case Record Number: 05-_____

Term: This plan is valid for the period beginning **January 17, 2012** and ending **December 31, 2022.**

Plan Status: This is a new plan, superseding the previous plan prepared by service forester Dave Schatz, dated _____.

Primary Objective

The Ohio Revised Code (ORC 5713.30), regarding Current Agricultural Use Value (CAUV), defines "land devoted exclusively to agricultural use" to include land "devoted exclusively to . . . the production [,] for a commercial purpose [,] of timber." Landowners enrolling their forestland in CAUV accept commercial production as their goal. For purposes of this plan, "commercial production of timber" is defined as management that promotes the growth, health, and reproduction of commercial timber species and the quality, value, and productivity of the forest.

Statement of Objective

I/We, Geoff and Michelle Greenfield, hereby affirm my/our objective to manage my/our forestland for the production, for a commercial purpose, of timber. For purposes of this plan, commercial timber production is defined as management that promotes the growth, health, and reproduction of commercial species and the quality, value, and productivity of the forest.

I/We understand that this management plan is to guide me/us in meeting that objective and agree to implement the plan to the best of my/our knowledge and ability. I/We understand also that this plan can be altered or amended to conform to changing conditions in the forest or to changes in my/our non-timber related objectives.

2/8/12

Signature and date

Michelle Greenfield 2-8-12

Signature and date

Forest Stewardship Management Plan

Landowner(s)
Geoffrey M. & Michelle Greenfield
16751 Hooper Ridge Road
Millfield, OH 45761
(740) 448-6103
Email: mgreenfield@third-sun.com

Case Record Number: 05-_____

Location
Athens County, Ames Township
Sections 23 & 29, Township 7 North, Range 13 West

Parcel Identification Numbers

In Section 23:	C010010027702	1.39 acres
	C010010027701	4.83 acres
In Section 29:	C010010026100	3.18 acres
	C010010026200	8.63 acres
Total		**18.03 acres**

Watershed
Unnamed stream→Bryson Branch→McDougall Branch→Federal Creek→Hocking River

Area
Total acreage: 18.03 acres
Forest stewardship acreage: 17 acres
Non-forest stewardship acreage for which stewardship recommendations are made: 0 acres
Non-forest acreage: 1.03 acres (home site)

Purpose
This plan has been prepared to qualify the landowner's forestland for the following programs:
- √ Current Agricultural Use Value (CAUV)
- √ Environmental Quality Incentives Program (EQIP)

And to advise the landowner on the management of his/her property, especially on **the process of managing, harvesting, and selling timber.**

Property Coordinates (Coordinates of the home site)
Longitude: 39.438 degrees Latitude: 82.017 degrees

Landowner Goals
1. Continued enrollment in the Current Agricultural Use Value (CAUV) program
2. Forest management, specifically, under CAUV, for the commercial production of timber
3. Personal enjoyment, outdoor recreation, privacy
4. Wildlife habitat

General Description

The Greenfield property is made up of four small parcels that were once part of a larger farm. It is now the location of the Greenfield family home and a nice little patch of woods, part of which was once open and used for farming, and all of which was probably once grazed by livestock. The last timber harvest was a high-grade harvest, which took place in the 1970s by Dave Schatz's estimate. There hasn't been any recent management of the woods. Although there is some good quality timber here, the woods would benefit from management, including:

1. Eradication of ailanthus or tree-of-heaven, and bush honeysuckle.
2. Grapevine control.
3. An improvement harvest.
4. General timber stand improvement (TSI), including crop tree release, thinning, and cull tree removal.

Rare, Threatened, and Endangered Species

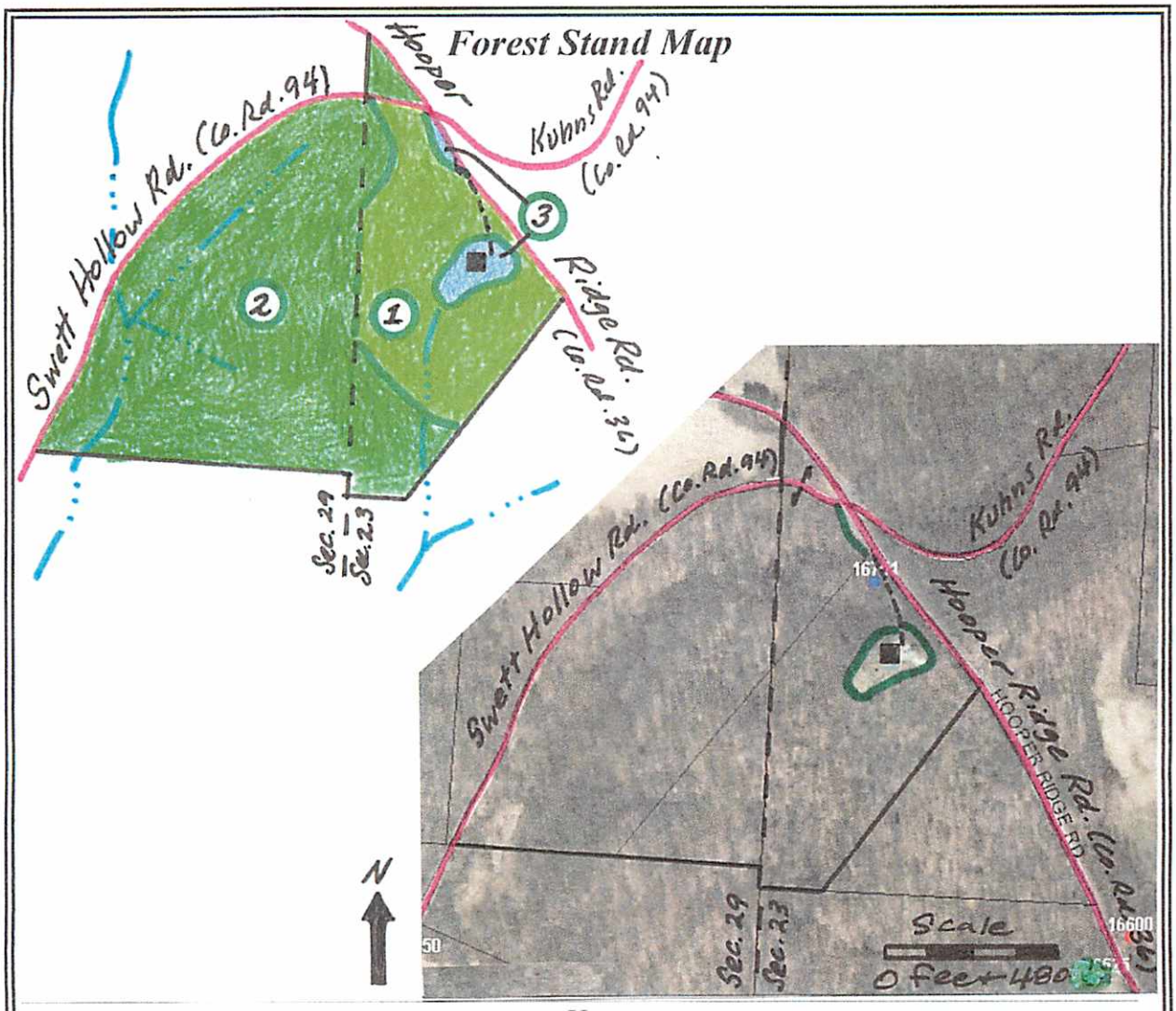
There aren't any known species in this category located on the property.

Cultural, Historical, and Archaeological Resources

There aren't any known resources in this category located on the property.

Soils

Soils on the Greenfield property are Guernsey, Upshur, and Westmoreland series, all of which are typical upland soils in southeastern Ohio. All are suited to a variety of upland hardwoods. As for site conditions: North- and east-facing slopes are cooler, more moist, and more productive than south- and west-facing slopes. You will recognize the poorest and driest sites by the presence of rock at the surface and trees such as chestnut oak and scarlet oak. The best sites in places where soils are deep, moist, and rich, such as in creek bottoms. These sites are likely occupied by trees such as sugar maple, northern red oak, and black walnut, as well as grapevines and spicebush.



Key

- Section, township, or county boundary
- Property boundary
- Public road
- Private road, trail or path
- Utility right-of-way
- Parcel boundary
- Parcel label
- Stand boundary
- Stand number
- Stream
- Lake or pond
- Wetland
- High point
- Ailanthus or tree-of-heaven
- Pine or other conifers
- Buildings
  - Current
  - Former
- Oil/gas well or facility
- Oil tank
- Cemetery
- Other features

Note: Not all features shown in the key are necessarily found on the map. Stand boundaries and stand acreage figures are approximate. This stand map is based on ground checks, aerial photographs, topographic maps, and/or other maps. Map drawn by Terence E. Hanley. Date: Jan. 17, 2012

Forest Stand Map goes here.

