

## Invasive Species

One of the most important changes that humans have made to ecosystems is the introduction of alien species. These are species that have been moved outside of their native range by human activities and which subsequently established self-sustaining populations. Many of the organisms that are most familiar to us, such as the apple tree or the common carp, are not originally from the United States. Even pineapples are not originally from Hawaii. Most non-native species are not invasive, and do not cause problems to their new ecosystem. Those that *are* harmful to an ecosystem are called invasive species; some recent examples include the bird flu, the Asian long-horned beetle (seen in the photo at right, from [www.whitehouse.gov](http://www.whitehouse.gov)), and purple loosestrife. In general, invasive species follow the “10% rule”: 10% of alien species survive in the new environment, and 10% of those that survive become invasive. Invasives cause a lot of problems, ranging from spreading disease to wiping out native species to completely changing the functioning of the ecosystem.



Newly introduced organisms tend to do very well because they have no native predators, don't have competitors, and are not susceptible to disease in the new home. If the population grows rapidly, it can take over entire habitats and out-compete native species. There are over 50,000 alien species in the United States. Non-native plants are invading about 1.7 million acres of wildlife habitat every year, threatening already vulnerable endangered species. The Asian long-horned beetle, mentioned above, eats all hardwood trees, and has the potential to destroy industries such as maple syrup, lumber, and tourism. Invasive insects and pathogens are responsible for millions of dollars in crop losses. One study estimated that invasive species cost the US more than \$100 billion dollars a year to control.

Islands are particularly vulnerable to invasive species, and dramatic changes can occur after an introduction. The Galapagos Islands, for instance, suffers from a number of invasive species including raspberry bushes, goats, rats, donkeys and pigs. All of these organisms escaped when humans brought them to the islands, and they have caused



dramatic problems. Currently, managers in the Galapagos have begun shooting the goats, donkeys, and pigs on some islands because they eat so much of the vegetation. The photo on the left from the Charles Darwin Foundation shows a fence that keeps goats out of a part of Isabella Island, restricting their ability to graze. Hawaii also suffers from many invaders, such as the mongoose, which was introduced as a biocontrol to eat the

rats that were destroying the sugar crop. A biocontrol is an organism that naturally eats the target pest, or invasive species. However, this attempt at biocontrol didn't work, because mongooses are active during the day, while rats are active at night. Instead of solving their problem, it was made worse, because now Hawaii has both rats and mongooses. Meanwhile, the brown tree snake is a problem on the island of Guam, where it has caused the extirpation of a dozen native bird species.

Another important and often-cited example of the damages caused by an invasive species



comes from Lake Victoria in east Africa. The Nile perch was introduced into the lake as a new source of protein for the local people in the 1950s. The perch grows quickly and to immense sizes (often six feet long; photo at left from [www.moldychum.com](http://www.moldychum.com)).

However, because the perch are so large, they also have to eat a lot, and native fish biomass decreased rapidly after its arrival. In 1978, the native cichlid species were about 80% of the biomass in the lake, while Nile perch were only 2% of the biomass. By the end of the 1980s, those numbers had reversed. Today, more than 60% of the native species are believed to have become extinct, and other changes have occurred in the lake, such as an increase in nutrients and a decrease in oxygen. Scientists believe this is due to

the decline in the native fish which previously controlled the plankton community. The lake now suffers from frequent algal blooms.

Since the middle of the 19<sup>th</sup> century, invaders have been establishing themselves in the Hudson River at a steady rate of about seven species per decade. Invasive species arrive inadvertently in ship ballast (both solid ballast and ballast water), through canals (like the Erie Canal), as unseen 'hitchhikers' on people, animals, or boats, through escaping from agricultural areas, on wooden shipping pallets, and by people introducing them on purpose, which is often the case with garden plant escapees. Many garden centers still sell invasive plants, such as Japanese barberry. Larger rivers like the Hudson are more susceptible to invasions because they are heavily used for transportation. The Hudson River is home to over 115 plant and animal alien species.

Recently, a new invasive species was discovered in the Hudson River, the Chinese Mitten Crab (*Eriocheir sinensis*). Scientists suspect that the crab was dumped into the river by people working at fish markets in New York City, who had extra live crabs and decided to dispose of them in the river. The mitten crab is very successful at reproducing in both fresh and salt water ecosystems, and likes to burrow



Photo Credit: Lee Mecum

into the sides of stream banks, causing concern about increased erosion. Along with the mitten crab, 2008 brought the arrival of the Northern snakehead (*Channa argus*), a fish that is extremely aggressive and can move across land to invade new waterways. The snakehead was found in a tributary of the Hudson, and the Department of Environmental Conservation (DEC) decided to try and contain the invasion by dumping enough chemicals (a pesticide called Rotenone) in the river to kill everything at once. When surveying the creek after treatment, they found 220 northern snakehead fish had been killed. No one knows yet whether or not this dramatic attempt at control has worked at eradicating the fish.



Snakehead photo from [www.invasivespecies.net](http://www.invasivespecies.net).

Once established, invasive species often are almost impossible to eradicate. Our efforts would be best spent being more proactive and preventing the invasions before they occur. If you spend time in an area with an invasive species, be sure to take care not to inadvertently spread the organism. There are reports from tropical areas, such as Costa Rica, where researchers carried a disease pathogen from an infected frog population to a non-infected population, causing a lot of problems. Similarly, when you are boating on the Hudson, you should be careful to clean your boat properly before putting it into another water body. Many invasives enter through goods that are imported through our ports, so encouraging our government to take better care of these systems would be a great way to reduce the spread of invasive species. All ships could be required to exchange their ballast water at sea, which would reduce the number of aquatic hitchhikers, and we could treat all wooden pallets before they leave our ports, reducing the insect pests. Finally, when you buy garden plants, make sure they are native species.

Common non-native garden plants:



Japanese barberry



Burning bush



Honeysuckle