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Non-native Invasive Plants

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Economically, non-native invasives cost the United States about $20 billion annually (Fantle-Lepczyk et al. 2022). Costs arise from decreased productivity and expenses associated with control efforts. Non-native invasives come in all shapes, sizes, and kingdoms. There are non-native invasive mammals, fish, insects, crustaceans, mollusks, bacteria, fungi, plants, and viruses. This publication will focus on non-native invasive plants. Virginia has over 100 species of non-native invasive plants.

So, what makes non-native invasive plants non-native and invasive? In general, they are species introduced (intentionally or unintentionally) from somewhere else that flourish in their new environment. They all tend to share certain characteristics that help them excel at being non-native and invasive. These include:

A lack of natural predators in their new environment. Most species that are invasive in their introduced location are not invasive in their native range. There is something in their native range that keeps them in check. This might be competition with other plants, soil conditions, weather, an insect, a disease, or a combination of factors. Unfortunately, when non-native invasive species are introduced here, the controlling agents are typically not.

Prolific reproduction. Non-native invasives tend to be extremely good at reproducing. An example is ailanthus or tree-of-heaven (*Ailanthus altissima*). A single female tree can produce over 300,000 seeds a year.

Multiple means of reproduction. Some species can reproduce in more than one way. For example, the aquatic invasive plant, hydrilla (*Hydrilla verticillata)*, has four means of reproducing. New plants come from fragments of mature plants, tubers, turions (detachable buds), and seeds.

Excellent dispersal. A key element of being an invader is the ability to spread across the landscape. The non-native invasive shrub, autumn olive (*Elaeagnus umbellata*), produces juicy, nutritious berries that wildlife eat and disperse.

Adaptability. Many non-native invasives are generalists and grow and live under a wide variety of soil, moisture, and light conditions. The non-native mile a minute vine *(Persicaria perfoliata*) invades a wide variety of habitats, from forest openings to stream sides.

Early arrival. Non-native invasive plants tend to be pioneer species. They quickly occupy sites that have been recently disturbed. Japanese stiltgrass (*Microstegium vimineum*) is a good example of an invader that fills in on disturbed soils along hiking trails, rights-of-way, and logging roads. As parcelization and fragmentation (land-use change) occur across Virginia, the number of disturbed areas increases.

Non-native invasive species have negative ecological impacts. These may include:

Altered forest structure. Healthy forests have a vertical structure that includes ground cover vegetation, shrubs, and young trees, and an overstory canopy. This vertical structure is important for the diversity of both plants and animals. A non-native invasive such as kudzu *(Pueraria lobata*) can eliminate this vertical structure by covering and pulling over shrubs and trees, resulting in a mat of vines with little vertical structure.

Altered ecosystem function. Non-native invasives change how our native ecosystems function. For example, English ivy (*Hedera helix*) is a non-native invasive vine (and widely planted) that climbs large trees, eventually taking over their canopies and killing them (figure 1). The result is like that of kuzdu; eventually, all that remains is a mat of vines.

Figure 1. English ivy is commonly found in urban and suburban areas. (Jennifer Gagnon, Virginia Tech)

Reduction of native species. Because of the characteristics mentioned above, non-native invasive species can outcompete slower growing, less prolific native species. And sometimes they get help from an opportunistic native species, the white-tailed deer. Deer will selectively browse native plants while leaving non-natives alone. This gives the non-natives an additional advantage.

Decreased productivity. Timber and native wildlife production on sites overtaken by most non-native invasive species will decrease, as native species often do not compete well with non-native invasives.

Decreased biodiversity. In areas inundated with non-native invasives, there is typically a significant diversity loss as natives are pushed out and one or several non-native invasive species take over.

The best advice for woodland owners is to know how to identify common non-native invasive species in their woods. Then, they should walk the property regularly to look for signs of these species. When problems are found, a mitigation plan should be formed as soon as possible. The earlier that non-native invasive problems are addressed, the less expensive and time-consuming control will be, and the chances of successful eradication (or at least containment) will improve.

To help narrow down which problems may be lurking in the woods, woodland owners should talk to neighbors and seek advice from local service foresters (http://www.dof.virginia.gov) or other natural resource professionals. Most natural resource professionals are all too familiar with non-native invasive species.

And what should woodland owners do if they find a problem? Learn about the species. Knowing how the species of concern grows, spreads, reproduces, etc., will help to formulate an effective mitigation plan. One important aspect of non-native invasive plant control is reclaiming the site afterwards. Once a non-native invasive is removed (or is at least under control), it is important to reestablish native species to claim the site. Otherwise, the area will be ripe for a new invasion.