Forest Stand Descriptions & Management Recommendations

Stand 1

Area: 6 acres

Forest Type: Early-successional hardwoods

Species: Yellow-poplar, red maple, black cherry, white ash, flowering dogwood, American elm, sugar maple, black oak, white oak, hickory, wild grape, and the following non-native, invasive species: ailanthus or tree-of-heaven and bush honeysuckle

Stand Diameter or Size Class: Saplings, poletimber, vines, and brush

Stocking Level: Well-stocked

Stand History: Stand 1 is growing on the site of an old pasture or hayfield. Year of origin is estimated as between 1966 and 1975.

Topography: Stand 1 is situated on sloping ground. There are deep cuts on lower elevations where erosion from old fields ate into the soil. Conditions have improved since those fields were abandoned.

Forest Health (Insects, disease, non-native invasive species, etc.): Invasive species include ailanthus or tree-of-heaven and bush honeysuckle. Diseases (none of which is serious) include nectria canker on sassafras and Dutch elm disease on elm.

Description: Stand 1 is a well-stocked, even-aged stand of good quality saplings and poletimber growing on the site of old fields. Yellow-poplar and associated species dominate. Grapevines are thick in some places.

Recommendations: In order of importance:

1) **Eradicate ailanthus or tree-of-heaven and bush honeysuckle** by a safe, prudent application of an approved herbicide in accordance with the herbicide label. See the attachment(s) for details.
2) **Cut grapevines growing in crop trees**, including poplar, cherry, oak, hickory, sugar maple, and the best specimens of other species.
3) **Undertake general timber stand improvement (TSI)**, including crop tree release, thinning, and cull tree removal with the advice and assistance of a professional forester.

Comments: None.

Stand 2

Area: 11 acres

Forest Type: Mixed hardwoods, mostly oak-hickory

Species: White oak, chestnut oak, black oak, northern red oak, scarlet oak, shagbark hickory, pignut hickory, mockernut hickory, sugar maple, American beech, yellow-poplar, white ash, black cherry, American elm, black walnut, flowering dogwood, spicebush, wild grape, and the following non-native, invasive species: ailanthus or tree-of-heaven

Stand Diameter or Size Class: Saplings, poletimber, and sawtimber, including some very large and overmature trees, plus vines and brush

Stocking Level: Well-stocked

Stand History: Stand 2 has been wooded for at least 45 years. The last timber harvest, what Dave Schatz called a "selective harvest," was in all likelihood a cutting of high-grade timber such as oak and walnut. There are quite a few large trees in this stand. I would guess their age at 100 to 125 years old. They probably date from when this stand was grazed heavily.

Topography: Stand 2 is situated on sloping to very steep ground, except for in the creek bottom on the west side of the property, which is entirely level. There are outcroppings of rock along the edge of the break between ridgetop and side slope.

Forest Health (Insects, disease, non-native invasive species, etc.): Same as Stand 1.

Description: Stand 2 is a well-stocked, uneven-aged stand of saplings, poletimber, and sawtimber, including some large, over-mature trees and culls. Some places are thick and brushy owing to an open canopy. Timber quality is generally good, but this stand is due for some improvement cutting, first to eradicate non-native species, second to get grapevines under control, and third to harvest timber from trees that are rotten, hollow, damaged, diseased, forked, crooked, twisted, or otherwise poorly formed or seriously defective.

Recommendations: In order of importance:

1) **Eradicate ailanthus or tree-of-heaven and bush honeysuckle by a safe**, prudent application of an approved herbicide in accordance with the herbicide label. See the attachment(s) for details.
2) **Cut grapevines growing in crop trees**, including poplar, cherry, oak, hickory, sugar maple, and the best specimens of other species.
3) **Undertake an improvement harvest with the advice and assistance of a professional forester.** This harvest should be to improve the quality, value, and productivity of the stand by removing the poorest trees and leaving the best trees to continue growing. See the general recommendations below for details on the proper way to conduct a timber harvest and sale.

4) **Follow the timber harvest with timber stand improvement (TSI),** including crop tree release, thinning, and cull tree removal with the advice and assistance of a professional forester.

Comments: None.

Stand 3

Area: 1.03 acres
Forest Type: Non-forest (home site)
Recommendations: Eradicate ailanthus or tree-of-heaven along the driveway.

Schedule of Activities

Year	Stand	Area (Acres)	Activity	Notes
2012-2022	All	18.03	Locate and mark your property boundary lines using paint applied to trees and fence posts along the perimeter with a distance of no more than 66 feet between marks. Maintain your boundary line markings for as long as you own the property.	
2012-2017	1, 2	17	Eradicate ailanthus or tree-of-heaven and bush honeysuckle by a safe, prudent application of an approved herbicide in accordance with the herbicide label. See the attachment(s) for details.	
2012-2022	1, 2	17	Cut grapevines growing in crop trees, including poplar, cherry, oak, hickory, sugar maple, and the best specimens of other species.	
2012-2022	1	6	Undertake general timber stand improvement (TSI), including crop tree release, thinning, and cull tree removal with the advice and assistance of a professional forester.	
2012-2022	2	11	If desired, undertake an improvement harvest with the advice and assistance of a professional forester.	
Following the harvest	2	11	Complete timber stand improvement (TSI)	

General Recommendations for Landowners in Ohio

1. **Eradicate the worst non-native, invasive species, including ailanthus or tree-of-heaven, bush honeysuckle, and kudzu.** Tree-of-heaven (*Ailanthus altissima*) is a non-native and very aggressive tree with no timber value and no wildlife value. Tree-of-heaven is detrimental to native trees and other plants in that it secretes a chemical in the soil that inhibits their growth. It also occupies space that could be used to grow high quality timber. Although tree-of-heaven often grows out of control, it can be eradicated. Bush honeysuckle (*Lonicera* species) is a name given to several species of honeysuckle shrubs. Research is beginning to show that bush honeysuckle can alter soil chemistry and can inhibit the growth of other plants. Kudzu (*Pueraria lobata*) is known as "the vine that ate the south." It is extremely aggressive and can quickly take over an area. Unfortunately, kudzu is becoming more common in the north. Eradicating these species is essential to improving the value, quality, and productivity of your woods.

2. **Control Japanese honeysuckle, multiflora rose, autumn-olive, privet, Japanese barberry, and other non-native invasive plants** wherever you find them, especially if they are interfering with the growth of native plants. Non-native plants may have wildlife benefits (it's why some were brought here from the Old World), but they can be very aggressive and crowd out native plants. Although you may not very easily eradicate them, you should do what you can to control their spread.

3. **Cut grapevines growing in timber-producing or mast-producing trees.** Wild grape is a native plant and good for wildlife. It can be hard on trees, though. Cutting grapevines will help speed the growth and improve the quality of desirable trees, that is, the trees you want to grow to maturity. You can leave grapevines growing on scrub trees such as elm, boxelder, and sassafras. You can also leave Virginia creeper and poison-ivy vines, as they do little if any harm to trees.

4. **Undertake timber stand improvement (TSI)** with the advice and assistance of a professional forester or forestry technician. TSI is designed to favor desirable trees at the expense of undesirable trees. Desirable trees include timber- and mast-producers such as oak, walnut, hickory, sugar maple, yellow-poplar, cherry, and persimmon. Trees to discriminate against might include: a) Trees that are poorly-formed, forked, crooked, twisted, broken, rotten, multi-stemmed, diseased, or otherwise seriously defective; b) Weedy or undesirable species, such as tree-of-heaven, red maple, boxelder, and elm. Be sure to talk to a professional forester before proceeding.

Guidelines for Timber Stand Improvement (TSI)

- **In sapling and poletimber stands** (dominated by trees between 3 and 11 inches in diameter-at-breast-height [dbh]): Thinning, weeding, vine control, and crop tree release. In high-value stands of walnut or white oak, you may also want to prune trees for good form and improved timber value. However, you should keep in mind that pruning pays only in the most valuable stands. Anywhere else, pruning might best be called a hobby.

- **In sawtimber stands** (dominated by trees 12 inches dbh and larger): Cull tree removal, vine control, cutting of firewood, improvement harvesting, intermediate harvesting, or final harvesting.

- **In high-graded or heavily cut over stands**: Cull tree removal, conversion of cut-over areas to group openings or true clearcuts (a group opening is more or less like a miniature clearcut), and coppice cutting of preferred species that have been damaged by logging.

