Alien Invaders!

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Ever wonder if there is life on another planet? Well, what if you knew there were alien invaders right in your own backyard? That is the case for most private landowners in the state of North Carolina. My job at the N.C. Wildlife Resources Commission is to help private forestland owners in the Piedmont region of North Carolina manage their property for wildlife, and almost every single piece of property I have visited in the last three years has had at least one exotic, invasive species present.

E.O. Wilson, the great American author and naturalist, once said "on a global basis...the two great destroyers of biodiversity are, first habitat destruction and, second, invasion by exotic species."

Wisteria Kelly Douglass

What is an exotic species?

Most biologists would claim that native species are those that occurred in the U.S. at the time of European exploration, around the late 1490s or early 1500s, and that exotic species are those that occur here as a result of direct or indirect, deliberate or accidental actions by humans (also called alien, introduced, non-native, or non-indigenous species).

There are actually two types of exotic species: benign exotics and invasive exotics. Benign exotics are species that depend on humans for their survival, like pansies or other cultivated plants that do not produce viable seeds. Invasive exotics are species that can survive and reproduce without human intervention, like kudzu or Japanese honeysuckle.

According to the Center for Invasive Species and Ecosystem Health, we have over 2,700 exotic species in North America. That includes 1,596 plants, 473 insects, 192 diseases and pathogens, 102 fish, 92 birds, 82 reptiles, 66 mollusks, 32 mammals, 31 crustaceans, 31 arachnids, 30 nematodes, and 7 amphibians.

How do they get here?

Most exotic species are introduced intentionally from other countries by people with good intentions to improve wildlife habitat, stabilize or prevent soil erosion, beautify their yards and homes, provide recreational opportunities like hunting or fishing, or for many other reasons. Species such as Chinese silvergrass and oriental bittersweet were introduced into the U.S. from Asia as early as 1736 for use as ornamental and horticultural plants. Autumn olive and bicolor lespedeza (shrub lespedeza or VA-70) were introduced from China and Japan in the 1800s for wildlife habitat and as ornamental plants. Nutria were introduced from South America for the fur trade, feral hogs were introduced (either escaped or released) for hunting purposes, and grass carp, brown trout, and flathead catfish were introduced for pond management and/or fishing purposes. Kudzu and sericea lespedeza were introduced into the U.S. from Asia in the late 1800s and early 1900s for erosion control and forage. Chinaberry and paulownia (princess tree) were introduced into North America in the early- to mid-1800s from Asia for ornamental plantings, but have also been imported

for wood products such as cabinetry. Mute swans were introduced into North America from Asia and Europe for city parks, zoos, and family estates in the late 1800s to early 1900s.

Though most exotic species have been introduced into the U.S. intentionally, some have hitched a ride here unintentionally through a variety of transportation methods. For example, the zebra mussel, native to the Black and Caspian Seas but discovered in the Great Lakes in 1988, was thought to have been introduced through the discharged ballast water of ships. Hydrilla, although released intentionally in the 1960s from aquariums into waterways in Florida, has made its way to at least 27 other states by traveling on boats and fishing equipment (fragments of the plant can root and develop into a new plant). The emerald ash borer, recently discovered in the U.S. in 2002, most likely hitched a ride in ash wood being used to stabilize cargo in ships or crate heavy consumer products from Russia, China, Japan, or Korea. And Japanese stiltgrass was accidentally introduced into the U.S. in 1919 while being used as packing material for porcelain being shipped in from Asia.

How do they become invasive?

First and foremost, they are extremely productive. They can grow and reproduce rapidly, can breed or reproduce at early ages, have longer growing seasons which means faster growth to maturity, and can reproduce via multiple pathways (via roots, stems, and/or seeds). Feral hogs, for example, can have 4-12 piglets per litter with 2 litters per year and can reach sexual maturity at 6-10 months of age. Purple loosestrife can produce hundreds of thousands of seeds per plant, while zebra mussels can produce up to 1 million eggs per year.

