

## Forest Disturbance Processes – Hemlock Woolly Adelgid



The hemlock woolly adelgid, *Adelges tsugae* (HWA), a tiny sap-sucking insect related to aphids, is causing widespread death and decline of hemlock trees in the eastern United States. This species, native to Asia and the Pacific Northwest, was first noted in the eastern United States in 1951 in a park in Richmond, VA. The genotype present in eastern North America originated in Japan and was probably introduced unintentionally with ornamental Japanese hemlocks. It initially spread slowly until the late 1980s when it reached natural forests and began to kill trees by the thousands. It

has since spread into at least 17 states from the Smoky Mountains to southern Maine. The HWA has few natural enemies in eastern North America, and our native eastern hemlock species are neither resistant to nor tolerant of adelgid feeding. Without these natural defenses, the adelgid poses a very serious threat to the sustainability of eastern hemlocks.

Research on the HWA by scientists at the Northern Research Station and their cooperators is focused on outlining the scope of the problem and identifying management options. Specifically, work on the HWA falls into four inter-related areas.

- **Risk, Detection, and Spread:** Understanding if, when, and how the adelgid is likely to infest new forests provides critical information for managers as they work to identify areas that are at high risk and allows managers to prioritize control efforts based on where and when those efforts will be most effective.
- **Biology and Ecology:** Work is underway to improve our understanding of the biology of the HWA, including its life history, reproduction, and ecological role. The data can provide the basis for evaluating where, when, and under what conditions the adelgid is likely to cause damage, as well as what basic mechanisms may act to control populations.
- **Control and Management:** Data collected by evaluating adelgid biology, ecology, landscape risk, and spread are used to develop control and management techniques. These techniques include the development of resistance to the adelgid in our native eastern and Carolina hemlocks. Control and management efforts also include the development of appropriate natural enemies as biological controls. Although chemical controls, such as the use of systemic insecticides and horticultural oil, have proven effective in controlling adelgids in yards, gardens, and parks, the cost, effort, and environmental consequences associated with these chemicals make them inappropriate for forests at the landscape scale.
- **Effects and Impacts:** Associated with efforts to control and manage the adelgid are efforts to understand the nature and magnitude of adelgid impacts on eastern forests. Current work includes efforts to identify those impacts both directly through the loss of hemlock species and indirectly through changes in the structure and biodiversity of eastern forests. This information can be used to evaluate the severity and nature of the threat to eastern forests posed by the HWA.