- **In all stands**: Favor crop trees, that is, trees that offer a benefit, provide a service or product, or meet your goals in some other way. In general, a crop tree is straight, tall, well-formed, healthy, vigorous, relatively free of defects, un-branched for at least 10 or 12 feet, and has a large and healthy crown.

5. **Exclude livestock from the woods.** Grazing and timber production are incompatible. Be sure to keep livestock out of your woods.

6. Do your best to **prevent forest fire** by not burning fields, fencerows, trash, etc., during fire season.

7. **Keep your roads and trails open** by mowing or bush-hogging them. Roads and trails offer access to the woods. They also act as firebreaks.

8. **Prevent erosion and runoff on your roads and trails** by implementing best management practices (BMPs). BMPs are described in a booklet called *BMPs for Erosion Control for Logging Practices in Ohio* (Bulletin 916), available online or in print from Ohio State University Extension.

9. **Mark your property boundary lines** using fence posts, fence wire, oil-based paint, and/or signs so as to prevent or discourage trespassing, timber theft, and poaching of game and medicinal or edible herbs.

10. **Provide and manage wildlife habitat** as desired.

11. When the time comes, **harvest timber with the advice and assistance of a professional forester.**

Timber Harvest Checklist

a. Work with a forester who is committed first and foremost to serving **YOU.**

b. Have your forester—with your input—select, mark, tally, and estimate volume and/or tonnage of trees for sale.

c. Sell **ONLY** the trees marked for sale by your forester. Don't make any side deals with the logger or timber buyer.

d. Advertise your timber sale as widely as possible.

e. Sell your timber by way of a sealed-bid process. A sealed-bid sale sets timber buyers up in competition with each other, thereby: 1) relieving you of the burden of determining the value of your timber; and 2) maximizing the amount you receive for your timber.

f. Sell timber **ONLY** by way of a written contract presented by **YOU** to the timber buyer.

g. Require payment in full up front, before any timber is cut.

h. Require proof of workers' compensation and liability insurance coverage from the timber buyer and/or logger.

i. Monitor the timber sale and logging operation by visiting the timber sale area at the beginning of the logging operation and at least twice a week afterwards.

j. Require the logger to implement best management practices (BMPs) for water quality and soil conservation during and at the close of the logging operation.

k. Follow up timber harvesting with timber stand improvement (TSI) with the advice and assistance of a professional 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.

l. **BY NO MEANS HIGH-GRADE YOUR WOODS!** High-grading is an all too common practice whereby the best, most valuable timber is cut and removed while the smallest and poorest timber is left in the woods. High-grading goes by many disguises.

Types of High-Grading
(or, Five Good Ways to Ruin Your Woods)

- **Diameter-limit cutting**—In diameter-limit cutting, every tree of value over a certain diameter—usually 12 to 20 inches—is cut and removed. Diameter-limit cutting is a form of high-grading because it **always** results in the removal of the best and most valuable timber. It also usually results in the removal of all or most of the oak, while red maple, blackgum, and other low-value species are left behind. Don't sell timber by a diameter-limit.

- **Logger's choice**—Allowing a logger or timber buyer his choice of trees to cut usually results in high-grading. The reason is that loggers and timber buyers are motivated by profit, not by the desire to manage your woods. Don't allow the logger or timber buyer his choice of 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 logger or timber buyer wants to cut trees of those species while leaving beech, blackgum, locust, elm, sycamore, etc., he is looking to high-grade your woods. Even some foresters are inclined to high-grade by species, especially when they operate on a percentage of the sale for their fee. 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. The term "select cut" or "select harvest" seems to be used in contrast to a clearcutting, where clearcutting is judged "bad" and "select cutting" is judged "good." There are other ways of cutting, though. You can read about alternatives below. In any case, don't sell timber by a so-called "select harvest."

- **High-grading by timber quality or value**—As the landowner, one of your objectives should be to improve growing conditions for the 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 harvesting your best, most valuable timber.

Alternatives to High-Grading

So what are the alternatives to high-grading? High-grading in all its forms is mismanagement. The alternative to high-grading is to manage your woods well. You can do that by continuing to work with a professional forester. If you decide to harvest timber, whether it's for firewood or sawlogs and whether it's for your own use or for commercial sale, talk to a professional forester first. A forester is a person with the education, experience, credentials, and—perhaps most importantly—the ethics needed to help you manage your woods.

There are many different kinds of managed cutting, but all have the same goal, that is, to improve the value, quality, and productivity of your woods. Remember, as the owner of

forestland under the Current Agricultural Use Value (CAUV) program, you have stated that as your goal as well.

Harvesting Timber

There are two basic approaches to harvesting timber, and each depends on the kind of stand in which you're working:

1. If you're trying to improve the quality, value, and productivity of the future stand (the residual stand, in other words, the stand that remains after you cut), then you're engaged in **intermediate cutting or intermediate harvesting**. It's called intermediate because it takes place at some interval between the time the stand started growing (the year of origin) and the final harvest meant to regenerate the stand. Intermediate harvesting includes: a) harvesting firewood, fenceposts, or other small products; b) improvement harvesting, in which low-value and low-quality timber is cut and sold; and c) commercial thinning, by which trees are removed to improve the spacing between trees that remain. Intermediate harvesting is appropriate in stands that have not yet reached maturity.

2. If you're trying to regenerate or reproduce a new stand from a mature, over-mature, or heavily damaged, diseased, or defective stand, you're engaged in **regeneration harvesting**, which includes four methods. From least to most intensive, these are:

- **Single-tree and group selection**, in which individual trees or groups of trees are cut for purposes of regenerating species that are tolerant of shade or somewhat tolerant of shade. The most tolerant trees include maple, beech, basswood, blackgum, and hemlock. Others that are somewhat tolerant of shade include elm, ash, white oak, and hickory. Contrast this method with a so-called "select cut" or "selective cut" in which a forester, timber buyer, or logger goes after the best and most valuable trees in the woods without having the goal of properly managing your woods. If the openings created by group selection are large enough (one-half to one acre or more), trees that are intolerant of shade, such as cherry, yellow-poplar, walnut, and pine, may also be able to grow and prosper.

- The **shelterwood method**, in which certain larger trees are left in the woods so as to provide shelter for a new generation. In a typical shelterwood, those larger trees are removed in a later harvest.

- The **seed-tree method**, in which fewer large trees, always of preferred species, are left so as to produce the seed necessary to regenerate the stand. The seed-tree method is seldom used in Ohio because our forests are regenerated satisfactorily by other methods.

- **Clearcutting**, in which every tree over 2 to 4 inches in diameter is cut, regardless of species, size, quality, value, or location.

Remember, these methods can be mixed and matched on any given piece of property. It's never all or nothing. The most important thing to remember is that if you manage your woods well and avoid high-grading, your woods will pay you dividends for as long as you own your land. A

forester can help you make decisions and can help you improve the value, quality, and productivity of your woods. Be sure to talk to a forester before selling timber.

As a professional forester, I am available to help you implement your forest management plan. If you have questions or need further advice and assistance, feel free to contact me. Good luck with the management of your property.

Terence E. Hanley
Professional Forestry LLC
P.O. Box 5622
Athens, OH 45701
(740) 592-5152

Forest Stewardship Management Plan
Current Agricultural Use Value (CAUV) Program

Appendix

General Information on Forest Resources

Timber—In almost all cases, timber is the most valuable commodity to come from our forests. Forests in Ohio are capable of producing timber of the highest quality and value, yet we seldom allow our forests to reach their full potential. Abuse, misuse, mismanagement, and practices that can only be considered ruinous have contributed to the degradation of our forests and shortages in high-quality timber. Grazing, burning, and high-grading are among those practices. Management is the best answer to degraded woods. As you go about managing your woods, be sure to consult with professionals in the field of natural resources. Above all, cut to improve your woods, not to degrade them.

Forest Health—In general, the health of trees in the woods is not a serious concern for landowners. Dutch elm disease, butternut canker, and certain other fungal diseases (nectria canker, armillaria root rot, etc.) are common and unavoidable. The best way to deal with diseases is to manage your woods for good health and vigor. Timber stand improvement (TSI) can be used to control competition, eliminate weed species, and reduce the number of trees in poor health.

On the other hand, many insects that attack forest trees are non-native and subject to control by state or federal agencies. The emerald ash borer is one of those. The emerald ash borer is a non-native, invasive insect that attacks only ash trees. This insect can spread naturally from tree to tree, as well as artificially through the movement of ash firewood or seedlings. You can reduce the risk of loss by gradually reducing the ash component in your woods. In your forest management activities, consider removing a larger component of ash than you might otherwise. In southeastern Ohio, ash makes up somewhere around 5 to 7 percent of the trees in the woods. Most landowners have little to worry about even if the emerald ash borer arrives here.

