

# Invasive Species

## What is an invasive species?

An invasive species is defined as a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health according to The Forest Service Framework for Invasive Species (USDA Forest Service, 2003). The framework notes that thousands of invasive exotic plants, insects, fish, mollusks, crustaceans, diseases, mammals, birds, reptiles, and amphibians have infested hundreds of millions of acres of lands and waters across the nation, causing massive disruption in ecosystem function, reducing biodiversity, and degrading ecosystem health. Forests, prairies, mountains, wetlands, rivers and oceans have each been infested by these aggressive exotic species.

## Trends and rising threats from invasive species

Humans intentionally and unintentionally spread invasive species. The foundations of agriculture and animal husbandry are based on ancient habits of selectively favoring some plant and animal species and their habitats over others for food, fiber, and medicine (Flannery 1973). According to Pimentel and others (1999), about 50,000 non-native species have been introduced in the United States. Many nonnative species have been deliberately introduced for erosion control (kudzu), food animals and fish (brown trout), agricultural crops (Johnson grass), and ornamental trees and landscape plants (purple loosestrife). Some insects and diseases have been introduced in ignorance, as was the Gypsy Moth, or as the unintentional result of a global economy, as with the West Nile virus and Zebra mussels (Pimentel and others 1999).

Many invasive plants in the United States were originally introduced for food, fiber or erosion control, or as ornamentals. For example, purple loosestrife was introduced as an ornamental in the early 19<sup>th</sup> century. Loosestrife is present in riparian areas throughout the continental United States and control costs are an estimated \$45 million per year. Riparian areas are extremely valuable to native plants and animals, and the wholesale invasion by Loosestrife poses a serious threat of eventual extinction to numerous riparian-dependent species (Pimentel and others 1999).

Other plant species, such as European Cheatgrass, have almost entirely displaced sagebrush-grassland plants and associated animals. Cheatgrass has also seriously altered the fire regime from an average return interval of 60-110 years to 0-3 years. Cheatgrass is an example of the adverse impacts an introduced species can have on the environment. Some scientists estimate that Cheatgrass is present on 100 million acres of grassland-steppe in the western United States. Cheatgrass forms a dense, uniform carpet that out-competes native grasses and shrubs. It greens quickly, dries quickly and produces a very flammable cover that often burns completely, without allowing native plants to reestablish. In pinyon-juniper woodlands, the combination of Cheatgrass and fire may effectively prevent the re-establishment of the original woodlands (Mitchell 2000).

Invasive species cost the public approximately \$137 billion per year in damage, loss, and control (Pimentel and others, 1999). The economic losses are significant but the

ecological and cultural losses of native flora and fauna are equally important. For example, the bullfrog, a nonnative species in California, has almost completely replaced the native California red-legged frog--the famed jumping frog of Calaveras County. Another introduced plant, the Giant Reed, eliminates native streamside vegetation and dries up creeks that provide habitat for four endangered species: least bell's vireo, southwestern willow flycatcher, California red-legged frog, and unarmored three-spine stickleback (USDA Forest Service 2003a). Approximately 46% of the plants and animals federally listed as endangered species have been negatively impacted by invasive species (Wilcove and others 1998).

Introduced insects and disease have also taken their toll on the environment. Chestnut Blight and Dutch elm disease are two well-known examples. Gypsy moth was intentionally introduced in the 1800s as a possible source of silk production. As a result of these well-known pests, the American chestnut and American elm have virtually disappeared from the US landscape and numerous other eastern trees are at risk from Gypsy moth (USDA Forest Service 2001).

## **What is the role of the Forest Service?**

The Forest Service Chief has recognized the threat that invasive species pose to forest health, the economy, and the mission of the Forest Service. The interaction between the invasive species threat and other significant threats needs to be considered. For example, accidental spread of invasive species by unregulated OHV use, the spread of invasives on newly burned areas, and the wide swaths of some invasives that fragment habitats are obvious interactions. The invasive species issue is broad and impacts almost all terrestrial and aquatic habitats nationwide.

## **Law and policy governing invasive species**

Managing and controlling invasive species requires an extraordinary coordination of programs, research, and management actions at the federal, state, and local levels. Invasive species affect all land ownerships and jurisdictions. The U.S. Department of Agriculture alone has six agencies involved in the control of invasive species (Tenny 2002).

The Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 et. seq.), 36 C.F.R. 222.8, Departmental Regulation 9500-10, and Forest Service Manual 2080 outline agency responsibilities for noxious weed management. (Note: not all legally defined "noxious weeds" are non-native invasive plants.) FSM 2080 provides guidance to the National Forest System to address the more narrowly defined "noxious weed management". Forest Service responsibilities and management direction for the control of insects and disease are listed in the Cooperative Forestry Assistance Act of 1978 (92 Stat. 356; 16 U.S.C. 2101) and Forest Service Manual 3400.

In 1999, Executive Order 13112 created the National Invasive Species Council (NISC) co-chaired by the Departments of Agriculture, Commerce and Interior. The executive order recognized the ecological and economic threat posed by invasive species and directed a broad intergovernmental effort to address invasive species problems (National

Invasive Species Council 2001). An Invasive Species Advisory Committee of non-federal representatives was appointed by NISC to provide advice and information to federal agencies. NISC's Management Plan, published in 2001, set nine goals including prevention, early detection and rapid response, control and management, restoration, international cooperation, research and education (NISC, 2001).

