

PART SIX: Invasive Species Management



17. CORRECTIVE STRATEGIES FOR INVASIVE SPECIES

Often hardy and sometimes toxic, invasive species have become widespread on roads and ditches, deep in the forest and throughout meadows, on wetland edges, under water and in the air. An *invasive species* is “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Most alien species (also referred to as exotic or nonnative) are not a threat to Vermont’s ecosystems. However, exotic species become invasive and a nuisance when they develop self-sustaining populations and out-compete native species, potentially impacting timber quality, soil chemistry and structure, wetland dynamics, and native species diversity.

ORIGINS AND CHARACTERISTICS

Plants

Plants have been moved around the globe for centuries, carried across oceans for food, shelter, medicine, and ornament. Today, the sale, importation, and propagation of exotic plants is heavily regulated by various state and federal laws. In Vermont, the Plant Quarantine Rule was passed by the Vermont Legislature in 2002, making it illegal to “sell, distribute, or transport” specific exotic species. Lists were subsequently created that aid gardeners and landscapers with finding substitutes for quarantined species.

Despite regulations, exotic invasive species continue to alter Vermont’s landscape. Established invasive populations of plants spread through natural dispersal mechanisms. People are also responsible for their inadvertent spread by seeds and fragments attaching to shoes, clothing, equipment, and boats, which are then dispersed to unaffected areas. Whether accidental or intentional, the introduction of invasive species must be avoided and current populations must be managed.

Exotic invasive plants succeed in new ecosystems for a number of reasons. For instance, each multiflora rose plant can produce 500,000 fruits and the plant forms dense thickets, thus out-competing native species. Common buckthorn is highly adaptable and also forms dense thickets (see Figure 17.1). Exotic species are typically less susceptible to local pests and diseases, and some such as garlic mustard produce toxins that deter native plants from growing. Invasive species tend to thrive in areas that have been or continue to be heavily disturbed.

Wildlife

Species of nonnative wildlife have been introduced through the ballast of cargo ships; these ships are now under the oversight of the U. S. Coast Guard to minimize the introduction of invasive species. Some nonnative insects have also succeeded in becoming pests. The hemlock woolly adelgid is a species that has causes widespread mortality of hemlock by sucking sap (see Figure 17.2). The Asian longhorn beetle and Eastern ash borer are also invasive pests that are causing devastating effects on forest health in the Northeast. Invasive pests and the effects they have on forest

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Figure 17.1
Image of common buckthorn.
Courtesy of L. Mehrhoff.



Figure 17.2
Woolly adelgid on hemlock. Courtesy of Robert L. Anderson, U.S. Forest Service, Bugwood.org.

health are important for you to consider when developing management plans for your property. For up to date information on infestations and new species accounts, visit the Vermont Invasives website at www.vtinvasives.org.

Illegal importation, bait bucket dumping, release of aquarium species, and escapees from private facilities are the likely causes of invasive species into Vermont's lakes and ponds. Goldfish, tench, rudd, and alewife are all baitfish species that Vermont anglers and fisheries managers are currently battling.

Recognized by the International Union for the Conservation of Nature as an invasive species, outdoor, feral, or stray cats are also one of the most controversial. As domesticated descendants of a Middle Eastern wild cat, the house cat is the most common pet in the United States. Unfortunately, the impact on native wildlife can be tremendous when these hunters stray from home or become feral. If you own a cat be mindful of this phenomenon and keep them indoors or have them wear a collar with a bell to warn birds and other wildlife of their presence.

Impacts

Invasive species can negatively affect native ecosystems in myriad ways. Forest regeneration is reduced as a result of intense shading and competition for space with exotic species. Soil chemistry is altered by chemicals produced by some exotic plants and European earthworm activity. Native species decline or may even disappear from a site. Since native insects and animals often find exotic species unpalatable, food chains are disrupted and habitat is degraded. These are just a few examples of the ecological changes resulting from invasive species. Table 17.1 highlights several common invasive species and their known impacts.