The best thing you can do is to stay informed. Check these websites 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/

Fire—Forestland and personal property in Ohio are not immune to the risks of fire. Although spring and fall are the main fire seasons, wildfires can spread whenever conditions are right. To protect your woods and your property: 1) Maintain good access with a system of roads and trails through your woods; 2) Create a defensible space around your home and outbuildings by removing flammable materials such brush, leaves, sticks, etc., from the ground, roofs, and gutters; 3) Do your landscaping with plants and

landscaping materials unlikely to burn; 4) Maintain an outdoor water source; and 6) Avoid outdoor burning. For more information on outdoor fire safety and fire safety around your home, contact the Ohio Division of Forestry Firewise program, toll-free (877) 247-8733. You can also contact your local fire department with questions about wildfire and burning.

Ohio Fire Laws: The Ohio Revised Code (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. The Ohio Administrative Code (OAC 3745.19) regarding outdoor burning is administered by the Ohio Environmental Protection Agency (EPA). You are required to notify EPA for many types of open burns in Ohio. Call (614) 644-2270 with questions, or visit www.epa.ohio.gov/dapc/general/openburning.aspx for more information.

Wildlife Habitat—Wildlife habitat includes the basic requirements of food, water, and shelter. Forests in Ohio provide these things and more. Food plants include producers of nuts and acorns (called hard mast) and producers of berries and other soft fruits (called soft mast). Hard mast producers include oak, walnut, hickory, beech, and hazelnut. Soft mast producers include dogwood, persimmon, cherry, viburnum, blackberry, raspberry, and greenbrier. In addition, animals feed on leaves, buds, twigs, and other plant parts (called browse). Maintaining diversity in the woods helps to preserve food plants for all.

Water can often be a limiting factor in wildlife populations. The quantity and proximity of water are usually more important than the quality of water. Pools, ponds, seeps, and springs are important sources of water in the woods. Even water trapped in cavities in trees (called spunk water or stump water) can be a good source of water for small animals. In working in your woods, be sure to retain sources of drinking water for animals.

Animals need shelter, or cover, for all their daily and seasonal activities, for dens, nests, roosting sites, and their movements here and there. Cover is available under rocks, logs, and boards; in brush and among dense growth; in den trees and snags; and under varying levels of the forest canopy. Forest management activities can be used to create or maintain cover, even if it's so simple a thing as putting out a nest box or bat box, or building a brush pile.

Water—Clean air, clean water, and prevention of soil erosion are among the non-monetary benefits provided by forestland. Again, healthy, vigorous, well-managed forestland is more likely to provide maximum benefits in this area. Be sure to keep livestock out of streams and out of the woods. Avoid sing vehicles on muddy or eroded roads and trails. Maintain culverts, stream crossings, roads, and trails for maximum erosion control.

According to the Ohio Revised Code (ORC 1501:15-5-12, Erosion from Silvicultural Operations): In order to abate wind or water erosion of the soil and to control pollution of waters of the state, the owner, operator, or person responsible for silvicultural operations shall apply conservation practices and follow an operation and management plan in accordance with the "Field Office Technical Guide" and "BMPs For Erosion Control On Logging Jobs" and may file such plans with the Soil and Water Conservation District in the county where such operations are performed. For more information, contact your SWCD office.

Best Management Practices—Best management practices (BMPs) are a series of measures designed to prevent erosion and runoff and to preserve the high quality of water flowing from forestland. During forest operations, be sure to follow BMPs outlined in the booklet *BMPs for Erosion Control for Logging Practices in Ohio* (Ohio State University Extension Bulletin 916). This booklet is available on line at www.ohiodnr.gov/forestry/ or at your local Division of Forestry or SWCD office.

The use of BMPs to prevent soil loss is a sound agricultural practice that helps maintain the productivity of the soil. Also, implementing BMPs helps you comply with the Agricultural Pollution Abatement Law.

Wetlands—Wetlands are important for water quality, and they provide unique habitat for fish and wildlife. Wetlands retain rain water and runoff and help to reduce erosion, sedimentation, and pollution of our streams and rivers. Ephemeral or seasonal wetlands—also called vernal pools—are typically small, temporary, and free of fish. They are important habitat for amphibians, especially during mating season. Be sure to protect wetlands on your property.

Other Resources—Forest resources vary from property to property, but typically they include edible, medicinal, and decorative plants and plant parts; fruits, nuts, and mushrooms; maple sap; beneficial insects and other invertebrates; and so on. If you're interested in other forest resources, ask for information on special forest products or alternative forest products.

Cultural, Historical, and Archaeological Resources—Cultural, historical, and archaeological resources are non-renewable and, once destroyed, they can never be replaced. Good stewardship of the land includes stewardship of all the land's resources. Be sure to protect these resources.

Recreation—Forestland can be used for many types of outdoor recreation including hunting, hiking, picnicking, outdoor photography, and wildlife viewing. Maintaining your trails will improve access and your opportunities for use of the area. A walk in the forest provides a time of learning but it can also be a time to relax. The forest can also be quiet a place of solitude, contemplation, or spiritual renewal.

Aesthetics—Aesthetics refers to the pleasing visual appearance of the woods. Many aspects of the land contribute to its aesthetic appearance. In your management activities,

be sure to consider the effect of your work on the appearance of the woods. For example, an old rotten beech tree may not produce any timber, but it does offer visual variety and interest. Likewise, dogwood and redbud may shade out other trees, but would you want spring woods without the white and pink flowers of these trees?

Carbon Cycle—When you as a forest landowner choose to maintain your forestland rather than convert to non-forest, you are making a significant contribution to the carbon sequestration equation. A vigorous, healthy forest sequesters—i.e., stores—carbon. Forest landowners interested in the carbon cycle have a unique opportunity to enhance carbon sequestration on their property. Forest management activities such as tree planting and timber stand improvement (TSI) can help in the equation.

Forestry Terms

Diameter

Foresters measure trees in different dimensions, including diameter, height, and volume. **Diameter-at-breast-height** (dbh, measured at 4-1/2 feet above ground level on the uphill side of the tree) is one of the easiest measurements to make. Each tree then falls into a specific diameter class or category:

- **Seedlings**-Trees less than 1 inch dbh and/or less than 4-1/2 feet tall.
- **Saplings**-Trees between 1 and 5 inches dbh.
- **Poles or poletimber**-Trees between 6 and 11 inches dbh.
- **Sawtimber**-Trees 12 or more inches dbh.

These categories are not strict. For example, it's possible to saw a tree as small as 10 inches dbh into boards. However, these categories are good general guidelines.

Volume & Weight

Board-foot-A unit of volume equivalent to a board 12 inches wide by 12 inches long by 1 inch thick. There are different rules for estimating board-foot volume. The **Doyle rule,** used since the 1800s, is the most commonly used rule in Ohio. Though easy to use, the Doyle rule underestimates the volume of small logs. The **International 1/4-inch rule** is a more recent development, and though more complicated, it more closely estimates the volume of standing timber and logs than the Doyle rule. **Sawlogs** and **veneer** logs are usually bought and sold by the board-foot. Volume figures for the Doyle rule and the International 1/4-inch rule, for standing timber and sawlogs, are readily available in standardized volume tables.

Cord-A unit of volume equivalent to a stack of wood 8 feet long by 4 feet wide by 4 feet high, for a total of 128 cubic feet of wood, bark, and air space. Firewood is usually bought and sold by the cord.

Rick-A non-standard measurement made up of pieces of firewood less than 4 feet long. May also be called a **face cord**.

Ton-A unit of weight equal to two thousand pounds. **Pulpwood, chipwood,** and other low-value materials are usually bought and sold by the ton. Pine, regardless of its value or use, may also be bought and sold by the ton.

Age

Even-aged-Describes a **stand** in which all or most of the trees are about the same age. Trees in an even-aged stand may vary by diameter, but trees of the same species, of the same height, and on the same site are also the same age. That fact is one argument against **diameter-limit cutting**. In other words, there isn't a strong relationship between diameter and age. Large trees are not necessarily old and small trees are not necessarily young. Removing larger trees from an even-aged stand usually means that you're removing the best and most vigorous trees. In any case, even-aged stands develop from

tree plantings and **clearcutting**, and often from abandoned fields. Consequently, stands of pine, yellow-poplar, and oak are often even-aged.

