

# Weeds Gone Wild

## Alien Plant Invaders of Natural Areas

[www.nps.gov/plants/alien](http://www.nps.gov/plants/alien)

### Definitions

**Native Range.** Every species of plant, animal, fungi, bacteria and other organism has a home in some part of the world, where it has existed for thousands of years as a result of natural forces and influences like climate, storms, moisture, fire, soils and species interactions. Over long periods of time, these and other physical and biological factors direct the distributions of organisms in nature. A **native** (indigenous) species is one that occurs in a particular region, ecosystem, and habitat without direct or indirect human actions (Kartesz and Morse, 1997). Species native to North America are generally recognized as those occurring on the continent prior to European settlement. **Endemic** is used to describe populations of native animals, plants or other organisms, that have relatively restricted distributions and are confined to certain environments.

Organisms are considered **non-native** (alien, exotic, foreign, introduced, non-indigenous) when they occur artificially in locations beyond their known historical natural ranges. Non-native can refer to species brought in from other continents, regions, ecosystems and even other habitats. Species exotic to the U.S. include those transported from Europe, Asia, Africa, South America, Australia and other parts of the world. It also includes any species moved by people from one locality in the U.S. to a new one. For example, black locust (*Robinia pseudoacacia*) is native to the southern Appalachian region of the eastern U.S. Because of its rapid growth and hardiness, it was planted all around the U.S. during this century for living fences, erosion control, wind breaks and other purposes. Even though it is native to the U.S., black locust is considered exotic anywhere it occurs outside its known historical natural range of southern Appalachia.

**Once an Exotic, Always an Exotic!** European settlers brought hundreds of plants to North America from their home lands, for food, medicinal, ornamental, and other purposes. Introductions of exotic plants continue today, and are increasing due to an exploding human population, increased international travel, and the intentional and accidental movement of large numbers of species between continents as a result of expanded international trade. Many introduced plants have become *naturalized* across the continent and some are replacing North American native plant species. These naturalized plants, however much a part of our current landscapes and ecosystems, are nonetheless exotic, since they were moved here by people rather than by natural means. Because the historical distributions of some species are unknown or unclear, research continues to attempt to unravel the tangle of human and natural influences responsible for their current ranges.

***Growth Habit - Invasiveness.*** The most important aspect of an alien plant is how it responds to a new environment. An ***invasive*** species is one that displays rapid growth and spread, allowing it to establish over large areas. Free from the vast and complex array of natural controls present in their native lands, including herbivores, parasites, and diseases, exotic plants may experience rapid and unrestricted growth in new environments. Invasiveness is enhanced by features such as strong vegetative growth, abundant seed production, high seed germination rate, long-lived seeds, and rapid maturation to a sexually reproductive (seed-producing) stage. Invasive plants reproduce rapidly, either vegetatively or by seed. Their phenomenal growth allows them to overwhelm and displace existing vegetation and form dense one-species stands.

**Not all exotic species are considered harmful.** For example, a small number of non-invasive alien plants (e.g., corn, wheat, oats) form the basis of our agricultural industry and pose little to no threat to our natural ecosystems. However, each alien plant is one less native host plant for our native insects, vertebrates and other organisms that are dependent upon them.

***Weeds, Wildlands and Natural Areas.*** The term weed is a subjective word used to describe any plant considered to be "out of place." In other words, weeds can include native and non-native plants alike, growing wherever someone wishes they weren't. Invasive exotic plants of natural ecosystems are often referred to as natural areas weeds. A ***natural area*** is generally an area of land or water with predominantly native vegetation or natural geological features that is allowed to respond to the forces of nature with little to no direct human interference. The term ***wildlands*** is also used to describe these areas.

***Biodiversity.*** *Biodiversity* is, simply put, all life on earth, even that which has yet to be discovered. More specifically, it includes the millions\* of diverse species, from bacteria to whales, that share the earth's lands and waters with us. Each year, many thousands of species are being extinguished as a result of human activities, such as habitat destruction and exotic species introductions.

*\*The actual number of species in existence is unknown and can only be estimated because we really only know about the species that botanists, entomologists and other scientists have been able to collect, process and identify to date..*

***Noxious Weeds.*** The term ***noxious*** is a legal designation used specifically for plant species that have been determined to be major pests of agricultural ecosystems and are subject, by law, to certain restrictions. The U.S. Department of Agriculture regulates noxious weeds. Plants can also be designated as "noxious weeds" by states and counties, usually through "noxious weed boards". Many noxious weeds designated for their impacts to agriculture also threaten natural areas. *Melaleuca (Melaleuca quinquenervia)*, a tree from Australia, aggressively invades seasonal wetlands in the Everglades National Park in Florida and has been designated a federal noxious weed. Additional listings of exotic pest plants affecting natural ecosystems are expected, as their ecological and economic impacts continue to grow.