The ecological impacts of exotic invasive species on Vermont are vast, but the economy, human health, and recreation are also affected. The zebra mussel is an invasive species in the Lake Champlain region detested for its prolific colonies that clog intake pipes, potentially damage underwater cultural resources, and out-compete native mollusks. Additionally, invasive aquatic species that reproduce rapidly can soon outnumber native species and dominate their habitat. The result is often reduced numbers of native species, reduced habitat and water quality, and a diminished experience for anglers and paddlers alike.

It can be especially disconcerting when an exotic invasive species poses a threat to human health. Giant hogweed, wild parsnip, and wild chervil all contain a phototoxic sap (see Figure 17.3a and b). If exposed to sunlight after touching this sap, a reaction occurs that causes

Figures 17.3 a and b
Giant hogweed (left)
and wild chervil (right)



Table 17.1

Selected invasive species and their associated ecological impacts

SPECIES	ECOLOGICAL IMPACT(S)
Hemlock Woolly Adelgid	Loss of hemlock stands could severely impact quality and quantity of deer wintering habitat and potentially affect the health of the State's deer population. Lack of shade along streams could impact fish habitat.
Invasive Fishes (Asian carp, alewife, tench, etc)	These species out-compete native sport fish for food and habitat. Some species will prey on the eggs and fry of native species such as smelt and walleye.
Aquatic Invasive Plants (water chestnut, Eurasia milfoil, and so on)	Thick stands of aquatic invasive plants impede water-based recreation such as boating, fishing, and swimming.
Japanese Knotweed	Frequently found along rivers and streams, this plant's early spring emergence and dense growth prevent native species from establishing in these traditionally species diverse areas. Less food and habitat is provided in knotweed monocultures.
Garlic Mustard	Notorious for quickly dominating groundcover plants and excluding native species through dispersion and chemical disruption of native root associations, thus altering suitable habitat for native birds, mammals and amphibians.
Purple Loosestrife	Although a beautiful plant, it quickly replaces native wetland species such as cattails and sedges, and holds little value as a food or habitat source for wildlife.
Common and Glossy Buckthorn	Both species produce fruits that are eaten and distributed by wildlife, thus enabling the creation of dense, even-aged thicket stands that crowd and shade out native species and impact success of native nesting birds.

burns, blistering, and skin discoloration. Gloves and long sleeves are recommended when working with these and any of the knapweed species. In addition, outdoor cats spread parasites through feces and are common carriers of the rabies virus.

MANAGEMENT

The myriad impacts resulting from exotic invasive species can be overwhelming and discouraging. However, with careful management and the right attitude, you will have some success at prevention and control of them on your land. Even if full eradication is not achieved, habitat for wildlife can be improved and native species will benefit.

The first step in successful control is to positively identify exotic invasive species on your property. There are many resources for identification online or in publication. If you are unable to identify invasive plants or animals using the resources listed in the suggested readings section below, seek the help of a professional botanist or other natural resources professional.

There are three categories for managing invasive species: chemical, mechanical, and biological.

Once invasive species have been identified on your property, a plan of attack is needed. Visual documentation through pictures can be used to measure management success over time. Some landowners may opt to hire a professional consultant to write a plan and create a map, while others will conduct their own research and use a hand-drawn map. Regardless, mapping the location of invasive populations on your land can be helpful in future monitoring efforts as well as for measuring success.

The Vermont Invasives collaboration has included a feature on their website which enables landowners to map invasive plants or animals on their property. This feature can be very useful in your own land management efforts. It is a good idea to approach the management of invasive populations on your land while considering other features within an area. Some infestations may vary by site, and Table 17.2 below can help narrow down an appropriate management approach.

