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From Microbes to Mammals: Invasive Species Work at the USGS

Invasives: Why Care?

- It is no exaggeration to state that the U.S. is under siege by more than 6,500 species of harmful non-native species that are estimated to cause more than $137 billion in damage each year to the U.S. economy.
- These costs are borne by farmers, ranchers, businesses, and local, state, tribal and federal governments battling to control the economic, health and environmental threats these invaders pose.
- Invasive species adversely affect every state in the country and including urban centers and wilderness areas. Increased global travel and trade provides pathways for both intentional and unintentional introductions of invasive species.
- Costly effects of invasives include crop decimation (cactus and gypsy moths), clogging of water facilities (quagga and zebra mussels) and waterways (hydrilla, giant salvinia), wildlife and human disease transmission (West Nile virus, monkeypox, and diseases in some ballast water), threats to commercial, native, and farmed fisheries (Asian carps, snakehead fish, sea lamprey, Asian swamp eel, whirling disease, and VHS), increased fire vulnerability (cheatgrass and buffelgrass) and adverse effects for ranchers and farmers (leafy spurge and cheatgrass).

Research Examples

The USGS Invasive Species Program works on every one of the species mentioned previously; in fact, our researchers work collaboratively on all significant groups of invasive organisms in terrestrial and aquatic ecosystems in all regions of the United States. Across the nation, our invasive species experts work with states, other federal agencies, businesses, agriculture, and natural resource managers to help solve the problems posed by these invaders.

Key components of invasive species activities include prevention, monitoring and forecasting threats, and control and management of established invaders.

Asian Carp: The USGS has been conducting research on Asian carps for over a decade. In areas where Asian carps are abundant, they have interfered with commercial fishing operations and recreational angling and other activities, reduced zooplankton abundance (important as food for many aquatic species), and affected native fish communities. Bighead and silver carps have moved up the Illinois River and are now poised to enter the Great Lakes. The unique nature of the Great Lakes ecosystem makes it difficult to predict whether they could become established, but it is feared that they would have ecological and economic impacts and negatively affect the $7 billion annual fishery in the Great Lakes. Early USGS research focused on understanding the distribution, abundance, and habitat use of these fishes along with collecting information on their biology and life history from around the globe. USGS researchers are currently doing work to examine aspects of risk to the Great Lakes from Asian carps in the Chicago Area Waterways System, as well as conducting studies to develop and test new control technologies to reduce the abundance and distribution of Asian carps.

photo caption TK

Viral Hemorrhagic Septicemia Virus: VHS is one of the most devastating viral pathogen of finfish worldwide and has been reported from the Great Lakes region. Fisheries managers throughout the U.S. and Canada are concerned about the further spread of this highly virulent virus among populations of native freshwater fish. The introduction of VHS into the private aquaculture industry could lead to trade restrictions as well as direct losses from disease. USGS scientists have been collaborating to develop egg disinfection methods and to improve surveillance and diagnostic techniques.

Invasive Wildlife Diseases: USGS scientists collaborate with public health and animal health agencies on notable invasive zoonotic diseases – *invasive* diseases that are transmissible between animals and people. Such diseases are a potential collateral result of exotic animal introductions. Specialized biological containment facilities at the USGS National Wildlife Health Center (NWHC) in Madison, Wisconsin, allow scientists to provide diagnostic surveillance, and research, information needed by all levels of government, enabling them to respond to wildlife diseases. NWHC scientists used patterns of wild bird mortality from West Nile virus, a wildlife disease introduced to the U.S. in 1999, as an indicator of the spread and activity level of this emerging disease. This information allowed public health officials to estimate human population risk and enact control and prevention activities. USGS and USDA surveillance also indicated that monkeypox, an invasive disease introduced to the U.S. from Africa through the international pet trade, had not spread from pets or humans to free-living wildlife. Since 2006, USGS along with other agencies, has been conducting surveillance and monitoring of wild birds to detect highly pathogenic avian influenza, an important zoonotic and economic disease, if it invades the United States through migratory birds.

