



GOOD GREEN

Homeowner's Guide to Managing Invasive Plants



*Funded by a U.S. Forest
Service Landscape Scale
Restoration Grant*

Good Green Invasive Species Management

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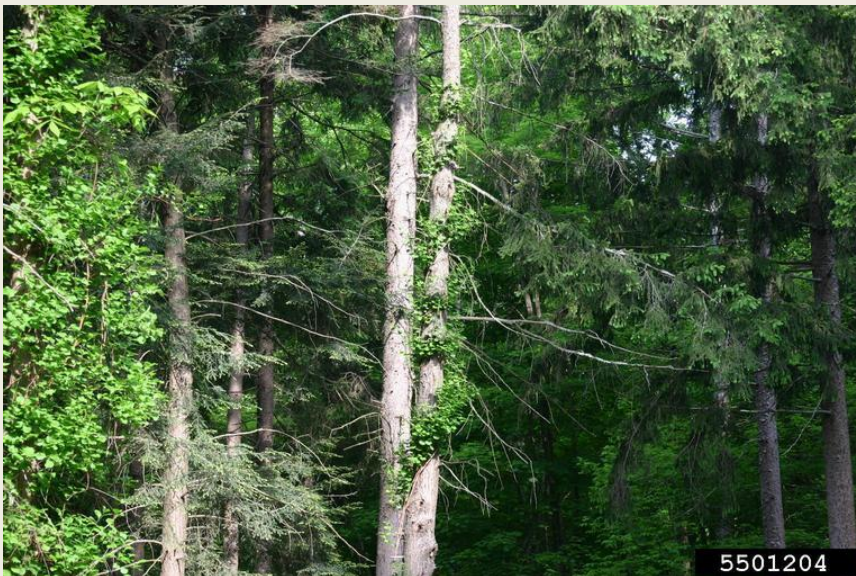
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Good Green

Good Green is a Maryland Department of Natural Resources Forest Service initiative to protect native vegetation in our natural areas. The initiative was started as a Landscape Scale Restoration grant from the U.S. Forest Service.

Oftentimes, we can visit natural areas that look green, healthy, and beautiful, when in reality they are threatened by invasive species. Invasive species can kill off or out-compete native vegetation, having a detrimental impact on the ecosystem. Native plants are important because local wildlife rely on them for food and shelter. Some native species are also rare, threatened, and endangered, and could

completely disappear if we don't perform good management.



Oriental bittersweet climbing a tree
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

The Good Green initiative provides the knowledge and tools to plan for invasive species management. Since Maryland is a patchwork of public, large-scale private and small landowners, it is essential to provide these tools so that everyone can participate in management. Cooperative management is needed because invasive species can flourish across boundaries and borders.

One landowner could never control invasives on their property if their neighbor does not.

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What Is an Invasive Species?

An invasive species is a non-native species whose introduction does or is likely to cause ecological or economic harm, or is a threat to human health. In natural areas management, most invasive species cause ecological and environmental harm. Non-native species that exist in the landscape without causing harm or taking over are not considered to be invasive, but can still be monitored.

Generally, invasive species are initially introduced by human activity. Often this can be a purposeful introduction. For example, kudzu was introduced to the southern U.S. as an erosion control method, but grew to outcompete surrounding vegetation. Other times it can be an accidental introduction, which is the predominant cause of insect and pathogen invaders. On rare occasions, an invader can spread from its nearby natural ecosystem. For example, southern pine beetle is native to the southeastern U.S. but it has spread northward with natural range expansion. Even without a human cause for invasion, invasive species should be monitored and managed in order to prevent devastation in new ecosystems.



Tree of heaven, Ansel Oommen, Bugwood.org

By and large, invasive species were initially able to establish because they were introduced from an area in the world with a similar climate. In some cases, the invasive species will have natural attributes that help it to establish well. For example, many invasive plants are pioneer species with attributes like rapid growth or nitrogen fixation. Many of these plants thrive when soils are disturbed, or bare ground is left exposed. After establishing, the introduced species does not face normal population controls like predation and disease. This can lead to rapid population expansion, with little opportunity for native species to compete.

In the yard, invasive plants can be extremely frustrating to deal with. Vines can run along the ground wrapping in the mower, or climb mature trees causing them to fall. Invasive herbaceous plants like lesser celandine can overtake areas of the lawn displacing grass. Some plants, like multiflora rose and Japanese barberry, have plentiful thorns making them difficult to remove. On larger properties, areas

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that are farther from the house can become infested with invasives without you knowing. The issue can become quite severe before you realize how large of a problem it is.

