

Invasive Species Management Program



Invasive species management programs help minimize the harm of invasive species on natural lands and encourage the health of native plants and wildlife.

Introduction 1

Program Goals 1

Ecological Impact 1

Resource Management Issues 2

Resource Management Methods 3

Resource Management Equipment 4

Implementation 4

Prioritization 5

Noxious Weed Law 5

Disclaimer 5

Resources 5

Publications: 5

Websites 7

Resources at ConservationTools.org 8

Introduction

Invasive species can harm the values for which land is conserved. Natural lands are not fully protected unless they also are managed for the features that first motivated preservation. Invasive species can change community structure, composition, and ecosystem processes on these lands in ways that may not be anticipated or desirable. Careful management can minimize these negative impacts.

This guide is designed to assist landowners and land managers, including municipalities, land trusts, homeowner's associations and watershed organizations, to develop and implement a management program for controlling invasive species.

Natural Lands Trust (NLT) developed the program described in this guide. NLT's methodology focuses on plants, but a similar approach can be used for other pest species. The techniques employed adhere to the principles of Integrated Vegetation Management (IVM). IVM practices reduce the need for pesticides, promote healthy ecosystems, and provide measurable results, such as greater natural species diversity and

better control of invasive species. Management options for IVM may include biological, chemical, cultural, manual, and mechanical techniques, as well as controlled burning.

Program Goals

As stewards of over 20,000 acres of lands protected from development and to set a region-wide example of ecologically sound management of natural areas, the Natural Lands Trust engages in the control of invasive plants on its preserves. Lands protected from development are not truly conserved if diverse natural communities degrade over time as a result of invasion of a relatively small number of aggressive species.

The goals of the NLT invasive species management species are to:

- reduce the impact of invasive plants on preserves,
- help other landowners manage invasive plants on their lands, and
- educate the public about this environmental problem.

To accomplish these goals, NLT land managers engage a variety of techniques to control invasive species and to manipulate habitat (such as minimizing disturbance and reducing "edge") to favor native non-invasive species. NLT is working to catalog invasive species present on its preserves and in the region, prioritize the problem species, study and standardize the best control methods, and share our experience with the public. Invasives and their management have close relationships with other NLT program areas including deer, hazard tree, and prescribed fire management.

Ecological Impact

One of the most serious problems NLT and others face in the management of open space is the presence of invasive species. Vines climbing trees and exotic shrubs

that choke abandoned fields have the ability to displace native vegetation, halt the natural process of succession from field to forest, and homogenize the structural and food resources of a site, thereby reducing its habitat value for native fauna. Many, but not all, of the invasive species were introduced by humans from other regions of the world. After habitat loss, invasive plants and animals represent the greatest threat to endangered species.

One or more of the following characteristics may be exhibited by invasive plants—but none is necessary for invasion:

- fast seed germination
- high population growth,
- early reproductive maturity,
- reproduction vegetatively as well as sexually,
- generalized pollination,
- wide tolerance to many habitat types,
- adaptation to disturbance,
- high rate of biomass accumulation,
- long-range seed dispersal capabilities,
- fruit used by wildlife (including humans),
- relative lack of predators or diseases in present location.

Invasive species are problematic as they can alter:

- nutrient cycling,
- local hydrology,
- fire regimes,
- geomorphological processes (such as dune formation or stream profile),
- species and structural diversity,
- available wildlife resources,
- and prevent recruitment of native species due to competition for light, nutrients, and/or moisture.

An historical land use dominated by agriculture and logging, coupled with recent development, has effectively disturbed native vegetation and added countless miles of the edge condition that is highly favorable to invasives. The misguided promotion of exotic species for erosion and livestock control, and horticulture plantings and unintentional introductions have provided seed sources to disperse numerous invasive exotic species.

Artificially high wildlife populations may further promote invasive species through soil disturbance and preferential feeding on native species. Forests that regenerated from the 90% clearcutting of Pennsylvania during the 19th century did so at a time when deer populations had also crashed. Since deer are adapted to feeding primarily on native species, there is concern that future forest succession will not be achieved given present high deer populations and the presence of so many invasive plants.

There is a higher number of invasive species being used for various purposes than ever before. The rate of species introduction is higher than in the past. The increase of invasives is exponential or logarithmic—not linear. This suggests why invasives are so much more of a problem now than when the species were first introduced—or even as recently as thirty years ago.

Natural areas are dynamic; invasive plants will always be with us. NLT uses a combination of strategies to minimize the impact of invasives with a minimum of effort, using natural processes such as succession and forest shade, and using native plantings to exclude invaders.