Many of the exotic, invasive plants have long seed viability (i.e., high dormancy rates), multiple adaptations for seed dispersal, and high and/or staggered germination rates. Eurasian watermilfoil fragments can be carried on boats or trailers to new locations hundreds of miles away and autumn olive berries can be eaten by birds and deposited wherever they fly. Japanese stiltgrass can produce 100 to 1,000 seeds per plant that can remain viable in the soil for at least 3 years, and are transported easily on animal fur and human clothing.

Some exotic, invasive plants, such as tree-of-heaven, have allelopathic properties and can release chemicals into the soil that inhibit the growth of or kill surrounding plants. In addition, a single mature tree can produce up to 300,000 seeds per year that can be dispersed by wind and water.

Exotic, invasive species also compete aggressively for resources, such as food, water, nesting sites, and cover, and can tolerate a wide variety of habitats and conditions. Many have salinity, drought, shade, and/or flooding tolerances, can handle high sedimentation high nutrient load waters, and can handle extremely cold or hot weather. They can also adapt easily and expand their range quickly. Most exotic, invasive species also lack natural predators or pests in the new ecosystem and may be resistant to native predators. Multiflora rose and trifoliate orange, for example, are resistant to grazing from cattle because of their thorns.

Many exotic, invasive species have at least one, if not several, of these characteristics.

Princess Tree Kelly Douglass

What effects do they have on our ecosystems?

Firstly, they can have community level impacts, such as native species displacement. Japanese knotweed, for example, can alter organic matter decomposition and soil chemistry to favor itself competitively. Japanese stiltgrass out-competes native herbs, and porcelainberry and kudzu shade out native plants. European honeybees can displace native pollinators by outcompeting them for floral resources, and coyotes can hybridize with native wolf species to reduce genetic purity.

Secondly, they can have direct or indirect effects on wildlife habitat and populations. Some exotic, invasive species, such as feral hogs, can destroy habitat and disturb soil, causing a direct negative impact on native wildlife. Bush honeysuckle and buckthorn are favored by birds because of their strong branches, but the shrubs also ease predator access which can result in reduced nest success. Many birds prefer exotic fruits and are attracted to the showy flowers and colorful berries, which only aids in the plant's dispersal and can alter the foraging activity of birds. Changes in fruit availability and nutrition can also have direct impacts on the health of wildlife populations. Other exotic species, such as autumn olive, can completely shade out the understory of a forest, reducing the herb layer that is consumed by eastern box turtles and other ground-dwelling wildlife. We also know that insects are closely related to plant diversity and native plant species – some insects are specialized pollinators or host-specific species. Therefore, if the number (or distribution) of invasive plants increases, the number of native plants will decrease. As a result, the number of insects (species abundance or distribution) will also decrease, causing a decline in potential prey for insectivorous wildlife and a decline in pollination services.

Tree of Heaven Kelly Douglass

Thirdly, they can reduce forest health and timber productivity. Invasive plant competition, introduced diseases, and insect infestations in forestland can cause increased seedling mortality or cause problems with natural regeneration of forests. Allelopathic plants or vines, such as wisteria and morning glory, can reduce seedling mortality and cause reduced growth rates of crop trees.

In addition, exotic, invasive species can have ecosystem level impacts by altering ecosystem processes, such as disturbance regimes, hydrology, geomorphology, and soil chemistry. Cogongrass, for example, can increase fire intensity in ecosystems that are adapted to frequent, low intensity fires, which can result in a decrease in native and/or rare plants associated with such ecosystems. Atlantic cordgrass can trap sediment on Pacific mudflats, creating marshes and thereby removing important foraging habitat for many migratory shorebirds that feed specifically in mudflats. Chinese tallow tree and barberry can increase soil pH and nutrient loads in soil, while salt cedar can dry up western river drains.

And lastly, but perhaps most importantly, exotic, invasive species can reduce biodiversity. They can lead to a decline in endangered, threatened, special concern or rare species or habitats. According to an article published in Ecological Economics in 2005, "approximately 42% of threatened or endangered species are at risk due to non-native, invasive species."

What are some exotic, invasive plants in North Carolina?

