Invasive Species

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Plants, animals, and other organisms that cause harm when introduced to new ecosystems or dramatically increase in abundance within their native ranges are known as invasive species. Non-native species often thrive in areas outside their natural range due to a combination of favorable environmental conditions and a lack of native controls, such as predators or herbivores.   Similarly, environmental changes can lead to explosive growth of some native species. Invasive species displace other species, thus reducing biodiversity. Some invasive species damage or destroy trees and crops, which impacts the environment, the economy, and even human health.

*A scientist examines an invasive insect, the eucalyptus weevil (*Gonipterus scutellatus*). Photo courtesy of Bernard Slippers.*

Researchers with the *USDA Forest Service Eastern Forest Environmental Threat Assessment Center (EFETAC)* are developing tools and information that can lead to early detection, prevention, control, and management of invasive species. Key projects include:

Invasive plants database

EFETAC scientists are developing a database that compiles several key life history and genetic traits for more than 4,000 known introduced plant species in the United States. These data will allow for continental scale analyses to determine how plant characteristics influence species invasiveness and distribution in order to detect, assess, predict and manage the impacts of invasive plant species. The database will be web-based for the public, land managers, scientists, and policymakers to use as a comprehensive resource on introduced plants in the United States.

*Kudzu (*Pueraria montana var. lobata*) is a well known, fast-growing non-native invasive plant species.*

Habitat preference studies

EFETAC scientists are collaborating with U.S. and international researchers to collect information regarding habitat characteristics of diverse forests and other ecosystems around the world. This effort will help understand what factors—such as land cover, land use, biodiversity, and climate—determine species invasiveness and habitat invasibility. Habitat comparisons across geographic regions can provide new insights useful to scientists, resource managers, policymakers, and the general public.

National-scale risk mapping and modeling for invasive forest pests

EFETAC researchers and partners are producing regional-, national-, and continental-scale maps that show risk associated with non-native invasive forest insects and diseases. Research is improving understanding of fundamental characteristics of biological invasions, such as pest spread routes (especially those related to human activities, including recreation and global trade), and the availability of host species in both developed and undeveloped landscapes. Researchers are also helping

*Hemlock woolly adelgid (*Adelges tsugae*) poses the greatest threat to eastern and Carolina hemlock.*

to improve effectiveness of national pest detection surveys, and modeling future pest range expansions across landscapes.

Because all risk assessment efforts involve substantial uncertainty, EFETAC scientists and collaborators are using state-of-the-art methods to rigorously document and assess the various sources of uncertainty. These methods help identify areas where research and monitoring can best reduce uncertainty and improve management.

Early Warning System

EFETAC scientists and collaborators established a prototype forest national early warning system by producing maps showing potential forest disturbance across the contiguous United States every 8 days, based on images obtained over the preceding 24-day analysis window. Potential disturbance maps are developed by comparing historical expectations of normal vegetation "greenness" with greenness from a series of current satellite views.

EFETAC researchers use satellite imagery and geographic information systems (GIS) to monitor vegetation greenness through time across the continental United States. By comparing current conditions with expected greenness, researchers can identify and highlight locations of unexpected change and potential disturbance, including areas impacted by invasive species and also at increased risk of invasion. Such warnings may prompt additional aerial and field observation to verifiy and interpret images, enabling managers to rapidly confirm and determine the nature and severity of threats to forest health.

Citizen science and invasive plant monitoring

EFETAC researchers and partners are working with community volunteers, known as citizen scientists, who collect invasive plant data in National Forests and along the Appalachian Trail in the eastern United States. Citizen scientists have been trained in basic Forest Service Forest Inventory and Analysis Program monitoring techniques and methods developed to identify environmental and biological factors that

A citizen scientist removes invasive plants along a roadside. Photo courtesy of Equinox Environmental.

are most conducive to high abundance of invasive plants. The use of GIS, and a broad suite of standardized field methods, allows researchers to identify areas of suitable habitat where invasive plant species are likely to be successful if introduced.

For additional information

To learn more about EFETAC and invasive species, visit http://www.forestthreats.org.