Resource Management Issues

A central issue of invasive plant management is the allocation of resources. There are more weeds than could ever be controlled. A strategy for prioritizing problem species, and for coexisting with these plants is needed—one which will minimize their effect on the ecological integrity of a property with a minimum of effort.

In natural areas management the most efficient and effective strategy usually results from a thorough understanding of the environmental forces in the area and having management goals that work with and not against these forces. Given that growing space (light, water, nutrients, etc.) in any site is finite, successful management will be a combination of practices which make more growing space available to desirable species and less to non-desirable species—in this case, invasives.

Land managers are aware of the greatest problem species on their preserves but are not necessarily equipped to evaluate impending invasions. The vines and Norway maple and ailanthus are a known threat and we also know where the plants are located. These species we stand a chance of controlling, at least in places. Other species, such as Japanese stiltgrass and garlic mustard we can identify but are clearly beyond our means to control on a large scale. We lose the advantage of early detection and rapid response (EDRR) with species that are yet to be identified as a threat.

We prioritize a species based on the damage it can do. Since forests have been the principal vegetative form in the Eastern U.S. biome, a species that is capable of halting succession *and* living in the shade of an existing native woodland—such as Japanese akebia—represents the greatest threat. As the native trees die and fall, the akebia is already present, has already inhibited seedling growth. An abandoned field that fills with akebia is not likely to ever become a woods. In contrast, a plant such as Canada thistle, though it is a major pest of agricultural areas and can displace native meadow wildflowers, may represent a lower threat since it will not prevent the field in which it grow from someday becoming a forest, where it cannot grow.

We also prioritize by location. A habitat that is least impacted is where our efforts will be most successful. Working to remove invasives in the shade of a closed-canopy forest will require less effort and have a longer-lasting effect than on the highly-invaded edge of that forest, or some other manipulated landscape. Connecting forest lands and closing the canopy minimizes edge where some invasives proliferate. This technique differs from traditional wildlife management which maximizes edge; however, the traditional management evolved at a time when the threat from invasives was not widely recognized. And creation of edge favors a subset of wildlife—edge species such as deer and game birds—over the welfare of interior species and the natural ecosystem.

Resource Management Methods

Invasive plant control methods are divided into four categories:

- mechanical,
- chemical,
- biological,
- and cultural techniques.

Mechanical methods are used extensively by staff and volunteers; they include:

- hand pulling,
- weed wrench,
- cutting (high and low, in the case of vines),
- mowing,
- digging,
- bush hogging,
- prescribed burning,
- brush cutting and weed whipping,
- and pulling with a tractor and chain or Brush Brute.

These methods are effective if repeated frequently during a growing season to exhaust a plant's root reserves, or if used in combination with other techniques.

Chemical methods involve the use of herbicides. The decision to use chemical controls is a carefully considered one. The exclusive use of herbicides alone is not likely to be an effective long-term solution for controlling invasives. Difficulties include controlling only target plants at the correct time during their life cycle, and the potential health risks to workers and the environment. Herbicides need to be applied only by trained and licensed personnel. In combination with physical methods of reducing the above-ground portion of a plant, herbicides may limit resprouting or effectively control plants when used in combination with other techniques. Typically herbicides are used in small quantities for a stump application immediately after an invasive is cut back, or they are used to control resprouts some time after the cutting. The environmental damage from invasive plants is considered to be greater than the risk associated with the use of non-persistent herbicides.

Biological control involves the introduction of species-specific predators from a plant's native habitat, and remains the domain of universities and government agencies. The risks associated with species

introduction are high, and only well funded and thoughtfully researched programs are effective. NLT may benefit from the existence of such programs, perhaps, for example, in the case of purple loosestrife. But it does not have the resources or the mandate to undertake such research on its own. Also considered biological control is the use of grazing animals, such as goats, to control invasives such as multiflora rose.

Cultural control loosely describes changes to the structure or nutrient availability of a site to create conditions that do not favor invasive plants. This form of control includes:

- minimizing the edge habitats that are prone to invasion,
- amending soil to tie up excess nutrients, or, for example, removing multiflora rose from a habitat as a way of preventing it from serving as a ladder for vines
- preventing access to control other invasive plants,
- replanting with a diversity of desirable species so that they can shade out invasive species.

Resource Management Equipment

Fortunately the tools used for invasives management are often the same ones that are used to maintain estate areas, trails, agricultural fields, reduce hazard trees, or meet other objectives on our preserves. Commonly used equipment includes:

- mowers,
- tractors,
- shovels,
- weed whips,
- chainsaws,
- chipper,
- Indian tanks,
- brushcutters,
- chains,
- trucks,
- small chemical sprayers,
- pruners,
- associated safety equipment including gloves, helmets, safety glasses, chaps, and steel-toe boots.