Uneven-aged-Describes a stand in which trees are different ages, hence different heights. Maple, beech, and other shade-tolerant species often form uneven-aged stands. Uneven-aged stands often develop in woods that have not been disturbed in a long time, or, conversely, in stands that have been cut over and **high-graded**.

Two-aged-Refers to a stand in which trees are of two ages. Two-aged stands usually develop in woods that were grazed for some time and in which new growth was prevented by livestock. After the livestock are removed, a second age class begins growing. In two-aged stands, the older generation is made up of trees that have an **open-grown** appearance. The younger generation can be made up of a variety of trees, but these trees are usually better in quality because they are **woods-grown**.

Stocking

Every growing site is capable of supporting a certain amount of growth. Best growth occurs when stocking levels are at optimum levels, in other words, when you have a **well-stocked** or **fully-stocked** stand.

Under-stocked sites are under-utilized, that is, they could be used to grow more trees. Planting may be in order in an under-stocked stand.

Over-stocking results in less than optimal growth due to intense competition among trees. Thinning is needed in overstocked stands if they are to grow and produce at optimum levels.

Form & Quality

Crop tree-A tree that you want to grow because it produces or provides you with something you want to meet your goals. For example, if timber is your "crop," then your crop trees would include the best and most valuable timber trees, especially oak, walnut, cherry, poplar, and sugar maple. Likewise, if mast is your "crop," then your crop trees would include trees that produce fruits and nuts, such as oak, hickory, walnut, and persimmon. Crop trees can be released from competition with their less desired neighbors through a practice known as **crop tree release**, one of many practices that fall under the heading of **timber stand improvement (TSI)**.

Cull-A tree with little or no commercial value because of rot, cavities, or other serious defects.

Den Tree-A living tree with one or more cavities in which wild animals can make their homes.

Open-grown or field-grown-Refers to a tree with spreading branches and a short trunk. An open-grown tree is one that has grown in the open with little if any competition from other trees. Sometimes called a "wolf tree," although this term has become outdated.

Snag-A dead tree still standing in the woods. Snags can be a valuable part of wildlife habitat. There isn't any need to cut snags for the sake of living trees.

Wildlife tree-A tree that may have little timber value but considerable wildlife value because it produces mast (such as acorns, nuts, or other fruit) or provides cavities for nests or dens. Oak, hickory, beech, and sugar maple often make good wildlife trees.

Woods-grown-Refers to a tree that has grown in the woods in competition with other trees. Because trees compete mostly for sunlight, woods-grown trees must grow straight and tall in order to beat out the competition.

Management

Coppice-A coppice cut is made by cutting the stem of a tree close to ground level so as to stimulate the sprouting of a new stem from the stump. Usually, a coppice cut is made to a tree of a preferred species but when the stem of the tree is damaged or poorly formed. In other words, a coppice cut is made to replace a low-quality stem with a high-quality stem.

Crop Tree Release-A management practice in which crop trees are released from competition from surrounding trees by cutting those surrounding trees.

Cull Tree Removal-A management practice in which cull trees are removed from the overstory, either by felling them or girdling them.

High-grading-A non-silvicultural practice in which all of the best and most valuable trees are cut and removed from the woods. High-grading is strictly for profit. It is not a management technique. In fact, high-grading is a form of mismanagement and even abuse of the woods. **Diameter-limit cutting** (in which a certain diameter is set and all trees of any value larger than that are cut and removed) and logger's choice (in which the logger chooses the trees he wants to cut) are two of the most common ways the woods are high-graded.

Improvement harvest-A timber harvest designed to remove defective, inferior, and low-value trees from a stand.

Pruning-Refers to the removal of the side branches of a stem to improve its form and quality. Pruning is usually reserved for the highest value trees such as walnut and perhaps white oak. Some landowners also prune white pine. Pruning can also be used to correct the poor form of seedlings and small saplings.

Silviculture-In technical terms, the art and science of tending a forest. More practically, silviculture is made up of all the practices undertaken for the proper management of the woods, from the initial establishment of trees through their final harvest.

Slash-Tree tops, limbs, branches, and other debris left over after a timber harvest. Slash can be: a) cut and removed for firewood, **pulpwood**, or **chipwood**; b) used to construct

brush piles or cover for wildlife; or c) left in the woods and allowed to add organic matter to the soil as it decays. The process of decay can be hurried along by cutting slash so that it lays on the ground.

Stand-An area of vegetation, usually trees, which can be delineated and described based on common characteristics such as age, species, site conditions, or location.

Thinning-A management practice in which **stocking** is reduced to a level more beneficial to the production of timber by cutting trees for the sake of good spacing between them.

Timber stand improvement (TSI)-Timber stand improvement includes a number of practices designed to improve the quality and productivity of the woods and the health, form, and quality of individual trees. TSI practices include **weeding, thinning, crop tree release, grapevine control, pruning,** and **cull tree removal.** TSI is usually a non-commercial activity, that is, the landowner doesn't make any money from the practice. An **improvement harvest** can serve the same purposes, but as the name implies, an improvement harvest is a commercial activity and generates income.

Weeding-A management practice, usually carried out in young stands, in which undesired species are removed.

Raw Materials & Products

Bolt-A short log, usually less than 8 feet long. Barrel staves, tool handles, and other small products are often cut from bolts.

Cant-A log that has been squared up by cutting off the sides. Those sides are called **slabs** and may have value themselves as firewood, chipwood, etc.

Chipwood-Wood that is chipped and used to make oriented strand board (OSB) and similar products. Chipwood is usually bought and sold by the ton.

Log-A length of round wood destined for a sawmill or veneer mill.

Pulpwood-Wood that is pulped and used to make paper and similar products. Pulpwood is usually bought and sold by the ton.

Sawlog-A log large enough and good enough to be sawn into boards. Sawlogs are usually bought and sold by the **board-foot.**

Sawtimber-Standing timber large enough and good enough to be sawn into boards. Sawtimber is usually bought and sold by the board-foot.

Standing timber-Trees that are still growing in the woods. Most timber is sold as standing timber rather than as logs. In this case, standing timber is also called **stumpage.**

Standing timber is usually bought and sold by the board-foot, although it may include pulpwood or chipwood tonnage as well.

Stave log or stave bolt-A log or bolt used to make barrel staves. Usually refers to white oak. Stave logs can be quite valuable.

Veneer-A thin slice of wood glued to cheaper wood and used to improve the appearance of a piece of furniture or other product. Veneer is one of the most valuable forest products. Veneer is cut from a **veneer log**, a log of the highest quality and value. Veneer can be cut from any species assuming the quality of the log is high. However, veneer is often limited to preferred timber species such as walnut, oak, cherry, sugar maple, and yellow-poplar.

THE OHIO STATE UNIVERSITY EXTENSION

FACT SHEET

Agriculture and Natural Resources

F-65-09

Controlling Non-Native Invasive Plants in Ohio Forests: Ailanthus

Kathy Smith, Extension Program Director–Forestry
School of Environment and Natural Resources
The Ohio State University

Annemarie Smith, Invasive Species Forester
Ohio Department of Natural Resources
Division of Forestry

Ailanthus (*Ailanthus altissima*), also known as tree-of-heaven, is a moderate sized (60 to 80 feet in height), deciduous tree first introduced into the United States from Asia in the late 1700s for use as an urban landscape tree and in strip mine reclamation in the Eastern United States. In many ways ailanthus is an ideal invasive—it grows rapidly (sprouts can attain a height of 6 to 12 feet the first year and grow 3 feet or more per year), is a prolific seeder, a persistent stump and root sprouter, and an aggressive competitor that thrives in full sunlight. It also produces an allelopathic compound that suppresses the growth of many native woody and herbaceous species. It will grow in relatively infertile, shallow soils of varying pH, and is highly tolerant of poor air quality.

Identification

Ailanthus trees may be commonly mistaken for black walnut, sumac, or butternut. To correctly identify a tree as ailanthus look for a tree with:

- **Leaves**—pinnately compound, 12 to 36+ inches long, with 11 to 27 leaflets that are green on upper side and grayish green on lower side; leaflets

Figure 1. Ailanthus twig, leaf, bark, and glandular teeth.

long and tapered with lobed bases and smooth edges. Each leaflet has one to several glandular teeth near the base (Figure 1).

- **Twigs**—stout, light chestnut brown, smooth to velvety with large tan bumps (lenticels) and a spongy pith, heart-shaped leaf scars; easily broken.
- **Bark**—pale gray and smooth with vertical streaking that develops into light tan fissures with age.
- **Flowers**—in large terminal clusters (up to 20 inches) of small yellowish green flowers, appearing from April to June. Male and female flowers commonly on separate trees.
- **Fruit**—winged fruit (samara), color ranges from yellow green to reddish brown, containing single seed, born in clusters (panicles) visible from mid to late summer and often persistent until following late winter or spring (Figure 2).