If your land is enrolled in the Use Value Appraisal (UVA) Program and a management plan has been developed, speak with your county forester about recommendations for maintaining forest health through the prevention and control of invasive species. Integrating invasive species management into any forest or wildlife management plan is an important

Table 17.2
Strategies for managing invasive species based on infestation level

SITE CHARACTERISTICS	MANAGEMENT APPROACH
Pristine: less than 10% cover of invasives	Prevention is key. Eradicate all populations of invasive species. Monitor “cleaned” sites and adjacent areas to remove new plants. Look for new species known to be in the area.
Somewhat disturbed: 10-30% cover of invasives (monocultures not yet formed)	Prioritize management activities based on the following: <ol style="list-style-type: none"> 1. Level of threat invasives pose to the site. 2. Special natural features (vernal pools, sugarbush, etc), wildlife habitat, or native species that warrant special effort 3. Practical and economic feasibility of species-specific treatment options Treat small infestations from the edge into the center and focus on controlling seed-bearing individuals first. Total eradication may not be possible.
Heavily infested: greater than 30% coverage of invasives	Don't get discouraged! Focus on protecting remnant patches of native vegetation and special natural features from invasives. Prioritize management based on the 10 to 30% cover scenario. Revegetation with native species will likely be necessary.

Source: Cusack, C., Plumb S, and D. Prince. 2011. Best Management Practices for the Prevention and Treatment of Terrestrial Invasive Plants in Vermont Woodlands. Montpelier: Vermont Chapter of the Nature Conservancy.

step to avoid their inadvertent spread. Whether or not a management plan is in place, early detection and rapid response is essential to stopping the spread of invasive species onto your property. There are three categories for managing invasive species: chemical, mechanical, and biological. Some methods are better for certain species and levels of infestation than others, and an understanding of these techniques and applications will help determine what is most suitable for your site.

Chemical

For invasive plants, chemical management involves the use of herbicides. In the State of Vermont you may apply a non-restricted use herbicide to your own land, but certification is required through the Vermont Agency of Agriculture for application of herbicides on land other than your own or to apply restricted use herbicides. Use of herbicides needs to be in accordance with the label. **The label is the law!** You could also hire a professional contractor who specializes in invasive species control.

Two types of herbicides are most commonly used in invasive species management — glyphosate and triclopyr. *Glyphosate* is a non-selective herbicide that can kill any plant it comes in contact with by interrupting its photosynthetic process. Aquatic, restricted use formulations exist for use near wetlands, but a permit from the Department of Environmental Conservation is required and these herbicides can only be purchased and applied by a certified pesticide applicator. *Triclopyr* is more selective and is used on plants that are more difficult to control without impacting monocots (grasses, orchids, lilies, and so on). Most formulations of this herbicide require a license to purchase and use. When dealing with chemicals, employing the correct formulation and concentration at the right time of year for your target species is critical. Consideration should also be given to the impacts of chemicals on nontarget species.

Small-scale problems typically require a *foliar* application, or spraying leaved and flowering plants with the herbicide. This can be done with a backpack sprayer or even a handheld spray bottle with a low concentration of active ingredient, conducted on a day when there is no wind and no threat of rain for the next 3 to 48 hours (depending on chemical). Some plants respond to treatment best if the existing stems are completely cut in spring and re-growth is sprayed in early fall. Remember that every species has different application rates and times to spray, and that using the least amount to work effectively on the target species will save money and minimize impacts to nontarget species.

Cut stem treatments involve cutting the stem close to the ground and immediately applying herbicide to the stump. These treatments are most effective in the fall and only the living tissue on the outer layer of the stem needs to be treated. Mixing a dye with the herbicide solution will stain treated surfaces and prevent reapplication and overuse of herbicide. Care should be taken with this method not to exceed per label allowed rates.

Mechanical

Mechanical control can be very intensive and involve several years of management, but it can also be effective. Many techniques are utilized on various species of invasive plants, and finding the right method based on plant biology is the most effective approach to eradication.



Figures 17.4

Foliar spray approach.
Courtesy of Steve Manning, Invasive
Plant Control, Bugwood.org



Figures 17.5

Regular mowing to control invasive
species. Courtesy of VFWD.

Girdling refers to the use of a chainsaw or axe to make two to three circular cuts set at three inches apart around the circumference of trees or shrubs with a single stem.