Specialized tools include the weed wrench and the Brush Brute front-end loader attachment, two that are shared throughout our preserves.

Training is required to operate powered equipment. Volunteers are an effective means to tackle supervised labor-intensive jobs such as cutting vines with pruners and hand saws, or planting native species. Trained staff can follow up later with complementary control techniques.

Implementation

Implementation of an invasive species management plan requires a long-term commitment to ongoing stewardship. Expertise is needed to identify resources and the threats to them, and the ability to prioritize by threat, by geographic site or resource being threatened, and by individual plants. Assessment and interpretation of the scale and type of work required are key factors in ensuring a successful species management plan.

Plan implementation involves the following steps:

- Monitor invasions and natural resources
 - Inventory, survey, and map invasive species and management efforts
 - Document in a written Invasive Plant Management Plan
- Prevent new invasions
 - Identify species known to be invasive in the region but not yet found on your land; these will be candidates for Early Detection–Rapid Response (EDRR) efforts.
 - Minimize unintended mechanical disturbance
 - Minimize seed movement and species introductions
 - Control deer population
- Reduce the impact of invasive plants on the preserve
 - Prioritize management efforts
 - by geographic location, including resources present
 - by species, including its ecological impact
 - by individual
 - Research best management practices for control methods
 - Apply best management practices to priority sites and species using integrated vegetation management (IVM)

- Evaluate the effect of ongoing control efforts (adaptive management)
- Restore sites or promote natural succession as needed
 - Fill niches with a diversity of native vegetation
- Capacity - labor (volunteer and/or paid professional staff) and equipment
 - Labor – identify, train, coordinate, and mobilize personnel appropriate to the tasks required. If entirely or partially a volunteer labor force, then a volunteer coordinator position will be necessary to ensure focused and appropriate invasive species management.
 - Equipment – Secure such tools and equipment that will ensure safe and simplest accomplishment of the scale of the tasks at hand. Purchase is preferable.

Prioritization

Prioritizing which species to control is an important consideration; there are never sufficient resources to manage them all and there will always be external sources of weeds—so it is important to determine which species are interfering most with your goals for the land. Ongoing funding for long-term maintenance may be limited, so prioritization is significant in the planning process.

The Invasives Management Plan should assign a priority score to each invasive species based on its potential impact, current distribution at the preserve, the value of the habitat it invades, and the difficulty of its control—for example:

We want to prioritize species that have the capability of forming dense populations, halting succession, and/or changing soil chemistry or some other chemical or physical property of the site. We also wish to prioritize species that are just beginning to invade the preserve—those that are not already ubiquitous. Deciduous woods, the natural vegetation of the Piedmont physiographic province, is the habitat to which we assign the highest priority score. Difficulty of control is not as heavily weighted a category since management techniques and capabilities are subject to change,

but we want to avoid attempting to manage invasions that are beyond our ability to control. This methodology does not necessarily capture all of the potential problem species, and does not necessarily capture trends of rapidly expanding populations.

Noxious Weed Law

Only a subset of the invasive plants of natural areas – such as multiflora rose, mile-a-minute, and Canada thistle – are listed under noxious weed laws. (Most are weeds of agriculture.) Enforced at the county level or by local municipality, these laws can alter which species are made priority for control on your land.

Plants recognized as noxious weeds under Pennsylvania state law are identified in Chapter 110 “Noxious Weeds” of the Pennsylvania Code:

<http://www.pacode.com/secure/data/007/chapter110/chap110toc.html>

Information regarding federal law can be found at <http://www.fws.gov/laws/lawdigest/FEDNOX.HTML>

Disclaimer

Where trade names are used, no endorsement is implied. Herbicides should be applied by trained personnel according to the directions on the container label. Natural Lands Trust and the authors of this information are not liable for the use of management practices described in this document.

Resources

The following list of publications and websites is meant to serve as a resource guide for further information on invasive species management.

Publications:

Alliance for the Chesapeake Bay. 2003. *Citizen's Guide to the Control of Invasive Plants in Wetland and Riparian Areas*. Alliance for the Chesapeake Bay.

Baskin, Yvonne. 2002. *A Plague of Rats and Rubbervines*. Washington: Island Press.