What Can You Do?

The first step in managing invasive species on your property is learning about them. Refer to the plants mentioned at the end of this document, visit DNR's [Forest Health webpage](#) or [University of Maryland Extension](#) to see what plants are a problem in your area. With these resources you can learn where these plants are likely to occur, how you can identify them, and how to control them.

The second step is to assess the invasive species issue on your property. For the average property, this can just be a walk around the yard where you note areas that are infested. On larger properties, it may be best to identify areas of likely infestation (roads, forest perimeter, trails, riparian areas), and then check each of those areas. As you identify invasive plants, note the growth form (shrub, vine, etc.). Generally, as part of your assessment, it is best to rank the level of invasion as mild, moderate or severe. A mild invasion may have a few non-native plants scattered about, with mostly native plants growing. A moderate invasion would have more invasive plants than native. Finally, a severe infestation would have almost all invasive plants with no or few natives growing. If invasive vines are present in wooded areas, it can also be helpful to record the condition of the tree canopy. After all, vines can destroy the canopy and lead to more invasive plants in the understory. One example of a ranking system for both understory and overstory infestations can be found below.

The third step is to plan and implement control of invasives around your property. Category 1 areas will be the first priority. These areas are relatively uninvaded, with only a few scattered plants, and lightly invaded areas with vines. Areas with vines should be targeted first because they can easily become more seriously invaded. They can also damage the canopy which will make restoration work more difficult. The small outlying infestations can also be targeted because they can be eliminated before causing more widespread invasions. Category 2 invaded areas like the moderately invaded leading edge can lead to new areas being invaded or can become heavily infested. Invasive shrubs and other shade tolerant species can survive in the understory without disturbance, and thus require more effort to control. Moderately invaded areas can be targeted with mechanical treatments, however it may be necessary to couple these with herbicide application.

Heavily invaded areas make up category 3 and are the most difficult and the costliest to manage. These treatment areas will likely also require restoration work, like planting and seeding.

The easiest way to manage against invasive species is to limit their possible exposure to a site. Cultural controls are preventive methods to try and prevent the introduction of an invasive species to a new area by changing human behavior. One of the best examples of this is the 'Don't move firewood' campaign,

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which was put in place to try and prevent the spread of invasive insects. By keeping firewood in the area where it was harvested, it will prevent the potential introduction and spread to a new, uninvaded area. At home, cultural controls could be as simple as cleaning your mower off before letting someone else borrow it. This can remove seeds before they are transported to another area.

Mechanical Methods

Mechanical treatments include hand and machine removal with methods like mowing, chipping and hand pulling. It is a popular method of control because it often does not add significant cost for management. For example, mowing can be used to control invasive grasses like Japanese stiltgrass. Continuous mowing would prevent the grass from going to seed, and would be much cheaper than purchasing and applying herbicide. Early vine infestations can be treated by cutting a large section of the vine out. Mechanical treatments do not eradicate the seed bank, and can leave root stocks that can resprout, so retreatment and monitoring is necessary. Over time, as the seed bank and other sources of reintroduction are depleted, the invasives can be controlled.

Mowing

Mowing is an especially good method for annual grasses, but will work well on perennial grasses, forbs and even vines. Mowing must be continued over several years before it will control the invasive plant. It is also best to mow a couple of times a year, to help control annual growth. Timing is important for mowing. Mowing after flowering will spread seed and worsen the infestation. Make sure mowing takes place before seed set, which is shown on the plant fact sheets at the links listed on Page 14.

Cutting

Cutting is particularly useful for larger woody shrubs and invasive vines. When vines are already climbing into trees, cutting them can prevent irreparable harm. The common method for cutting vines is a window cut; cut the vine as high as you can reach, and again near where it comes out of the ground.

Cutting can also be used for woody shrubs by cutting as close to the ground as possible. In both vines and shrubs, this will cause them to grow back but repeated cutting will cause the plant to use up its stored energy. To speed up the efficacy of cutting, herbicides can be used. More on this under the chemical section below.

In the case of some species, such as Japanese knotweed or English ivy, fragments of the plant can vegetatively reproduce, and extra care should be taken that all parts of the plant are removed from the site. Bagging and allowing the plant material to decompose before disposal is recommended.