Hand pulling limits the eradication effort to only the target species. It is most easily accomplished when the ground is moist and soft such as in the spring or after a rain. If working in those conditions isn't possible, a shovel or weeder may help remove the plant stem. With or without tools, remove the entire plant, including the root and rhizomes to avoid re-sprouting. Avoid hand pulling when berries are ripe or seeds are set to minimize accidental spreading. Pulling causes site disturbance, and you should make an effort to put disturbed soil back in place to minimize re-colonization.

Cutting or mowing is best used where invasive plants exist in large monocultures or have extensive root systems (such as with Japanese knotweed), and at sites that can be visited often. This method works by continually stressing the root system and depleting carbohydrate reserves in the plant through multiple cuttings over a period of time. It may take several years to accomplish this and a commitment should be made to continue this method as long as it takes to eradicate the problem species.

Smothering a site with UV-stabilized plastic will effectively kill most plants underneath. It is helpful to remove all above-ground vegetation prior to covering, and extending the cover 3 to 5 feet from the affected area as a "buffer zone." Secure the plastic with rocks or stakes and leave in place for a full growing season. For species such as knotweed, goutweed, and wild chervil, leaving the plastic in place 2 to 4 years proves more effective.

Girdling refers to the use of a chainsaw or axe to make two to three circular cuts set at three inches apart around the circumference of trees or shrubs with a single stem. The living tissue of the cambium layer (inner bark) will no longer be able to transport essential nutrients and sugars and will eventually kill the plant. The cut should not be too deep to avoid creating a hazard under high wind situations. Re-sprouts can be a problem with this approach.

Biological

Biological management usually involves the introduction of an invasive species' natural predator to the ecosystem. In Vermont, two species of leaf-eating beetles and a root-boring weevil have been released, each feeding on purple loosestrife in their native Europe. Sites where beetles have been released have seen reduced growth rates of loosestrife and signs of native plant recovery. This method is overseen by Vermont's Department of Environmental Conservation and is unavailable for private landowners without permission.

SUMMARY

Having so many options available for exotic invasive species control and management may be confusing, but ample resources for information and education are available. For instance, specific species information can be found at www.vtinvasives.org. In addition, the suggested links that follow in **Resources** are a good place to start in your effort to manage your land. As you move forward with management, replanting will be a likely step in reclaiming your land. Planting native species at a site or stocking native fish in a pond is always recommended over the alternative, which can lead to ongoing problems for Vermont's economy, ecology, health, and recreation. Be sure to check with the Vermont Department of Forests, Parks, and Recreation for sources to obtain native stock of plants and for any quarantines that may be in effect that apply to the transportation of woody plants in Vermont.



RESOURCES

Cusack, C., Plumb S, and D. Prince. 2011. *Best Management Practices for the Prevention and Treatment of Terrestrial Invasive Plants in Vermont Woodlands*. Montpelier: Vermont Chapter of the Nature Conservancy.

Lake Champlain Basin Program. "Aquatic Nuisance Species in Lake Champlain and the Basin." <http://www.lcbp.org/nuissum.htm>

National Invasive Species Information Center. <http://www.invasivespeciesinfo.gov/index.shtml>

U.S. Department of Agriculture, Natural Resources Conservation Service. Invasive Exotic Plant Info Sheet. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081111.pdf

Vermont Department of Agriculture. Pesticide regulations. <http://www.vermontagriculture.com/ARMES/pest.htm>

Vermont Invasives. <http://www.vtinvasives.org/>

—. Management Tools. <http://www.vtinvasives.org/plants/prevention-and-management/tools-resources>

—. Vermont Invasive Exotic Plant Committee. <http://www.vtinvasives.org/plants/vermont-invasive-exotic-plant-committee>

—. Invasive Plant Impacts. <http://www.vtinvasives.org/plants/impact-invasives>

—. Quarantine Rule. <http://www.vtinvasives.org/plants/state-quarantine-rule>

—. Watch List: <http://www.vtinvasives.org/plants/report-it>

—. Vermont Invasive News Updates: <http://www.vtinvasives.org/news>