There are several tools available for woodland owners with non-native invasive plant problems. Some may be more appropriate depending on the species, the site, and the woodland owners' resources. Access to machinery, ability to perform physical labor, time, and money may all affect which tools are used.

Mechanical control entails pulling, digging, mowing, disking, grazing, or burning. Timing of mechanical controls can be crucial to success. For example, in most instances, mowing should occur before the target plants produce seed.

Mechanical control can be effective with certain species. For example, garlic mustard (A*lliaria petiolata*) is a non-native invasive herbaceous plant that can be easily hand-pulled. However, in some cases, attempts at manual control without chemical follow-up can exacerbate the problem. When the tree-of-heaven is cut, the remaining stump and roots produce numerous sprouts; one stem is replaced by many. Chemical follow-up is required to manage the problem. Additionally, repeat mechanical treatments are necessary for many species.

Figure 2. Mechanical control, such as hand-pulling, is an effective means of removal for some species, like garlic mustard. (Karen Snape, Virginia Tech),

Biological control methods involve introducing natural predators to control pests. Biological controls can be effectively used for some plant pests. However, all biological controls must undergo intensive testing before being released into the environment, lest they, too, become a problem. Appropriate biological controls must only affect the desired pest species and must not become invasive themselves.

Chemical control can be an effective means of reducing or eradicating non-native invasives. A wide variety of herbicides are available.

Chemicals vary in their selectivity. Some are broad-spectrum (non-selective) that may kill a wide variety of species. Others are narrow-spectrum (selective) and may only work on one or a few species. The label explains which species are affected by the active ingredients in the chemical formulation.

Some chemicals tend to leach from the soil into waterways, while others remain in the soil long after the targeted species dies. Many chemicals are available in either water-based or oil-based solutions; the difference between these formulations contributes to the chemical's environmental persistence and efficacy.

It is always important to read the label before choosing a chemical control option. Not only does the label state what the chemical is designed to control, but it also states if it is safe to use around water. The label lists required personal protective equipment to wear during application and mixing, usage rates, and other pertinent guidelines. Pesticide labelling carries the force of law. The Virginia Cooperative Extension publication Reading Pesticide Product Labels provides greater detail about the information found on labels.

Cultural control practices, such as promoting the use of native species and preventing the sale of non-native invasive species, can also help slow the spread of non-native invasives in the landscape. And landowners can directly aid with cultural control by learning what non-native invasives are in their woods and taking steps to manage them.

For many non-native invasive species, the best approach is integrated pest management. IPM incorporates two or more of the above control methods.

Figure 3. While chemical control should be your last resort, in some cases, herbicides are the only effective means of controlling non-native invasive species. A wide variety of hand-held and backpack sprayers are available to help woodland owners apply chemicals safely and effectively. (Jennifer Gagnon, Virginia Tech)

There are numerous non-native invasive resources available.

- Blue Ridge PRISM: https://blueridgeprism.org/
- Early Detection & Distribution Mapping System (EDDMapS): http://www.eddmaps.org/
- Environmental Safety of Forestry Herbicides: http://www.cof.orst.edu/cof/fs/kpuettmann/FS%20533/Vegetation%20Management/Environmental%20safety.htm
- Fantle-Lepczyk, J.E., P.J. Haubrock, A.M. Kramer, R.N. Cuthbert, A.J. Turbelin, R. Crystal-Ornelas, C. Diagne, and F. Courchamp. 2022. Economic costs of biological invasions in the United States. Science of the Environment. V. 806, 3. https://doi-org.ezproxy.lib.vt.edu/10.1016/j.scitotenv.2021.151318
- Herbicides and Forest Vegetation Management: https://extension.psu.edu/herbicides-and-forest-vegetation-management
- Invasive and Non-native Species of North America: www.invasive.org
- Non-native Invasive Plant Species Control Treatments https://dof.virginia.gov/forest-management-health/forest-health/invasive-plants-in-virginia/Nonnative Invasive Plants of Southern Forests: A Field Guide for Identification and Control: https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs062/
- Plant Invaders of Mid-Atlantic Natural Areas: https://www.invasive.org/midatlantic/fieldguide/index.cfm
- Southern Regional Extension Forestry Forest Health: http://www.southernforesthealth.net/
- Southeast Non-native Pest Plant Council (SEPPC): https://www.se-eppc.org/weeds.cfm
- USDA PLANTS Database: https://plants.usda.gov/
- Virginia Tech Pesticide Programs: https://vtpp.ento.vt.edu/
- Virginia Invasive Species: http://www.vainvasivespecies.org/species

If you have additional questions or need assistance, contact an Extension Agent with your local Virginia Cooperative Extension office (www.ext.vt.edu).

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