Note: *All parts of ailanthus have a strong offensive odor (particularly the male flowers), often described as smelling like rotting peanuts or cat urine.*

Figure 2. Immature winged fruit.

Control Methods

Methods effective in controlling ailanthus depend on plant size, the size of the infestation, potential non-target impacts, and a landowner's comfort level with those methods. While not always easy to control, ailanthus less than 8 inches in diameter have proven considerably easier to control than larger trees. Small ailanthus trees, perhaps up to ½ inch to 1 inch in diameter, can be controlled by physical means or with foliar herbicides. Larger trees, up to about 8 inches in diameter, can be effectively controlled using basal herbicide application, with the need for occasional follow-up to control sprouting. Trees larger than 8 inches are commonly more difficult to control whether by basal spraying, cut stump herbicide application, or herbicide injections as all of these methods may result in a need for follow-up treatments to control sprouting. Frilling or girdling is not commonly recommended for killing ailanthus, as it almost always results in prolific sprouting. **Whatever method is used, it will be important to monitor treated areas to make sure that 100% control is achieved.** Any trees that survive the initial treatment should be re-treated along with any new sprouts or seedlings that appear. For a more detailed description of the methods covered below see OSU Extension fact sheet *Controlling Undesirable Trees, Shrubs, and Vines*, OSU Extension Forestry Fact Sheet F-45, and *Herbicides Commonly Used for Controlling Undesirable Trees, Shrubs, and Vines in Your Woodland*, F-45 Supplement-06.

Environmental note: Many of the following herbicides are labeled to be mixed with a penetrating basal oil, diesel fuel, or kerosene as their carrier agent. The choice to utilize basal oil (particularly a methylated seed oil) instead of diesel fuel or kerosene will result in a more environmentally friendly practice.

Mechanical Control

Small infestations of small plants can be pulled, dug, cut, or mowed. Because none of these methods remove the entire tree (including roots) they must be repeated until food reserves are exhausted and

the tree dies. Pulling or digging of small plants is most effective if done when the ground is moist. Cutting and mowing is most effective when initiated in early summer when food reserves are at their lowest. Again, the key to any mechanical control is to repeat frequently until the food reserves are exhausted.

Mechanical control is generally not the best choice when dealing with larger trees. Cutting large stems often stimulates the production of hundreds of sprouts. Control methods that follow are more effective in controlling larger plants or larger populations of smaller plants.

Foliar Herbicide

Foliar spraying is a method of control in which a dilute herbicide is sprayed directly on the leaves. Herbicides need to be applied sometime after the plant is in full leaf and before the onset of fall color in order to maximize effectiveness. Generally herbicides are applied to wet the leaves but not to the point of runoff.

Exercise caution when applying foliar herbicide. This method should only be used when the target plants are within easy reach of the sprayer. Spraying directed at taller or otherwise less accessible plants can damage or kill valuable non-target plants through herbicide drift or overspray. Herbicides recommended for foliar spraying of ailanthus in a forest setting are listed in Table 1.

Basal Bark Application of Herbicide

Basal bark applications are commonly used to control small to medium sized ailanthus by spraying the circumference of the lower 12–18 inches of the trunk with an herbicide in an oil carrier. This method is very effective in controlling trees up to

Figure 3. Basal bark application.

Table 1. Herbicides recommended for foliar spraying of ailanthus.

Herbicide	Example Brand Names	Comments[1]
glyphosate	Roundup herbicides, Accord herbicides, and other herbicides containing at least 41% glyphosate	Apply solution of 2% herbicide in water (vol/vol) when leaves are green; add a surfactant if not in herbicide.
	Groundwork Ready to Spray Foam Weed and Grass Killer and others	Ready to use formulations should be at least 1% glyphosate. Follow directions on label.
triclopyr	Garlon 3A, Tahoe 3A	Apply 2% solution (vol/vol) of herbicide in water when leaves are green.*
	Garlon 4, Garlon 4 Ultra, Tahoe 4E, Remedy	Apply 1.5% solution (vol/vol) of herbicide in water.*

*A surfactant at .25% vol/vol rate may be added to the various triclopyr formulations when foliar spraying.

[1]These comments are not intended to be a substitute for the herbicide labels. To ensure the safe and effective use of the herbicides recommended in this publication read the label and MSDS (Material Safety and Data Sheet).

8 inches in diameter; larger trees can be controlled but research and experience is limited in regards to the success rate; therefore, follow-up treatments will be necessary if sprouting occurs.

Current research and experience suggests that basal bark treatments can be applied effectively May through October, and may be most effective in the later part of that window. Herbicides recommended for basal spraying are listed in Table 2. To avoid the unintentional killing of desirable plants when basal spraying, special care should be taken to avoid over-spraying (spraying that does not strike the targeted trunk) or excessive spraying to run-off. Basal bark treatments should only be applied when the trunk is dry.

Cut Stump Herbicide Treatment

Traditionally cut stump treatments have been an effective method for controlling larger ailanthus, though sprouting may occur and require one or more follow-up treatments.

Table 3 contains both water carried and oil carried herbicides for cut stump application. Herbicides carried in water should be applied to the outer ⅓ of the top of the stump within minutes of making the cut. These herbicides have proven to be most effective on ailanthus when applied late May through September.

Oil soluble herbicides should generally be applied to the entire cut surface and sides of the stump. When using an herbicide carried in oil, immediate application is not as crucial as when using an herbicide carried in water. These herbicides have proven to be most effective on ailanthus when applied from late May through November.

Hack & Squirt (herbicide injection)

Hack & squirt (or herbicide injection) involves introducing an herbicide into an ailanthus tree through spaced cuts made around the trunk of the tree with an ax, hatchet, or tree injector. When using an ax or hatchet, small amounts of herbicide

Table 2. Herbicides recommended for basal treatment of ailanthus.

Herbicide	Example Brand Names	Comments[1]
triclopyr	Pathfinder II RTU	Ready to use formulation; do not dilute.
	Garlon 4, Garlon 4 Ultra, Tahoe 4E, Remedy	Apply solution of 20% herbicide in a basal or penetrating oil, diesel, or kerosene.
imazapyr	Stalker, Chopper	Mix 8 to 12 ounces in enough basal oil or diesel fuel to make one gallon.
triclopyr + imazapyr	Garlon 4, + Stalker or equivalent	Mix 15 to 20% Garlon 4 + 3 to 5% Stalker in a basal or penetrating oil, diesel fuel, or kerosene.

Table 3. Herbicides recommended for cut stump treatments of ailanthus.

Herbicide	Example Brand Names	Comments[1]
glyphosate	Roundup Pro, Accord, and others	Apply solution of 60% herbicide in water. Effective at killing juvenile stems that are less than 2 inches in diameter. Not effective against larger stems.
triclopyr	Pathfinder II RTU	Apply full strength, do not dilute.
	Garlon 4, Tahoe 4E, Remedy	Apply solution of 20% herbicide in basal oil, diesel fuel, or kerosene.
imazapyr	Stalker, Chopper	Apply solution of 20% herbicide in basal oil, diesel fuel, or kerosene.
triclopyr + imazapyr	Garlon 4, + Stalker or equivalent	Mix 15 to 20% Garlon 4 + 3 to 5% Stalker in a basal or penetrating oil, diesel fuel, or kerosene.

[1]These comments are not intended to be a substitute for the herbicide labels. To ensure the safe and effective use of the herbicides recommended in this publication read the label and MSDS (Material Safety and Data Sheet).

Figure 4. Cut stump application.

Figure 5. Hatchet used for spaced cuts (hack) with herbicide applied in cut (squirt).

are applied to each cut using a pint or quart spray bottle (such as those available at garden stores). When using an injector, the herbicide is automatically applied to the cut when the cut is made. Several types of injector systems are available including one that utilizes an herbicide shell. The choices between using an ax or hatchet versus an injector, and the type of injector, depend on individual preference, the herbicide to be used, and the size of the job. Because the herbicide is applied to only a small area, this method minimizes the potential for non-target effects through overspray, drift, or runoff. However, non-target species can still be impacted if they are connected to the targeted plant through root grafts. This method can result in extensive sprouting and requires follow-up treatments. Herbicides recommended for hack & squirt or injection systems are listed in Table 4.

Table 4. Herbicides recommended for hack & squirt or injection treatments of ailanthus.