# The Invasive Problem

**Impacts of Invasive Alien Plants.** Invasive non-native organisms are one of the greatest threats to the natural ecosystems of the U.S. and are destroying America's natural history and identity. These unwelcome plants, insects and other organisms are disrupting the ecology of natural ecosystems, displacing native plant and animal species, and degrading our nation's unique and diverse biological resources. Aggressive invaders reduce the amount of light, water, nutrients and space available to native species, alter hydrological patterns, soil chemistry, moisture-holding capacity, and erodibility, and change fire regimes (Randall 1996). Some exotics are capable of hybridizing with native plant relatives, resulting in unnatural changes to a plant's genetic makeup; others have been found to harbor plant pathogens, such as bacterial leaf scorch (*Xylella fastidiosa*) that can affect both native and non-native plants, including ornamentals (McElrone, et al., 1999). Still others contain toxins that may be lethal to certain animals. For example, garlic mustard has been found to contain compounds that are lethal to a native butterfly species.

Exotic organisms have been referred to as biological pollution (Westbrooks 1991). In some cases, exotic plant invaders are driving our rarest species closer to extinction. According to the U.S. Fish and Wildlife Service, an estimated 42% of the nation's endangered and threatened species have declined as a result of encroaching exotic plants and animals. And management of these species is expensive. Each year, the National Park Service and the Fish and Wildlife Service spend an estimated 2 and 10 million dollars, respectively, on controlling exotic plants (Westbrooks, 1998). Invasive plants also cause great economic losses and expenditures each year, measured in billions of dollars, for agriculture, forestry, range lands and roadways management (Westbrooks 1998).

**Impacts to Native Fauna.** Our native fauna, including insects, birds, mammals, reptiles, fish and other animals, is dependent on native plants for food and shelter. While some animals have a varied diet and can feed on a wide number of plant species, others are highly specialized and may be restricted to feeding on several or a single plant species. For example, caterpillars of the monarch butterfly have evolved to feed primarily on plants in the genus *Asclepias* (milkweeds) that contain special chemicals. The term *host plant* is generally used to describe a plant species that is required food for at least one stage of an insect or other animal. As exotic plants replace our native flora, fewer host plants are available to provide the necessary nutrition for our native wildlife.

Approximately 4,000 species of exotic plants (Kartesz and Morse 1997) and 500 exotic animals (Office of Technology Assessment 1993) have established free-living populations in the United States. Nearly seven hundred are known to cause severe harm to agriculture at a cost of billions of dollars annually. Over 1,000 exotic plant species have been identified as a threat to our native flora and fauna as a result of their aggressive, invasive characteristics.

Some of the known ecological impacts of invasive plants are summarized below, and include:

- reduction of biodiversity
- loss of and encroachment upon endangered and threatened species and their habitat

- loss of habitat for native insects, birds, and other wildlife
- loss of food sources for wildlife
- changes to natural ecological processes such as plant community succession
- alterations to the frequency and intensity of natural fires
- disruption of native plant-animal associations such as pollination, seed dispersal and host-plant relationships

Invasive alien plants:

- compete with and replace rare and endangered species
- encroach upon limited habitat of rare and endangered species
- reduce or eliminate localized or specialized native plant communities, such as spring ephemeral plant communities
- disrupt insect-plant associations necessary for seed dispersal of native plants
- disrupt native plant-pollinator relationships
- reduce and eliminate host plants for native insects and other wildlife
- hybridize with native plant species, altering their genetic makeup
- serve as host reservoirs for plant pathogens and other organisms that can infect and damage desirable native and ornamental plants;
- replace nutritious native plant foods with lower quality sources
- kill trees and shrubs through girdling
- increase the incidence of plant disease and stress in forested areas
- prevent seedling establishment of native trees and shrubs
- reduce vigor of mature trees through shading
- reduce the amount of space, water, sunlight and nutrients that would be available to native species
- increase erosion along stream banks, shorelines and roadsides
- change characteristics of the soil structure and chemistry
- alter hydrological flows and conditions

***Disturbance Effects.*** Invasive species are especially problematic in areas that have been disturbed by human activities such as road building, residential development, forest clearing, logging operations, grazing, mining, ditching of marshes for mosquito control, mowing, erosion control and fire prevention and control activities. Natural disturbances, such as fires, floods, tornadoes, landslides, and tree falls also provide avenues for invasive species to get started. The enormity of change wrought upon the American landscape over the past few hundred years has thrown things out of balance. Lacking exotic species, native species and ecosystems benefit from natural disturbances that provide opportunities for genetic mixing and nutrient recycling, and reduce fuel loadings.

