

Invasive Species

Plants, animals, and other living things can cause harm when introduced to new areas. Known as non-native invasive species, they can thrive in areas outside their natural population range due to a combination of favorable environmental conditions and a lack of native controls such as predators or herbivores (plant-eating animals). Similarly, native species can become invasive when environmental changes lead to explosive population growth.

Invasive species displace other species and reduce biodiversity, which refers to the variety of plant and animal life in a particular habitat. This affects ecosystem health, productivity, and resilience. Some invasive species damage or destroy trees and crops, which impacts the environment, the economy, and even human health.



Hemlock woolly adelgid is a non-native invasive insect threatening eastern and Carolina hemlock trees. Eastern Threat Center research supports hemlock conservation strategies.

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

Invasive Plants

Plant traits provide invasive 'big picture'

Researchers can use biological information to study species characteristics that may influence plants' abilities to invade and spread across the landscape. Eastern Threat Center scientists are developing a database of plant traits for more than 4,000 known introduced species in the United States. The online database will assist natural resource managers, scientists, policymakers, and the public with assessing, predicting, and managing the impacts of invasive plants.



Japanese stiltgrass spreads and displaces native plants. Eastern Threat Center scientists study plant and habitat characteristics to better understand invasion success.

Invasive plants prefer certain habitats

Several factors can determine a plant's ability to invade a vulnerable habitat—land cover, land use, biodiversity, and climate change. Eastern Threat Center scientists are collaborating with US and international researchers to compile characteristics of diverse forests and other habitats around the world. Numerous scientific papers resulting from these efforts will provide valuable insight for scientists, natural resource managers, and policymakers.

Invasive Insects and Diseases

Maps reveal trees at risk of invasion

Research is helping natural resource managers understand how and where people can transport and spread invasive insects and diseases through activities such as recreation and global trade. Knowledge about the risks associated with these activities can help managers reduce impacts of invasive forest pests.

Eastern Threat Center scientists and partners are producing regional-, national-, and continental-scale maps that show risk of tree loss due to non-native invasive pests. Researchers are also improving the effectiveness of national pest detection surveys as well as identifying areas where research and monitoring can increase accuracy of data and models used to support natural resource management.



Natural resource managers can use risk maps to understand, prepare for, and respond to potential forest pest invasions.

'Eye in the sky' aids forest monitoring

Tracking forest conditions over vast and remote lands is a challenging task. To address this challenge, Eastern Threat Center scientists and collaborators developed the web-based **ForWarn** tool to complement and focus the efforts of existing forest monitoring programs. **ForWarn** uses NASA satellite imagery, processed and delivered to users through the Forest Change Assessment Viewer. The Assessment Viewer provides weekly US maps of leaf greenness levels that reveal the status and timing of seasonal forest development. In near real time, natural resource managers can

view leaf greenness levels compared to the previous year, the last three years, and the past decade to detect sudden disturbance events as well as more slow-acting disturbances or forest recovery.



*Scientists used **ForWarn** to detect areas in southeastern Louisiana defoliated by the forest tent caterpillar, a native pest.*

Healthy forests rely on genetic diversity

Eastern hemlock and ponderosa pine are important native tree species with large ranges where they can grow in the United States, but their survival is at risk. The non-native hemlock woolly adelgid is destroying eastern hemlock, and climate change, development, and bark beetles are impacting isolated populations of ponderosa pine. Forest management decisions must consider how genetic diversity is distributed across species' ranges in order to help at-risk tree species survive and adapt in the face of multiple threats.

Eastern Threat Center scientists and collaborators from North Carolina State University are leading two studies of genetic variation in eastern hemlock and ponderosa pine across these species' ranges. Results from both studies are influencing management decisions related to gene conservation and strategies for collecting and planting seeds in suitable habitats.

For additional information:

To learn more about the Eastern Threat Center and invasive species, visit www.forestthreats.org.

Contact Us:

USDA Forest Service Eastern Forest Environmental Threat Assessment Center

*Danny C. Lee, PhD
Director*

Asheville, NC

Southern Research Station
200 W.T. Weaver Boulevard
Asheville, NC 28804
(828) 257-4298

Research Triangle Park, NC

Forestry Sciences Laboratory
3041 E. Cornwallis Road
Research Triangle Park, NC 27709
(919) 549-4000

Raleigh, NC

North Carolina State University
Centennial Campus
920 Main Campus Drive
Venture Center II, Suite 300
Raleigh, NC 27606
(919) 515-9489

Website:

www.forestthreats.org

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