Herbicide	Example Brand Names	Comments[1]
Triclopyr	Garlon 3A, Tahoe 3A	Leave 3 to 4 inches between hack mark centers. Apply 1 ml (0.03 ounces) of undiluted herbicide per hack mark.
Imazapyr	Habitat	**Dilute solution**: Mix 8–12 fl. oz. herbicide with 1 gal. of water. Apply 1 ml of dilute solution per hack mark at 1 inch intervals. **Concentrated solution**: Mix 2 qts. of herbicide with no more than 1 qt. of water. Apply 1 ml of concentrated solution per hack mark at 3 inch intervals.
	Stalker, Arsenal	Mix 8–12 fl. oz. of herbicide with 1 gal. of water. Apply 1 ml of diluted herbicide per hack mark—hack marks are no more than 1 inch between edges.
	Arsenal AC	**Dilute solution**: Mix 6 fl. oz. of herbicide with 1 gal. of water for a dilute solution. Apply 1 ml of solution per hack mark at 1 inch intervals. **Concentrated solution**: Use undiluted product or mix with up to 75% water, by volume. Apply 1 ml of solution per hack mark at 3 inch intervals.

[1]These comments are not intended to be a substitute for the herbicide labels. To ensure the safe and effective use of the herbicides recommended in this publication read the label and MSDS (Material Safety and Data Sheet).

Summary

Label recommendations should be followed to maximize the potential for successful control. **At a minimum, monitor treated ailanthus trees for two years to determine if complete control is achieved.** Trees that resprout or are not completely killed by the first treatment will require a follow-up treatment.

Herbicides, like all pesticides, are approved (labeled) for specific uses by the Environmental Protection Agency. Approved uses and application methods are listed and described on the pesticide's label. The herbicides listed in this fact sheet were appropriately labeled at the time of publication. Because pesticide labeling may change at any time, you should verify that a particular herbicide is still labeled for your intended use. At the time of this writing, copies of most herbicide labels and MSDS could be obtained online at the Crop Data Management System web site **http:// www.cdms.net/ manuf/manuf.asp.** Others are available through the individual manufacturer's web site.

F-45-97

THE OHIO STATE UNIVERSITY EXTENSION

Extension FactSheet

School of Natural Resources, 2021 Coffey Road, Columbus, Ohio 43210

Controlling Undesirable Trees, Shrubs, and Vines in Your Woodland

Randall B. Heiligmann
Associate Professor of Forestry
Extension Specialist, Forestry

Timber stand improvement is the removal or deadening of undesirable vines, shrubs, and trees in a forest stand. It is a major forest management tool to help woodland owners achieve their management objectives. Once ownership objectives are identified, the less desirable trees can be removed to favor the growth of those that better satisfy the owner's objectives (e.g., quality timber, wildlife habitat, etc.). At the same time, woody plants that pose a threat to human health or safety, such as poison ivy, can be eliminated. Several timber stand improvement techniques can also be used to create standing dead trees to provide various types of wildlife habitat such as perches, dens, and foraging trees for animals and birds.

Timber stand improvement can be accomplished by cutting the less desirable woody vegetation or by killing it in place. Undesirable trees with commercial value can be sold, making the timber stand improvement operation an income-generating forest management activity. Some undesirable trees may be used for lumber, firewood or other products. Grapevines might be used for wreaths. In most timber stand improvement operations, however, the undesirable vegetation is of little economic value or use. Although it can be cut and left in the woods, the safest and most efficient way to remove undesirable vegetation is often to kill the trees, shrubs, or vines and leave them standing.

The most effective method for killing standing trees, shrubs, and vines will usually involve the use of an herbicide. For those who prefer not to use pesticides, cutting, frilling, or girdling can be used without herbicides. However, physical methods of deadening standing trees that do not use herbicides are generally less dependable (particularly with hard-to-kill species such as red maple, hickories, and dogwoods) and require longer to be effective than those that incorporate herbicides into the treatment.

Selected Timber Stand Improvement Techniques

The remainder of this fact sheet discusses when and how to use four commonly applied timber stand improvement techniques: frilling or girdling, spaced cuts or injection, basal bark spraying, and cut stump application. Fact Sheet F-45 Supplement-97 presents herbicides commonly used with each method, along with brief recommendations for their use. As noted in in the fact sheet, these recommendations are not complete instructions; they are provided to help you select among the herbicides. It is essential that you read the entire label before using any herbicide. The label contains complete instructions for use, along with other valuable information such as personal and environmental safety considerations and procedures. Many of the labels also list information about the effectiveness of the herbicide in controlling different species of trees, shrubs, and vines. All herbicides are not equally effective in controlling different species.

Herbicides, like all pesticides, are approved (labeled) for specific uses by the Environmental Protection Agency. These approved uses are listed and described on the pesticide's label. The herbicides listed in Tables 1-5 were appropriately labeled at the time of publication (Winter 1997-98). Because pesticide labeling may change at any time, you should verify that a particular herbicide is still labeled for your intended use.

References to Tables 1-5 in the remainder of this fact sheet refer to the tables in Fact Sheet F-45 Supplement-97.

Frilling or Girdling

Girdling and frilling are methods of killing standing trees that may be done with or without an herbicide.

Girdling involves cutting a groove or notch into the trunk of a tree to interrupt the flow of sap between the roots and crown of the tree (Figure 1). The groove must completely encircle the trunk and should penetrate into the wood to a depth of at least 1/2 inch on small trees, and 1 to 1-1/2 inches on larger trees. Girdling can be done with an ax, hatchet, or chain saw. When done with an ax or hatchet, the girdle is made by striking from above and below along a line around the trunk so that a notch of wood and bark is removed. The width of the notch varies with the size of the tree. Effective girdles may be as narrow as 1 or 2 inches on small-diameter trees, and as wide as 6 or 8 inches on very large-diameter trees. When a chain saw is used to girdle, two horizontal cuts between 2 and 4 vertical inches apart are usually made completely around the tree when no herbicide is used (Figure 2) and one horizontal cut is made completely around the tree when herbicide is used (Figure 4).

Figure 1

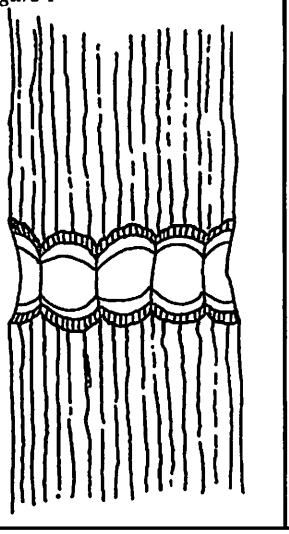
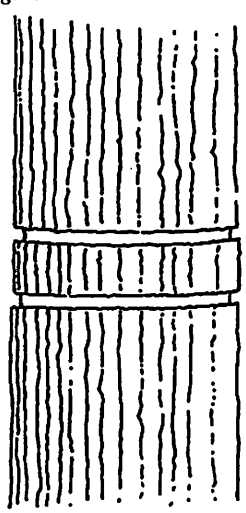


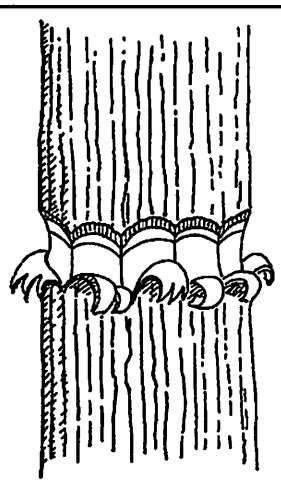
Figure 2



Frilling is a variation of girdling in which a series of downward angled cuts are made completely around the tree, leaving the partially severed bark and wood anchored at the bottom (Figure 3). Frilling is done with an ax or hatchet.

By themselves, girdling and frilling are physical methods to deaden trees that require very little equipment and may be done without herbicides. Both techniques require considerable time to carry out, particularly with an ax or hatchet. Girdling with a chain saw is much faster. The effectiveness of girdling and frilling depends on the tree species and on the size and completeness of the girdle or frill. To be effective, girdles and frills must completely encircle the tree. Because frills can heal-over more easily, girdling is usually more effective.