Northern Snakehead Fish: When the non-native, air-breathing northern snakehead fish was discovered reproducing in a Maryland pond, USGS researchers were on the scene to identify the fish, provide information on its biology and potential ecological effects, an suggest control methods. This valuable input contributed significantly to the successful rapid response of a highly destructive aquatic species that poses a severe threat to native fish and wildlife and the economic sectors that depend on them.

photo caption TK

Department of Defense Pacific Rim Operations Biosecurity Research: As the Department of Defense reorganizes its Pacific Rim operations and focuses on infrastructure and personnel in Guam, a tremendous volume of supplies and goods will be shipped among bases and ports throughout the Pacific, including California and Hawaii. This increase in shipping drastically raises the risk of invasive species invasions — in particular the brown tree snake, a rear-fanged snake that has eliminated native bird and mammal species on several Pacific islands it invaded. Additionally, this invasive species has short-circuited power lines and caused costly power outages. USGS ecologists are collaborating with the U.S. Departments of Defense and State to study brown tree snake genetics, distribution, and biology in order to formulate proper biosecurity procedures that will help prevent the species from spreading beyond its current range, especially to Hawaii and the U.S. mainland.

Giant Salvinia and Leafy Spurge: USGS scientists have assisted in developing an early detection network for giant salvinia (an aquatic weed), which is clogging waterways in southern U.S. lakes. The information provided by USGS has been invaluable in helping citizens plan their efforts to keep this weed from spreading into their lakes. Leafy spurge is an invasive plant that is poisonous to cattle. It outcompetes other prairie and pasture plants, dominates landscapes, and crowds out natural grasses and habitats. It now infests more than 2.7 million acres in southern Canada and the Northern Great Plains and is rapidly spreading toward much larger susceptible habitats. USGS is using a variety of technologies to detect and map leafy spurge infestations and is providing information on the effectiveness of various control methods (including biocontrol).

Cheatgrass: In some western states, wildfires are 20 times more likely to happen where the aptly named cheatgrass has invaded. USGS researchers in Oregon, Idaho, Utah, and Nevada are evaluating management techniques for reducing the dominance of cheatgrass and other weeds, which burn with increasing frequency and intensity, destroying the native habitat and helping promote the further spread of this and other invasive species that burn easily. Research by USGS scientists on restoration methods to re-establish native plant communities will help in efforts to inhibit destructive fires and reduce the cost of fire fighting and additional restoration.

Sea Lamprey: The USGS continues to work closely with the Great Lakes Fisheries Commission to produce a successful integrated pest management approach to control the parasitic sea lamprey, a fish that was decimating the economically important lake trout fishery in the Great Lakes. USGS scientists developed technologies to block spawning migrations in Great Lakes tributaries. A lampricide is used at low concentrations to control sea lamprey populations in small tributaries, while sterile males are released to achieve reduction in large river systems. Adult lake trout populations are stable or rising as a result of these controls.

photo caption TK

Invasive Brome Grass Removal and Native Desert Habitat Restoration: The wide expanses of golden grasslands seen in many California and Nevada desert landscapes today are unnatural — the result of massive swaths of invasive, nonnative brome grasses. These invasive grasses greatly heighten wildfire risk and frequency, suppressing native plant growth, harming many native animal species, drastically converting habitat types, incurring unnecessary burden to wildfire managers, and posing potential threats to desert air quality and to tourist hotspots such as Red Rock Canyon outside of Las Vegas and Joshua Tree National Park. USGS ecologists are collaborating with resource managers in Nevada to test invasive grass removal methods and reseeding strategies to encourage growth of native plants like Mormon tea and blackbrush. Research is on-going to determine a proper regimen of invasive species suppression, native plant seeding, and management of soil-seed reserves that will facilitate the recovery of burned desert landscapes to their original balance and beauty.

photo caption TK

For more information, visit

http://ecosystems.usgs.gov/invasive/ or contact

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