Hand Pulling and Digging

Hand pulling is useful for forbs and smaller woody plants, where the root system can be more easily removed. It is also easier with sandy, loose, or wet soils. The benefit of pulling over cutting is that the

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removed root system is unable to resprout. However, it requires significantly more time and effort than cutting.

When a plant is too large for hand pulling, digging is an alternative. When using a shovel or other digging tool, be careful to remove all parts of the plant. Often, if you cut the roots and do not remove a section, it can resprout and become an issue again. Digging is still not practical for very large plants.

As with cutting and mowing, be sure to remove the plant before it seeds or remove seeds with the rest of the plant material. Material should be bagged and allowed to decompose before disposal. Be sure to stabilize soils after disturbing them or replant with desired species.

Girdling

Girdling is a method to control invasive trees by cutting off the flow of nutrients between the roots and the leaves. The most efficient method is to use a chainsaw, making a cut encircling the tree, deep enough to sever the cambium. Make a second cut several inches above the first in order to ensure cut off of nutrients. Girdling should not be near your house or frequented areas on your property as the dead standing tree can be a hazard. It also should only be used when you are able to revisit the site to remove sprouts and suckers. If any trees are being removed, be sure to use a [Licensed Tree Expert](#), which can be found on the Maryland Forest Service website.

Chemical Methods

In many cases the scale of invasion is too much to handle with mechanical controls; in these cases chemical controls may be necessary. Herbicides can be used in a few ways to provide a quick and cost-effective way to manage an array of species. Herbicides can be post-emergents where they will kill a growing plant, or pre-emergents where they will prevent plants from being able to sprout. In some cases, herbicide will need to be applied more than once to prevent resprouting and new growth from seed. The appropriate treatments at the right time of year will help to eliminate regrowth.

It is important to choose the correct chemical to treat invasive plants safely and effectively. The categories below and the referenced plant fact sheets will have recommendations for which chemical to use. Be sure to always read the product label, and not to use it for purposes not on the label. There are many companies that will perform herbicide work. These companies employ certified pesticide applicators who can apply herbicide safely and effectively. Some chemicals will require a pesticide applicator's license and application should not be attempted without a license.

Method	Plants	When to use	Time of year
Foliar Spray	All	Mild to severe infestations. When plants are below head height.	Leaf out (spring) to early fall.

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Hack and Squirt	Woody species	Mild to severe infestations. When plants are larger and away from areas where they present a hazard after dying.	Late summer to early fall.
Cut and Paint	Woody species	Mild to moderate infestations. Useful with large shrubs, vines, and trees, especially when above head height. Areas where standing dead plants could be a hazard.	Year-round, unless ground is frozen.
Basal Bark	Woody species	Mild to severe infestations. When plants are larger, and when plants away from areas they can present a hazard after dying.	Year-round, unless ground is frozen.

Foliar Spray

A foliar spray is the most versatile chemical treatment, as it can be used on any plant while there are leaves or other soft surfaces. A variety of sprayers, from backpack sprayers to truck rigs, can be utilized to adapt foliar application to your needs. Using sprayers, especially high-powered ones, can lead to drift and non-target application, and care should be taken to minimize these. In many cases the addition of a surfactant to the chemical will help the chemical stick to the leaves and improve efficacy.

The chart below shows timing of treatment, and type of chemical for different types of invasive species. Visit the UMD Home & Garden Information Center for individual fact sheets on many species (extension.umd.edu/hgic/topics/invasive-plant-photos-and-information).

Species	Chemical	Time of year
Lesser Celandine (Forb)	Glyphosate- 1.5% in surfactant and water	Early spring, before flowering
Oriental Bittersweet (Vine)	Glyphosate- 3% in surfactant and water	July to October
Japanese Stiltgrass(Grass)	Glyphosate- 1% in surfactant and water	July to October

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Cut and Paint

Cut and paint is a combination of chemical and mechanical methods. It involves cutting the plant off near the ground, and then painting the stump with herbicide. This method works well to combat root suckering and resprouting in trees, vines and shrubs.

When using cut and paint, herbicide is usually applied with a backpack sprayer. The chemical should be applied to the stump immediately after the cut is made; otherwise the chemical may not be drawn down into the root system.



Cut and Paint: James H. Miller, USDA Forest Service, Bugwood.org

Basal Bark

A basal bark application is herbicide mixed with oil applied to the bark of a tree or shrub. Basal bark herbicides can be mixed with oil on your own, or bought as a premix (easier but more expensive). A mixture of basal bark will require a slightly different pesticide than a foliar application. Make sure that the product you purchase is labeled for basal bark. For example, with the triclopyr product Garlon, Garlon 3A is for foliar applications, but Garlon 4 is for basal bark.