Because I work primarily in the Piedmont region, I have compiled a list of the top 20 exotic, invasive plants that I most commonly observe on private land in the Piedmont:

Trees: tree-of-heaven, princess tree, chinaberry, mimosa

Vines: kudzu, Chinese wisteria, Japanese honeysuckle, Oriental bittersweet, English ivy, and periwinkle

Shrubs: Chinese privet, nandina, autumn olive, multiflora rose, Russian olive, bicolor lespedeza (shrub lespedeza or VA-70)

Grasses: Japanese stilt grass, Chinese silvergrass, tall fescue, bamboo, Johnson grass, Bermudagrass, bahiagrass, weeping lovegrass

Aquatic: alligatorweed, hydrilla, Japanese knotweed, purple loosestrife, parrot feather milfoil, giant salvinia

Herbs/forbs: sericea lespedeza, garlic mustard, bull thistle

What can you do?

After reading about all the doom and gloom associated with exotic, invasive species, there is some good that can come from our situation. The old adage "a pound of prevention is worth an ounce of cure" is completely true when it comes to exotic, invasive species. Our best defense against invasive species is to prevent their introduction. Our next strategy is to eradicate or reduce the spread of the exotic, invasive species already here. So what can you do to help?

1. Learn which exotic, invasive species are in your area. Know how to identify them, report infestations to your local conservation agency, and tell your friends and family about the negative effects of exotic, invasive species. See "A Field Guide for the Identification of Invasive Plants in Southern Forests" by James H. Miller, Erwin B. Chambliss, and Nancy J. Loewenstein (2010) free, on-line at http://www.treesearch.fs.fed.us/pubs/35292.
2. Buy local, native plants, mulch, and firewood. Reduce the demand for exotic species at plant nurseries and outdoor stores by buying locally. Plant only native or benign exotics on your property. Replace any exotic plants with native alternatives. Check out N.C. State University's Going Native website at www.ncsu.edu/goingnative or the North Carolina Native Plant Society website at http://www.ncwildflower.org/index.php for recommendations on native alternatives.
3. Do not collect invasive plants, their seeds, or reproductive bodies. Do not purchase or transport materials containing exotic, invasive species (e.g., Oriental bittersweet wreaths) and do not collect seeds for friends and family. Minimize disturbed ground. A great book to read is "Bringing Nature Home: How You Can Sustain Wildlife with Native Plants" by Douglas W. Tallamy (2009) $15-20, on-line.
4. Control or eradicate exotic, invasive species on your property. Monitor your property annually, learn effective management practices, and treat the exotic, invasive species quickly before they become established. You will most likely need multiple chemical or mechanical treatments for invasive plants. Start with the mature, fruiting plants first, then attack the immature, non-fruiting plants. Be persistent and get help (e.g., volunteer groups like boy scouts, churches, neighborhoods, etc.). See "A Management Guide for Invasive Plants in Southern Forests" by James H. Miller, Steven T. Manning, and Stephen F. Enloe (2010) free, on-line at http://www.treesearch.fs.fed.us/pubs/36915.
5. Do not keep exotic animals as pets. Do not release any exotic animals into the environment – take them to an animal rescue facility or have them humanely euthanized at a veterinarian clinic.
6. Get a habitat management plan, especially if you own more than 10 acres. Contact your local wildlife biologist for more information: www.ncwildlife.org.
7. Be conscious of moving livestock around on your property, because seeds will travel in their digestive systems. Provide a quarantine location, usually for up to 24 hours, for each animal before letting them return to the original paddock/pasture.
8. Avoid driving or recreating in areas where exotic, invasive plants grow. Clean boats/trailers, vehicle undercarriages, boots, and equipment, removing all plant material and mud. Brush dogs before leaving the site. Empty all live wells and bait buckets on-site.
9. Report invasive plant infestations to your local land management agency or one of the following agencies:
    - EDDMapS (http://www.eddmaps.org/)
    - NC Exotic Pest Plant Council (http://nceppc.weebly.com/index.html)
    - The National Invasive Species Council (http://www.invasivespecies.gov/)
    - Center for Invasive Species and Ecosystem Health (http://www.invasive.org/)
    - USDA National Invasive Species Information Center (http://www.invasivespeciesinfo.gov/)