Penn State Natural Resources Extension

Forest Vegetation Management



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Integrated Vegetation Management (IVM)

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1. Introduction

As a forest landowner or manager, there is a need for increased understanding of the impacts created by competing and invasive vegetation in our woodlots. Competing and invasive forest vegetation impact regeneration success, proper timber stand development, and native plant and wildlife species diversity. Competing and invasive plants are referred to as "interfering" plants. Interfering plants limit future forest species diversity and thus future timber value (Stout & Finley, 2001). Interfering plants do this primarily by casting dense shade on the forest floor as well as competing for sunlight, water, nutrients, and space that would be available for more desirable species.

Many factors contribute to the development of interfering vegetation in our forests. These factors include: shady understory conditions, preferential browsing by white-tailed deer, poorly planned and executed timber harvesting practices, and increasing invasive

plant species abundance. Most species of interfering plants can thrive in shady understory conditions beneath mature forest canopies. Deer, by selectively browsing preferred species, have the ability to shift forest understories to less preferred plant species. This includes many of our interfering plant species; hayscented fern, striped maple, beech, ironwood, mountain laurel, blueberry, spicebush and some invasive exotic plants. Poorly planned and executed timber harvests, known as "high grading," leave behind trees with low commercial value. This practice has resulted in a shift towards less desirable and poorer quality tree species in our woodlots. Lastly, the increasing abundance of invasive plants is directly influencing the ability of forests to retain native plant and wildlife diversity.

To sustain viable and healthy forest ecosystems it is necessary to consider vegetation management practices. Successful vegetation management uses a systematic approach called Integrated Pest Management (IPM), or in this case Integrated *Vegetation* Management (IVM). Consider IVM a subset of IPM. Pest management techniques generally include cultural, manual/mechanical, biological, and chemical. Conceptually, IVM is a pyramid, with cultural practices at the bottom and chemical at the top. As you move up the pyramid control practices become more complex and generally more costly. When choosing control practices always start with the simplest method and move, as necessary, to more complicated interventions.

IVM uses a four phase approach to control interfering plants. First, scout the property identifying and identify the pest plants that are present. This information helps to define threshold levels of plant abundance for initiating intervention when necessary. Management thresholds will differ depending on what plant species you encounter as well as your objectives. For example, do you wish to prevent the plant's spread or completely eliminate it from the property as might be the case for certain exotic invasive plant species. Next, begin pest plant control measures. Use as many IVM practices as practical in concert with each other. These will include cultural, manual/mechanical, biological, and chemical practices. Lastly, evaluate the results. Keep accurate records and modify the pest management program as needed.

Integrated Vegetation Management Principles

1. Whether to control a plant depends upon species, abundance, stage of stand development, and landowner objectives.
2. Preserving desirable plants is very important. They provide a service by occupying space that might otherwise support interfering plants.
3. Interfering plants are a form of "pollution." Particularly, if they are non-native and invasive.
4. A responsible forest landowner/manager keeps interfering plants under control and from spreading onto adjacent properties.

(Principles revised from A. Gover, *Implementing Integrated Vegetation Management on Pennsylvania's Roadsides,* Penn State Roadside Vegetation Management Project, 2000. http://vm.cas.psu.edu/)

2. Cultural Control



Cultural control practices enhance the growth of desirable plants and make the environment unsuitable for interfering plants. Cultural control strives to prevent an interfering plant problem by maintaining a healthy mix of desirable tree species. Maintaining a vigorous and healthy forest helps reduce infestations. Understand that cultural control practices alone may not be enough to prevent interfering plants from establishing.

Cultural Control Practices



The following is a list of cultural control practices used in forests to suppress and/or prevent interfering plant establishment.

- Implement proper timber harvesting practices.
  - Utilize regeneration methods that create light conditions appropriate for chosen species.
  - Thin overstocked stands, favoring desirable tree species with healthy crowns.
- Use specific preventative measures during planting projects.
  - Select and plant only native species adapted to the site conditions.
  - When seeding roads and landing locations insist on certified weed-free seeds.
  - If bringing in topsoil, nursery plant soil, and mulches check the source for weed seeds and root stock.

- Prevent over-browsing by reducing and maintaining white-tailed deer populations at levels appropriate for available habitat.
- Clean all logging equipment and other vehicles of soil and vegetative material before entering property.
- Keep land disturbance activities to a minimum.
- Revegetate bare soil areas as soon as possible.
- Monitor property frequently and eradicate small infestations before they become major problems.
- Communicate with neighbors, educating them about the importance of learning how to identify and control interfering plants.

3. Manual / Mechanical Control

This control approach involves hand or machine removal of interfering plants. Mechanical control practices generally involve cutting the target plant. Manual control involves physically pulling plants. Hand pulling is practical for small isolated infestations and individual plants. Pulling works best on annuals and biennials that will not resprout from root fragments. Hand pulling is not practical for large infestations of perennial weeds and shrubs with extensive root systems which can resprout.

To remove all or most of the root system pull plants when soil moisture is high. This helps prevent resprouting from root fragments. Also, to prevent further spread, pull plants before seeds mature. Keep soil disturbance to a minimum so that other plants do not invade the site.