To apply basal bark start about two feet above the root collar, and spray the entirety of the bark surface down to the root collar. The bark should be wetted, but without chemical running off. This treatment can be applied at any time throughout the year, though it is most effective in the fall.

Basal bark treatment should be applied in areas where standing dead trees will not present a hazard. Trees that die while standing can become falling hazards.

Hack and Squirt

Hack and squirt has a similar effect to basal bark, as it will kill the tree while standing. This method has the advantage of not needing a special herbicide or an oil carrier, it is also extremely selective, and uses less herbicide mixture (as the dose is more concentrated).

The hack and squirt treatment requires the use of a hatchet or other sharp tool to cut into the bark at a 45 degree angle, the cut should pass the cambium. A dose of the herbicide is then squirted directly into the cut using a spray or squirt bottle. Additional cuts are made around the tree, with 1 cut for every inch of diameter.

Like basal bark treatments, hack and squirt is well suited for areas with high density of invasive trees that are away from easily accessible areas.

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Follow-up Practices

Invasive species management is never a one and done kind of project. Following up on the initial treatments will help to ensure that goals and objectives are met. Practices include additional treatments, monitoring and restoration plantings.

Many species can be treated in the spring, allowed to grow over the summer, and then treated again in the fall. This practice will target resprouting and plants that were missed the first time. Treatments in subsequent years are necessary to deplete the root reserves, and the seed source. Many invasive plants have seeds that can survive in the soil for years before germinating. By treating for multiple years, it helps to give native plants a chance to outcompete the invasive seed source. Once native plants are re-established, the need for annual treatments should diminish.

In some cases, allowing for the native vegetation to come back on its own may not be enough. Areas that have been disturbed for many years may not have adequate seed source for native vegetation to restore naturally. Similarly, areas that were heavily invaded or invaded by aggressive species may have too much competition for native seed source to establish. In these cases, it's best to do restoration work like planting.

Planting

Follow-up planting can have different approaches based on your needs. The most important thing that planting does is provide competition for invasives by chosen plants. Invasive plants will have a harder time re-establishing if there is shade or good ground cover.

Ground cover can be established by seeding in new grasses or herbaceous plants, or planting plugs. Ground cover is important in areas that were totally invaded and treated, which now have exposed, bare soil. These areas will erode and can be taken over quickly by aggressive invasives. Seeding in a native grass or fast-growing herbaceous plant can establish new ground cover quickly. Look for native meadow mixes that match the growing conditions of the treated areas. You may desire to have some species in the site that do not grow well from seed. In this case, purchasing plugs of the plant can be an effective way to mix it in with a seed mixture.

Planting woody species is essential to restore damaged forested areas. By planting, you can help control the species that will grow into the area and give them a leg up on re-establishing invasive species. The goal with planting woody species is to eventually have canopy closure, which will make it more difficult for invasive species to be re-introduced. Your local county forester can help with making a planting plan for areas you need to restore. Below are some guidelines to follow for having a successful planting.

1. Right tree right place - make sure the planted species is suitable for the planting area by matching it to light, moisture, and soil conditions. [Chesapeake Natives](#) is a useful tool by U.S. Fish and Wildlife for determining appropriate plants.

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2. Diversity - having a variety of species can help protect against disease and increase resiliency of the planting. It also looks nice!
3. Right time - planting in mid-spring and late fall is ideal for tree survival. Late spring and summer can be too hot, and the new environment can shock and kill the tree.
4. Spacing - 10 x 10 ft is common for spacing planted trees in larger plantings. It allows for the canopy to close quickly but allows for mowers and equipment to fit between trees. For plantings around the house, try to keep 30 feet from mature trees and buildings.
5. Use tree protection - tree tubes and stakes will protect trees from being eaten by deer, voles, and other animals. Weed mats can provide additional support against competition.
6. Maintenance - inspecting the planting, resetting tubes, and pulling weeds can all help ensure survival of planted trees. Watering can help establishment when possible, in summer months.



Restoration project featuring tree planting at Tuckahoe State Park

Monitoring

As you move forward with managing the invasive species, it's important to continue monitoring to see how treatments are working, and if any new invasions are occurring. Monitoring can be significantly easier than the initial inventory, as you can focus on areas that you know are invaded or likely to become invaded. Areas that were treated for invasive species should be checked at least annually for re-establishment. Early detection of regrowing species will let you treat them while it is more manageable and less costly. Areas that were not infested but were near severe infestations can also be checked annually.

