



## ALLIANCE FOR *Saving Threatened Forests*

### RESEARCH ON INVASIVE FOREST PESTS

In the early to mid-1900s two small insect pests entered the United States and began devouring evergreen forests in the eastern North America. From the 1950s until today, both the balsam woolly adelgid and the hemlock woolly adelgid have left trails of tree “ghosts” in the Appalachians and elsewhere.

The balsam woolly adelgid has nearly eliminated older Fraser firs, and the hemlock woolly adelgid is even more devastating to eastern and Carolina hemlock forests, leaving giant holes in the landscape as trees die off. But while they threaten American forests, neither woolly adelgid is a threat in their native country.

Hemlocks mature to become large majestic trees in the northeastern and Appalachian forests. They can live for over 800 years and grow to be over 175 feet tall and more than six feet in diameter. Hemlocks are shade tolerant riparian evergreens that occupy a unique ecological niche.

Fraser firs are remnants of the glacial-front forest, located only in the highest elevations of the southern Appalachians. In fact, 75% of all natural stands of Fraser fir are found in the Great Smoky Mountain National Park. Its perfect conical shape has made it the most popular Christmas tree in the country.

The death of the fir and hemlock forests impacts the aesthetic quality of the landscape, reduces terrestrial habitat diversity, and eliminates unique aquatic habitats.

Eastern hemlock forests extend from Nova Scotia southward to Alabama and westward to Minnesota. Adelgids have almost completely annihilated hemlocks in infested areas, and they are spreading. The balsam woolly adelgid has placed the Fraser fir on the endangered list as “threatened.”

**The Alliance for Saving Threatened Forests** which is part of the Center for Integrated Pest Management at North Carolina State University supports research on how tree species prevail when attacked by insect pests. As scientists try to understand the differences in species susceptibility and determine if a selection or breeding program can produce resistant trees, the Partnership looks to the long-term goal of restoring fir and hemlock forests in the Eastern United States that have succumbed to the adelgids.

The Partnership’s mission is to provide more stable long-term support for research on host resistance, to supplement the short-term support from two-or three-year research grants. Experts

from across the country in entomology, forestry, genetics, microbiology, wood and paper science, and geographic information systems are combined in this interdisciplinary research effort.

The occurrence of a small number of hemlock and fir survivors in areas that have been heavily infested for many years provides some hope in the otherwise bleak outlook for both species. Worldwide, a number of fir and hemlock species considered to be tolerant or resistant to adelgids could serve as a source of resistance for a hybrid/backcrossing program. If these trees could be selected and bred, they could produce HWA and BWA resistant planting stock and seed.

**The Partnership seeks to address these goals:**

- \* Development of reliable and effective methods of evaluating trees for adelgid resistance
- \* Determining genetic and environmental contributions to the long-term survival of individual trees in severely infested areas
- \* Understanding the mechanisms of resistance and how fir and hemlock trees inherit adelgid resistance

**To support this research, the Partnership seeks funds from:**

- \* Forest industry
- \* Environmental organizations
- \* Government agencies
- \* Private funding sources

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