Figure 3

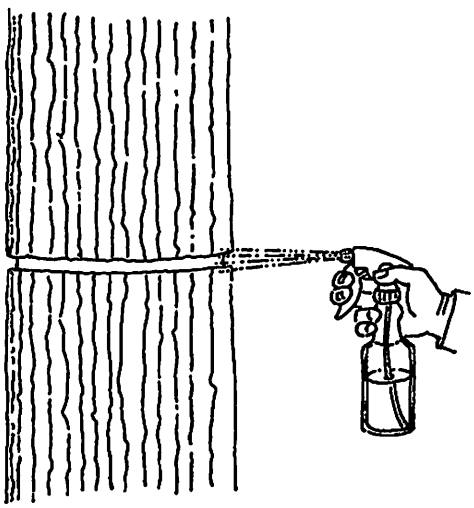


The effectiveness of both girdling and frilling can be increased by using herbicides (Table 1). With frilling and girdling, water soluble forms of herbicides are most commonly used to get maximum movement of herbicide within the plant. When using water-soluble herbicides, the herbicide/water mixture is commonly applied by squirting it on the girdle or frill until the cut surface is wet. Hand-held, pint or quart spray bottles, such as those available at local garden stores, are ideal for applying herbicide to the girdle (Figure 4). Again, note that a single, rather than double chain saw girdle is used when a water soluble herbicide is to be applied (Figure 4).

Exceptions to the above recommendation of using a water soluble herbicide for gridling and frillling are the commonly-used forestry herbicides that contain the ester formulation of 2,4-D + 2,4-DP, such as Patron 170 and Super Brush Killer. They are labeled for use with frilling in an oil carrier, and the recommendation is to fill the frill with the mixture. They are commonly applied with a backpack or hand-held, hand-pumped sprayer.

Spaced Cuts - Tree Injection

Figure 4



Tree injection involves introducing an herbicide into the undesirable tree through spaced cuts made around the trunk of the tree with an ax, hatchet, or tree injector (Figure 5). The procedure can be visualized as a discontinuous frill with a small amount of herbicide placed in each cut. With an ax or hatchet, non-overlapping horizontal cuts penetrating into the sapwood (the outer area of lighter-colored wood in the stem cross section) are made completely around the tree. Cuts are approximately 2 inches long and are spaced with their edges 1 to 3 inches apart, depending on tree species and specific herbicide being used. A small amount of herbicide is then placed in each cut (Table 2). This can be done conveniently with a pint or quart spray bottle (such as those available at garden stores). The amount of herbicide to be placed in the cut is specified on the herbicide label, but is generally 1 to 2 milliliters. There are also various tree injectors available including the "hypo-hatchet," which is a hatchet with a reservoir constructed to inject herbicide when it is struck into the tree.

Tree injection is generally more effective than mechanical girdling or frilling without herbicide because of the use of the herbicide. However, on difficult-to-control species, such as red maple, hickories and dogwoods, a continuous frill or girdle with herbicide may be necessary to obtain acceptable control. For this reason, many commercial TSI (timber stand improvement) contractors routinely use a single chain saw girdle with herbicide on all species to maximize effectiveness.

As with most of the herbicides suggested for use with girdling and frilling, the herbicides for tree injection are mostly water-soluble materials that move vertically and horizontally within the tree to complete a chemical girdle.

Figure 5

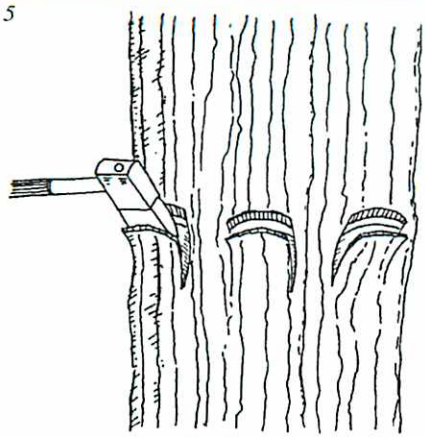
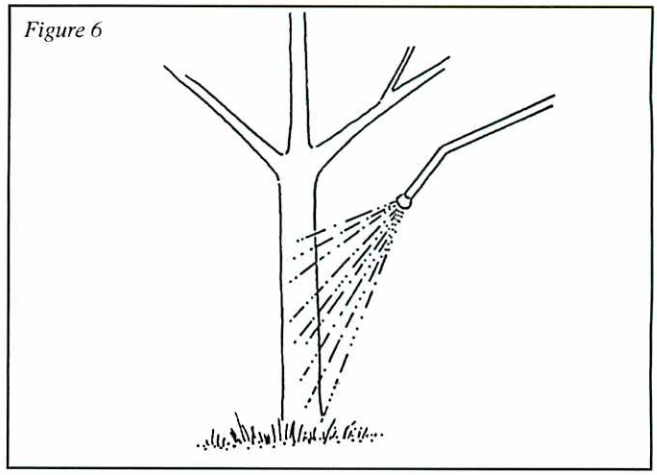


Figure 6



Basal Bark Spray

Basal spraying, or basal bark as it is sometimes referred to, is a technique to deaden small trees, shrubs, and occasionally vines by spraying the lower 12 to 18 inches of the trunk with an herbicide (Figure 6). The intent is for the herbicide to penetrate the bark and kill the tree and any basal buds that might sprout. Herbicides used for basal spraying are generally applied in oil carriers (Table 3). The technique is effective on trees less than 4 to 6 inches in diameter. As bark becomes rougher and thicker, the techniques becomes less effective. Care must be taken when the herbicide is applied to minimize the amount that runs into the soil. This is important not only from an environmental quality standpoint, but also to avoid damaging nontarget trees. The roots of trees often extend well out beyond their crowns. It would not be at all unusual for the roots of an adjacent desirable tree to extend below the trunk of a tree being basal sprayed. If excess amounts of herbicide were applied to the treated tree, the adjacent desirable tree could absorb the herbicide and be killed or seriously damaged.

Cut Stump

When a tree or vine is cut, there is a high probability that the stump will sprout. When this is undesirable, the sprouting can be eliminated by treating the cut stump with an herbicide. Herbicide can be applied to the stump in many ways, the most common being to spray with a backpack or hand-held sprayer.

How much of the stump needs to be treated depends on the formulation of herbicide used. Many of the herbicides labeled for cut stump application are water soluble (Table 4). With these materials it is not necessary to treat the entire stump. The critical area of the stump that must be treated to prevent sprouting is the sapwood and bark of the stump's cut surface (Figure 7). Stump treatment with water soluble herbicides must be done immediately after cutting the tree or vine in order to be effective. If treatment is delayed, adequate downward movement of the herbicide will not occur and sprouting will not be eliminated.

Some herbicides labeled for cut stump application are formulated to be mixed with oil (Table 5). These materials do not move readily within the plant, but penetrate the bark. To be effective in suppressing stump sprouting, the entire stump, particularly the bark and exposed roots, must be thoroughly sprayed (Figure 8). Timing is less critical with these materials because they are not so dependent on movement downward from the cut surface to distribute the herbicide. In situations where immediate treatment of stumps is not possible, an herbicide in an oil carrier should be used rather than one in a water carrier.

Treatment with an oil-carried herbicide is also recommended in the spring when treating species that exhibit a spring "sap flow," such as the maples (*Acer*), grape (*Vitis*) and ironwood (*Ostrya*). Water-carried herbicides will usually not be adequately absorbed to be effective during the spring "sap-flow."

Figure 7

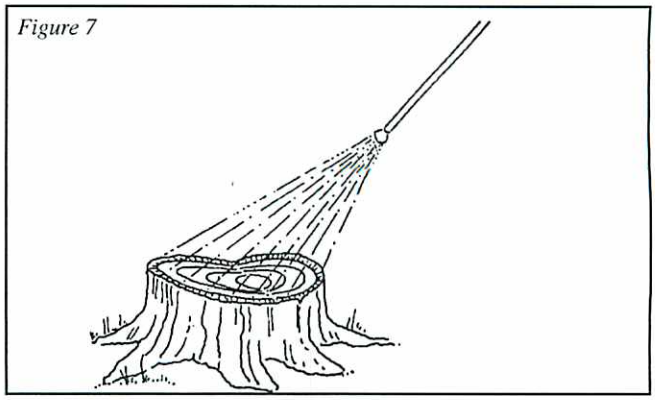
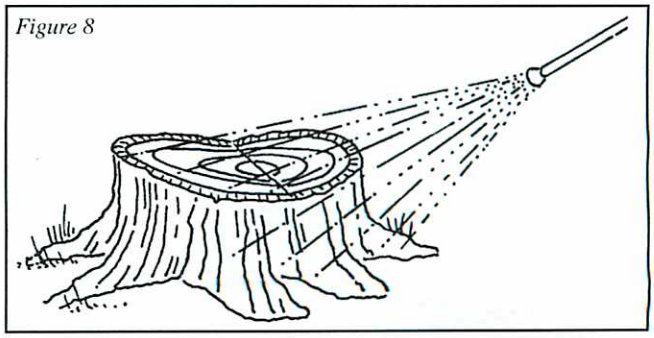


Figure 8



Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Keith L. Smith, Director, Ohio State University Extension.

1/98-des