

## Invasive Species

One of the most significant changes that humans have made to ecosystems is the introduction of non-native species. These are species which humans have moved from their native range to one they'd never experienced 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 do not cause problems in their new ecosystem. However, some are so successful in their new environment that they harm the ecosystem.

These are called invasive species; some examples include the brown marmorated stink bug, the Asian long-horned beetle (shown in photo at right, [www.whitehouse.gov](http://www.whitehouse.gov)), and purple loosestrife. Invasive species tend to follow the "10% rule": 10% of non-native 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 dramatically altering ecosystem cycles.



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. Shown at left is the



invasive kudzu vine, which tends to completely cover all existing vegetation and thereby prevent other plants from receiving sunlight (photo by Kerry Britton, USDA). There are over 50,000 non-native 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, while invasive insects are responsible for tens of millions of dollars in crop losses every year in New York alone. 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. One study estimated that invasive species cost the US more than \$100 billion dollars a year to control.

Islands are particularly vulnerable to being severely impacted by invasive species, and dramatic changes can occur after an introduction. For example, the Galapagos Islands suffer from the effects of 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 serious problems. The goats, donkeys, and pigs eat so much of the vegetation that land managers have been shooting them to control their populations. On the island of Guam, the brown tree snake has caused the local extinction of a dozen native bird species. Hawaii also suffers from many invaders, such as the mongoose, which was introduced as a biocontrol to eat the invasive rats that were destroying the sugar crop. A biocontrol is an organism that naturally eats the target

pest, or here, an 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.

Another striking 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, 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), on wooden shipping pallets, through canals (like the Erie Canal), as unseen 'hitchhikers' on people, animals, or boats, by escaping from agricultural areas, and by people introducing them on purpose, which is often the case with pet species and 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 used heavily for transportation. The Hudson River is home to over 115 non-native plant and animal species.

In 2008, two new invasive species were discovered in the Hudson River—the Chinese Mitten Crab (*Eriocheir sinensis*) and the Northern snakehead (*Channa argus*). 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



Photo Credit: Lee Mecum

USDA

Chinese mitten crab

reproducing in both fresh and salt water ecosystems and likes to burrow into the sides of stream banks, causing concern about increased erosion. The Northern snakehead is an extremely aggressive fish that can move across land to invade new waterways. The snakehead was found in a tributary of the Hudson. The Department of Environmental Conservation (DEC) considered this species to be so dangerous to the health of the Hudson River that they resorted to drastic measures to try to control this species: they added

enough of pesticide to the riparian area to kill everything at once. When surveying the creek after



treatment, they found 220 northern snakehead fish had been killed. While it appears that this drastic control effort successfully eradicated the fish from the area, it does not mean that the threat to the Hudson River is over. There is

still a viable population in Queens, near the Flushing airport.

Once established, invasive species are nearly impossible to eradicate. Most strategies for controlling invasive species consider the prevention of new introductions to an area as the single most effective management effort. Our efforts are often 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 or any other water body, 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 invasive garden plants:



Japanese barberry



Winged Burning bush



Exotic bush honeysuckle