The Forest Service is developing a comprehensive national strategy to alleviate the impacts and reduce the threat from exotic invaders (Forest Service 2003). Invasive species control is also addressed in the agency's strategic plan under "Goal 2: reduce the impacts from invasive species" (USDA Forest Service 2003b). The objective under this goal is to "improve the effectiveness of treating selected invasive species on the Nation's forests and grasslands."

## **Invasive Species on National Forests**

### ***Invasive Plants***

The United States has about 2,000 non-native invasive plant species, which are concentrated in California, Florida, and Hawaii (Mitchell 2000). On non-croplands in the midwestern states, one Forest Service researcher estimates that 14 percent of the plant species are non-native invasive plants. Trend data from the 19<sup>th</sup> century to the present indicates a significant escalation in the percentages of non-native invasive plants in the last half of the 20<sup>th</sup> century (Mitchell 2000).

An estimated 3.5 million acres of National Forest System lands are infested with invasive weeds, according to the 2000 RPA assessment, which summarized local estimates from individual national forests (USDA Forest Service 2001). However, local estimates vary widely, and the agency lacks a comprehensive inventory for either terrestrial (land) or aquatic areas infested with invasive species. The Framework for Invasive Species calls for expanding inventory and monitoring activities to identify more invasive insects, pathogens and plants (Forest Service 2003). Some species of particular concern to Forest Service managers are leafy spurge, knapweeds and starthistles, saltcedar, non-indigenous thistles, purple loosestrife, and cheatgrass in the West and garlic mustard, kudzu, Japanese knotweed, Tree-of-heaven, and purple loosestrife and hydrilla in the East (Mitchell 2000).

### ***Insect Damage and Disease***

Insect damage and plant disease are natural disturbances that are part of a healthy, functioning ecosystem, along with fire and wind damage. However, both native and non-native insects and diseases have caused above normal mortality rates on forested lands in the United States. Some 58 million acres or 8 percent of forested land are at risk for mortality rates that exceed the norm by 25 percent or more (USDA Forest Service 2001). High mortality rates can accelerate the development of high fuel-loading in fire-dependent forests, effectively remove important ecosystem elements, and reduce private property values.

The highest profile exotic insects and diseases include Dutch elm disease, chestnut blight, white pine blister rust, Port-Orford cedar root disease, European gypsy moth, hemlock wooly adelgid, and beech bark disease. Aside from the potential

economic loss from timber volume, many wildlife and fish species are dependent on the ecosystems affected by these invasive insects and diseases (USDA Forest Service, 2001).

## **International context**

Invasive species negatively affect natural ecosystems throughout the world by out-competing native flora and fauna for resources and growing space. Because there are often no biological controls on their growth, invasive species spread quickly and negatively impact threatened and endangered species. At least 4,500 nonnative plant, animal, and microbe species were established in the United States during the 19<sup>th</sup> century, and about 15 percent of these are considered harmful (Eav 1999).

Many invasive species arrive in the United States through international trade. Therefore, the Forest Service must work with international partners to (1) stem the flow of invasive species into the country, (2) discern and apply biological controls for invasives that have already established and spread, and (3) protect island ecosystems, which are especially vulnerable due to their high percentage of unique species and evolutionary isolation.

## References

- Eav, B.B. 1999.** International perspective: Cooperation to control invasive species. International Programs News.  
<http://www.fs.fed.us/global/news/oldnewsletters/september99/welcome.htm>
- Flannery, K.V. 1973.** The origins of agriculture. Annual Review of Anthropology 2: 144-174.
- Mitchell, J.E. 2000.** Rangeland resource trends in the United States: A technical document supporting the 2000 USDA Forest Service RPA assessment. RMRS-GTR-68. USDA Forest Service Rocky Mountain Research Station. 84 p.
- National Invasive Species Council. 2001.** Meeting the invasive species challenge. Management plan. <http://www.invasivespecies.gov/council/nmp.shtml> (October 2001)
- Pimentel, David and others. 1999.** Environmental and economic costs associated with non-indigenous species in the United States.  
[www.news.cornell.edu/releases/jan99/species\\_costs.html](http://www.news.cornell.edu/releases/jan99/species_costs.html)
- Tenny, D. 2002.** Testimony to Congress on October 2, 2002 concerning invasive species. Deputy Under Secretary Natural Resources and Environment United States Department of Agriculture. [www.fs.fed.us/congress/2002\\_testimony](http://www.fs.fed.us/congress/2002_testimony)
- USDA Forest Service. 2001.** 2000 RPA assessment of forest and range lands. USDA Forest Service, FS-687, February 2001
- USDA Forest Service. August 2003.** Framework for a Forest Service strategy for invasive species.
- USDA Forest Service. 2003a.** [www.fs.fed.us/r6/invasiveplant-eis/plantinfo.html](http://www.fs.fed.us/r6/invasiveplant-eis/plantinfo.html).
- USDA Forest Service. 2003b.** Strategic plan for fiscal years 2004 – 2008.
- Wilcove, D.S. and others. 1998.** Quantifying threats to imperiled species in the United States. BioScience. 48:607-615.

-FS-