To control interfering plants, mechanical removal uses tools or machinery. Many weeding tools are available. Mechanical control also involves using loppers and power equipment to cut interfering plants. For larger infestations specialized brush mowing equipment is available. Cutting interfering plants removes their competitive height advantage. When done repeatedly and often, cutting can deplete stored root reserves eventually starving the plant. Cutting at the proper time of year can also prevent seed production. In many instances, cutting or mowing alone is ineffective as many plants respond by producing large numbers of vigorous sprouts. However, mowing may be the only way to start controlling dense infestations of multiple woody interfering plants.

Manual/Mechanical Control Practices

The following is a list of manual/mechanical practices used in the forest for controlling interfering plants.

- Hand pull or dig individual plants and small infestations when first discovered. For complete root removal pull plants when soil moisture is high.
    - Pull trees and shrubs using a Weed Wrench (http://www.weedwrench.com). This tool uses a lever action to pull roots from the soil.
- Periodically cut woody interfering plants using loppers, power saws, and/or weed whackers. To reduce root reserves and remove the competitive advantage make first cutting in early summer immediately following full leaf out.
- Regular mowing of fields and meadows can prevent interfering plants from invading and becoming established.
    - Repeated mowing throughout the growing season for several years may eventually deplete plant nutrient reserves.
- Tilling and discing a site can help to remove weeds from the soil by slicing roots and burying seeds. Late fall tilling can kill roots by exposing them to winter frosts. A word of caution: cultivation, unless done periodically, may provide a seed bed for new invasions and can spread infestations by transporting root segments on equipment.

4. Biological Control

This type of control involves one type of organism preying on another. The most common approach is to identify and release insects or diseases known to affect the specified interfering plant. Biological control measures reduce interfering plant populations to manageable levels rather than eradicating them completely. After the initial biological control agent introduction it may take years before their populations are present in large enough numbers to control targeted plants. Biological controls can provide long-term, inexpensive solutions to many interfering plant problems. However, few biological control measures are known for interfering plants.

To find appropriate biological controls researchers search a plant's native range to identify pests that limit its spread. The key to successful biocontrol is finding the insect or disease that will thrive after introduction, controlling only the targeted interfering plant species. The U.S. Department of Agriculture's Animal and Plant Health Inspection

Service (APHIS) (http://www.aphis.usda.gov/index.shtml) is responsible for controlling introductions of species brought into the United States for biological control of plants.

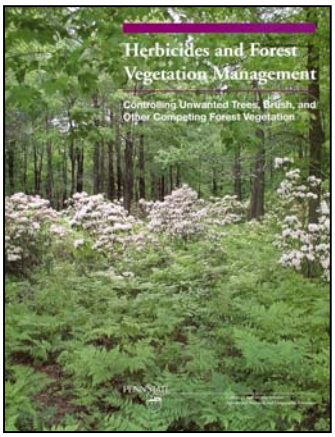
Grazing by domestic livestock and white-tailed deer is a form of biological control. Livestock and deer grazing on palatable interfering vegetation can control some species. This form of control rarely results in eradication. Most livestock species are preferential grazers. This means they select the most palatable species first. Deer in particular will tend to browse the most desired tree species from a woodlot and can actually shift species composition towards less desirable interfering plants. Using goats to control interfering plant species in woodlots has met with some success. Cornell University and Penn State cooperated on several studies using "Goats in the Woods." (http://www.dnr.cornell.edu/ext/goatsinthewoods/) The studies showed how to manage herd stocking levels; how to assess success potential; and how to sustain forest and herd health.

5. Chemical Control

This control method involves using pesticides. Pesticides specific for plant control are called herbicides. Today's herbicides are a safe and effective method for controlling interfering plants. In forest management, herbicides reduce competition between undesirable vegetation and valuable crop trees as well as aid in regeneration establishment, enhance wildlife habitat, control non-native plants, and facilitate road maintenance. Herbicide applications are a part of any IVM program.

No single herbicide, rate, or application method works for all vegetation management needs. Each situation requires advanced assessment to ensure that the safest, most efficient, and cost-effective chemical control program is chosen. Soil type, plant species, density, and size all affect the herbicide prescription. Additional factors such as time of year, and weather conditions are important because they affect plant growth, herbicide uptake, and translocation.

For treating large extensive areas broadcast treatments using helicopters or tractor mounted equipment may be necessary. These treatments are generally done as non-selective applications. However, herbicide application methods are also available to selectively target individual stems with little or no impact to non-target plants. With selective applications, the herbicide is applied directly to the target plants. These methods include directed foliar sprays, cut surface, and basal bark applications. For detailed herbicide application methods consult the Penn State Cooperative Extension Herbicides and Forest Vegetation Management publication. (http://pubs.cas.psu.edu/freepubs/pdfs/UH174.pdf)



Herbicide Treatment Guidelines

Many interfering plants are perennials, with extensive root systems. Herbicide treatments often offer the best means of eradication because they can control root systems without baring the soil to erosion or reinvasion. For effective herbicide treatments follow these guidelines:

1. Use the herbicide that is most effective at controlling the target species.
2. Use the herbicide at the lowest labeled rate that will give optimum control.
3. Follow prescribed application methods on label.
4. Apply herbicide at optimum time of year.
5. Follow all label precautions.
6. Be patient, allow time for the herbicide to work. Results may not be evident until the following growing season.

(Revised from J. Miller, *Nonative Invasive Plants of Southern Forests: A Field Guide for Identification and Control,* U.S. Forest Service Southern Research Station, 2003. http://www.invasive.org/eastern/srs/)