Some native plants display invasive growth tendencies in their native ranges, often as a response to natural or human-caused disturbances. For example, native grape vines in forests may grow vigorously in response to a tree fall or selective timber cut that opens the canopy and brings abundant sunlight into previously shaded areas. This "invasive" growth spurt is usually temporary though, and slows down again as trees and other plants fill in and the forest canopy is recovered.

*The best way to reduce plant invasions is to focus on preventing non-native species introductions, managing existing infestations, minimizing disturbance to forests, wetlands, barrens and other natural communities, and learning to work with, rather than against, "Mother Nature."*

**Importance of Native Plants.** Approximately 18,000 plants are native to the ecosystems of North America. Our native flora (i.e., all U.S. native plants) provides the foundation of the historic American landscape and defines the various ecosystems and regions of the country. These plants also provide natural sources of food and fiber, and were the essential sources of nutrition and other materials for native American Indians.

The populations of many native plants have been greatly reduced as a result of human encroachment which has destroyed many millions of acres of natural habitat. In the U.S. alone, about 200 native plant species have become extinct since the 1800's and 5,000 species are considered to be at risk. Invasions of non-native plants are the second greatest threat to native species after direct habitat destruction.

### **Selected References**

Kartesz, John, North Carolina Botanical Garden, and Larry Morse, The Nature Conservancy, 1997, Personal communication.

McElrone, A., Sherald, J. L. and Pooler, M. R. 1999. Identification of alternative hosts of *Xylella fastidiosa* in the Washington, DC area using nested polymerase chain reaction (PCR). J. Arboric. (IN press)

Office of Technology Assessment. 1993. Harmful non-indigenous species in the United States. OTA-F-565. Government Printing Office, Washington, D.C.

Randall, J. and J. Marinelli. 1996. Invasive plants: weeds of the global garden. Brooklyn Botanic Garden Club, Inc. Handbook No. 149. 111 pp.

Sherald, J. L. and Kostka, S. J. 1992. Bacterial leaf scorch of landscape trees caused by *Xylella fastidiosa*. J. Arboric. 18: 57-63.

Stein, B. and S. Flack. 1996. America's least wanted: Alien species invasions of U.S. ecosystems. The Nature Conservancy, Arlington, Virginia.

Westbrooks, R. 1991. Plant protection issues I. A commentary on new weeds in the United States. Weed Technology 5:232-237.

Westbrooks, R. 1998. Invasive plants, changing the landscape of America: Fact book. The Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), Washington, D.C., p.8

The Nature Conservancy, Arlington, VA.

## What You Can Do

*In order to prevent the introduction or spread of invasive alien plants into natural areas, and to help restore our native flora and fauna, you can:*

- Avoid disturbance to natural areas, including clearing of native vegetation, planting of non-native plants and dumping of yard wastes.
- Do not purchase or use invasive exotic species in your landscaping or for land restoration or erosion control projects.
- For landscaping, use plants that are native to your local region as much as possible or those that are not known to be invasive.
- Know your plants. If you are unsure of the identification of a plant, take a sample to a university, arboretum, department of agriculture office, local nature center, or native plant society for assistance. Find out if it is known or thought to have invasive tendencies. If the exotic plant is closely related to an invasive species, it is likely to have similar tendencies. To be on the safe side, if you don't know it, don't grow it.
- Control exotic invasive plants in your landscape either by removing them entirely or by managing them to prevent their spread outside your property. This may include pruning to prevent flowering and seed dispersal or cutting, mowing or herbicide use to prevent vegetative spread.
- Discuss your concerns about invasive exotic plants with nurseries and garden shops and ask them not to sell these species. Provide them with printed material (such as this) explaining the problem to read later. Ask for non-invading alternatives instead.
- Notify land managers of invasive exotic plant occurrences.
- Offer to assist in exotic plant removal projects.
- Work with your local government to encourage the use of native plants in their urban and suburban landscapes. Provide them with lists of attractive, non-invasive locally native alternatives that are naturally more hardy, pest-resistant, and provide more nutritious food for wildlife than cultivated plants.