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Common Invasive Plants in Maryland Natural Areas

This appendix provides an overview and introduction to some of the common invasive plant species.

Tree of heaven

Growth form: tree

Habitat type: disturbed areas, open forest, rights-of-way

Reproduction and spread: produces windblown seeds, stressed trees will produce large number of root suckers

Asiatic dayflower

Growth form: emergent

Habitat type: wet soils, can be submerged

Reproduction and spread: seed, sometimes fragmentation

Autumn olive

Growth form: shrub

Habitat type: disturbed areas, open forest, rights-of-way

Reproduction and spread: animals spread seeds

Callery pear

Growth form: tree

Habitat type: disturbed areas, rights-of-way

Reproduction and spread: animals spread seed, roots suckering

Garlic mustard

Growth form: herbaceous biennial

Habitat type: prefers forest understory with partial shade, disturbed or riparian areas. Will grow full shade to sun

Reproduction and spread: cross or self-pollinated seed production

Japanese barberry

Growth form: shrub

Habitat type: disturbed areas, partially shaded forests

Reproduction and spread: animals spread seed



*Callery pear blooming in Anne Arundel County
Photo by Will Parson/Chesapeake Bay Program*

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Japanese honeysuckle

Growth form: vine

Habitat type: forest edge, riparian areas, disturbed areas

Reproduction and spread: animals spread seed



*Japanese honeysuckle by Mokkie
Wikimedia Commons*

Japanese knotweed

Growth form: herbaceous shrub

Habitat type: riparian, disturbed areas, rights-of-way

Reproduction and spread: seeds and fragmentation

Japanese stiltgrass

Growth form: grass

Habitat type: disturbed areas, rights-of-way, forests, riparian areas, especially areas that are partially shaded and moist

Reproduction and spread: seed and vegetative by root nodes



*Japanese stiltgrass by Michael Ellis
Wikimedia Commons*

Japanese/Chinese wisteria

Growth form: vine

Habitat type: forest edges, rights-of-way, disturbed areas

Reproduction and spread: seed or vegetative from rootstocks

Mile-a-minute

Growth form: vine

Habitat type: open fields, disturbed areas, forest edges, rights-of-way

Reproduction and spread: animals spread seed, water dispersal

Mimosa tree

Growth form: tree

Habitat type: disturbed areas, riparian, forest edges, other open areas

Reproduction and spread: seed and vegetative



*Multiflora rose by Famartin,
Wikimedia Commons*

Multiflora rose

Growth form: shrub, can act like a vine and climb

Habitat type: disturbed areas, fields, forests, common along agricultural/pastoral fields

Reproduction and spread: animals spread seed

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Oriental bittersweet

Growth form: vine

Habitat type: disturbed areas, forest edges, riparian area, can invade into forests

Reproduction and spread: animals spread seed, vegetative via stolons and rhizomes

Paulownia

Growth form: tree

Habitat type: forest edges, disturbed areas, adjacent to currently or previously landscaped areas

Reproduction and spread: wind and water spread seed, suckering

Wavyleaf basketgrass

Growth form: grass

Habitat type: forest shade tolerant, can be found from edges to interior

Reproduction and spread: sticky seeds that can be transported by animals and humans



Pulling wavyleaf basketgrass at Patapsco Valley State Park

Wineberry

Growth form: subshrub

Habitat type: disturbed areas, forest edges, riparian areas, prefers moist

Reproduction and spread: animals spread seed, vegetative when the edge of branches touch ground

Noxious weeds

There are several noxious weeds in the state including shattercane, johnsongrass, Canada thistle and other invasive thistles. These species are mainly a problem in agricultural lands and rights-of-way.

Intense management has led to the decrease of these species, and they are not often found in natural settings.

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Resources for ID and Management

ID Guides

[Plant Invaders of Mid-Atlantic Natural Areas](#)

Swearingen, J., B. Slattery, K. Reshetiloff, and S. Zwicker. 2010. Plant Invaders of Mid-Atlantic Natural Areas, 4th ed. National Park Service and U.S. Fish and Wildlife Service. Washington, DC. 168pp.

Management Guides

[A management guide for invasive plants in southern forests](#)

Gen. Tech. Rep. SRS-131. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 120pp.

[Penn State Invasive and Competing Plants](#)

Species specific and general guides for tackling invasive species.