



Invasive Species Research

The Leetown Science Center's research provides information on early detection and assessment, ecological effects and new methods of control of invasive species.



Hemlock woolly adelgid infestation
(photo: Mark McClure CT Agricult. Exp. Station)

Invasive species (also known as exotics, non-native, introduced, non-indigenous, or alien species) cause an estimated \$137 billion in damages each year in the United States. These animal and plant invaders create major management issues for the federal refuges and parks by out-competing native species and degrading or changing habitats. They have contributed to 68% of the fish extinctions in the past 100 years, and are responsible for 70% of the decline in listed endangered fish species.



Banded darters (an invasive) have displaced native species

The goals of the U.S. Geological Survey research program for invasive species are to: 1) better understand and predict the pathways of these invasives; 2) identify and assess the environmental risks; 3)

monitor changes; 4) determine the effects; and 5) provide approaches for control. Center scientists teamed in 1998 to initiate research on early detection and assessment, ecological cause and effects, and new methods for control of invasive species. This research is conducted in collaboration with federal, state and other partners to develop biological and ecological information needed for sound resource management.

In eastern forests the invasive hemlock woolly adelgid is an increasing threat to stands of hemlock trees. This small, aphid-like insect causes defoliation of the trees and ultimately their loss from the forest ecosystem. The Center's research is focused on assessing the potential risk of these infestations by building models of stand vulnerability and determining how bird and aquatic communities associated with the hemlock stands are most likely to be impacted. Results of the research will

provide resource managers with tools necessary to predict likely impacts and take corrective action.



Bird species may be impacted by the loss of hemlock forests caused by the hemlock woolly adelgid.

Research is also addressing the ecological effects of invasives on freshwater mussels, which are among the most threatened animals in North America. The introduction of invasive fish species has caused declines or extirpation of native fish that serve as host species for mussel glochidia or larvae, thus, disrupting their complex reproductive cycle. Resource managers will use the information to identify which of the numerous invading species

Research Applications

- In the Delaware Water Gap National Recreational Area, breeding bird populations are being characterized in matched hardwood and hemlock stands and models developed to predict changes in bird communities if hemlock trees are eliminated by the hemlock woolly adelgid.
- In Pennsylvania, host fish for freshwater mussels that are being threatened by invasive fish species are being identified to help resource managers take corrective action to prevent loss of native mussel populations.
- A model is being developed to evaluate the vulnerability of hemlock stands in Shenandoah National Park to the hemlock woolly adelgid and it will be applied to other parks at risk such as the Great Smoky Mountains National Park.
- A new technology using exposure to supersaturated concentration of carbon dioxide gas shows promise for the control of zebra mussels.
- In partnership with Delaware, a system is being developed to map and track invasive species.

pose the greatest threat to these host fish and where to target control and eradication programs. Other studies have investigated the role of landscape features in invasion of non-indigenous fish species in north central Appalachian streams, and competition of the Asian clam on movement and condition of native mussels.



Asian clams

Zebra mussels and Asian clams are invasive species that rapidly displace native mussel species. Zebra mussels create extensive damage to water intake structures when their large numbers restrict water flow. Center scientists are investigating new control technologies that are effective, economical, and environmentally safe. One example is the use of continuous

or intermittent exposure of the species to supersaturated concentrations of carbon dioxide, air, stack gas, or a mixture of these gases. Pilot scale tests,



New technologies to control zebra mussels

using Asian clams, are used to demonstrate application of the control process and to establish relative treatment costs.

Partners

Partnerships are an important aspect of these projects, providing not only funding support but cooperators in the research effort. Partnership also provide important perspectives from management in the application of the research findings. Current partners include the Fish and Wildlife Service, National Park Service, Electric Power Research Institute, States, Freshwater Institute, and Conservation Fund.

Location of Center Components



Leetown Science Center (1)

- Fish Health Branch
- Aquatic Ecology Branch
- Restoration Technologies Branch

Conte Anadromous Fish Branch (2)

No. Appalachian Research Branch (3)

So. Appalachian Research Branch (4)

Orono Field Station (5)

Columbus Field Station (6)

Great Smoky Mountain Field Station (7)

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