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- Swearingen, Jil et al. 2002. *Plant Invaders of Mid-Atlantic Natural Areas*. Washington: National Park Service and U.S. Fish and Wildlife Service.
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- Tu, Mandy et al. 2001. *Weed Control Methods Handbook: Tools and Techniques for Use in Natural areas*. The Nature Conservancy.
- Uva, Richard H. et al. 1997. *Weeds of the Northeast*. Ithaca: Comstock Publishing.
- Van Driesche, Jason and Roy Van Driesche. 2000. *Nature Out of Place: Biological Invasions in the Global Age*. Washington: Island Press.
- Van Driesche, Roy, et al. 2002. *Biological Control of Invasive Plants in the Eastern United States*. Washington: U.S.D.A. Forest Service.
- Zheng, Hao, et al. 2005. *Invasive Plants of Asian Origin Established in the United States and their Natural Enemies*. Morgantown, WV: U.S.D.A. Forest Service.

Websites

Center for Invasive Species and Ecosystem Health;

<http://www.invasive.org>:

Host website for the two services below (WeedUS database and EDDMaPps) as well as Forestry Images, Integrated Pest Management Images, Forest Pests and more. Hosted by The University of Georgia Warnell School of Forestry and Natural Resources. This site also archives the Nature Conservancy's disbanded Global Invasive Species Team's resources: a Weed Control Methods Handbook, Element Stewardship Abstracts (ESA's), and Weed Management Plan templates. (The GIST resources are no longer being updated but are nevertheless of value.)

ConserveOnline; <http://www.conserveonline.org/>:

A partnership of the Nature Conservancy and other organizations this website is a place where people doing conservation can share their experiences in "workspaces" for their projects.

Early Detection & Distribution Mapping System;

<http://www.eddmaps.org/>

Software tool where users can input occurrences of invasive plants; expert-verified and mapped in Google Maps. It is intended to identify new invasions and help managers and government officials prioritize invasives management.

Flora of Pennsylvania; <http://www.paflora.org/>

An example of a comprehensive state database of plants; where to turn to learn whether a species is native or introduced and where in the state it has been found. Also used for plant identification.

Governor's Invasive Species Council of Pennsylvania;

<http://www.invasivespeciescouncil.com/>

The PISC website covers the management plan for invasive species in Pennsylvania, agencies involved in the effort and meeting minutes for the council. It also lists invasive species known to be widespread, those of limited distribution, and those not yet found in Pennsylvania.

iMap Invasives;

<http://www.imapinvasives.org/>

iMapInvasives provides an on-line, GIS-based data management system to assist citizen scientists and natural resource managers working to protect natural resources from the threat of invasive species.

Invasive Plant Atlas of New England; <http://www.eddmaps.org/ipane/>

A database of where invasive plants are found in New England, part of an effort for Early Detection-Rapid Response.

Invasive Plant Council of NYS; <http://www.ipcnys.org>

This website identifies invasive plants in New York by region and is designed to help with Early Detection-Rapid Response for new invasive species.

Mid-Atlantic Invasive Plant Council: <http://www.ma-eppc.org/>

Formerly the Mid-Atlantic Exotic Pest Plant Council, this organization coordinates regional efforts by sharing information, hosting a biennial conference, and offers a tutorial for land managers on invasive plants.

Natural Lands Trust's Center for Conservation Landowners; <http://natlands.org>

A downloadable publication: **Stewardship Handbook for Natural Lands in Southeastern Pennsylvania** is available on this website. Also case studies and resources as well as a description of planning and stewardship services offered by the Center.

National Biological Information Infrastructure & National Invasive Species Council;

www.invasivespecies.gov

The NISC website has information about the National Invasive Species Plan, Early Detection-Rapid Response (EDRR), research and management, and public awareness efforts.

Pennsylvania Department of Conservation and Natural Resources; <http://www.dcnr.state.pa.us>

This website has lists of Pennsylvania invasive plants and landscaping suggestions that are alternatives to using invasive plants.

Plant Conservation Alliance; <http://www.nps.gov>

This website has links to fact sheets for many invasive plants.

U.S. Department of Agriculture, Animal & Plant Health Inspection Service; <http://www.usda.gov>

U.S.D.A. APHIS website has lists of species whose importation is regulated.

U.S. Fish and Wildlife Service; <http://www.fws.gov>

Website with articles and resources for invasive species, including related regulations.

WeedUS: Database of Plants Invading Natural Areas in the United States;

<http://www.invasive.org/weedus/>

A partnership between the National Park Service and the Center for Invasive Species and Ecosystem Health at University of Georgia, this website has a profile of hundreds of invasive plants with pictures, maps of where they are found, and links to other websites with information about their control.

Resources at ConservationTools.org

To find experts on the topics covered by this guide, see the right hand column of the on-line edition at <http://conservationtools.org/guides/143>. The on-line edition also contains the most up-to-date listing of related library items and guides.

Library Categories

[Invasive Plant Species](#)

[Invasive Species in Pennsylvania](#)

[Native Plant Species](#)

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