



Nursery & Landscape IPM

This project has developed integrated pest management strategies for insect pests and diseases of ornamental plants in nurseries, landscapes, and urban forests.

Who cares and why?

Nursery and landscape industries are fast growing segments of U.S. agriculture, contributing around \$147 billion each year to the U.S. economy and supporting over 600,000 workers. Over the last 20 years, public demand for high quality ornamental plants has more than tripled, with more than \$20 billion spent each year at retail and mail order stores on plants and associated products for lawns, parks, urban forests, golf courses, etc. Beyond their economic value, these plants are integral to human health, recreation, and community pride. Properly placed and maintained plants—especially urban trees—absorb noise and air pollutants, purify water, reduce soil erosion, and provide wildlife habitat. However, ornamental plants are threatened insect pests and diseases. Widespread shipping and planting of ornamental plants has facilitated the rapid spread of these pests and diseases, and current suppression and eradication efforts are complicated and costly. Concerns about environmental and human health risks have led to restrictions on many available insecticides and fungicides. For example, there are critical concerns about the impacts of insecticides on honey bees and native pollinators. Heavy use of pesticides also increases the potential that pests and pathogens will develop resistance. Nurseries, landscapers, homeowners, and governments are now embracing integrated pest management (IPM)—an environmentally sensitive and economical approach that combines natural plant resistance with available control techniques, including prevention, monitoring, pheromones, trapping, weeding, and judicious chemical pesticide use. To implement IPM, more detailed information about pest biology is needed in addition to new tools for predicting and monitoring outbreaks.



Recent research has shown that urban trees reduce air pollution and improve human health. NCERA-193's IPM recommendations have helped ensure that nurseries have healthy trees and other ornamental plants available for landscaping urban public spaces as well as residential areas. Top photo by Mark Heard. Bottom photo by Phillip Merritt.

What has the project done so far?

With such a diversity of plants—each with their own complement of pest problems—no individual researcher or state can hope to address them all. For almost 20 years, NCERA-193 has fostered highly efficient and successful coordination among plant pathologists and entomologists working on IPM programs for ornamental plants. Over the past five years, studies conducted by NCERA-193 members have shed light on the biology and behavior of invasive insect pests such as emerald ash borer, pink hibiscus mealybug, chili thrips, grand fir twig borer, viburnum leaf beetle, and banded elm bark beetle. NCERA-193 members have also studied important tree diseases including Dutch elm disease, sudden oak death, pine tip blight, and bacterial scorch and have conducted surveys of pests in firewood. These studies have led to a better understanding of the life cycles of pests and pathogens and have revealed potential hosts. Other studies have assessed how plants, pests, and pathogens are affected by various environmental stressors—such as drought—and practices like mulching, fertilizing, composting, and pruning. NCERA-193 researchers have also improved visual and remote sensing approaches and molecular methods for detecting pests and diseases. Additionally, they have developed new tools to determine the rate and direction of pest and pathogen spread. Using this information, the team has been able to initiate successful rapid responses to outbreaks of emerald ash borer and sudden oak death. Another major focus of NCERA-193 scientists has been evaluating reduced-risk chemical pesticides, biopesticides (formulated from bacterial, fungal, or viral agents), and new application technologies. Researchers have also developed and evaluated pest and pathogen resistance in major landscape plants including ash, hemlock, maple, fir, pine, rhododendron, and viburnum. For example, researchers have developed a variety of chokecherry that is more tolerant of X-disease. Researchers have also set up study sites across the U.S. to determine how resistant varieties of Dutch elm perform under environmental and biotic stress. NCERA-193 has developed IPM guidelines based on this research

and members have served as liaisons with federal and state regulatory and management agencies. NCERA-193 Extension professionals have also reached out to nursery and landscaping industries, gardeners, and communities. They have distributed science-based materials including fact sheets, newsletters, bulletins, and an award-winning video about invasive pests and have designed and maintained listservs and websites to quickly and easily disseminate information. The group has also hosted conferences, field days, and Master Gardener trainings.

Impact Statements

Brought together scientists across disciplines and states, accelerating advanced research and IPM solutions

Made it possible to respond earlier and more successfully to outbreaks with new tools that increase the speed and accuracy of pest detection and disease diagnosis

Encouraged adoption of good horticultural practices that minimize pest and disease control costs and environmental harm

Reduced health risks to workers, non-target organisms, and the environment by developing new, safer chemical insecticides and natural alternatives

Raised profitability of ornamental plant producers by raising awareness of ways to improve plant yields and quality using IPM

Guided new regulations on the movement of firewood, thus limiting the spread of pests and diseases

Protected valuable resources like water and soil from erosion by saving landscape plants from pests and diseases

Renewed acceptance of elms as valuable trees among urban foresters, nurseries, landscape planners, and the public

What research is needed?

This project has received renewed federal support and will continue (as NCERA-224) through 2017. Development and evaluation of IPM strategies that conserve pollinators and protect the health of honey bees are high priorities. Researchers also need to assess the true potential of natural host resistance to pests and pathogens. Further research also needs to assess the economic impact of recently discovered invasive exotic insects and diseases, especially those with expanding ranges due to climate change.



	National Parks	Colorado State Parks
% firewood bought outside park	25	28
% firewood cut or collected at home	17	15
% firewood with signs of bark beetles/wood borers	45/40	67/57
% firewood with stain or decay fungi	39	79

NCERA-193 studies have shed light on the emerald ash borer, an invasive insect that bores into trees to lay eggs. When the eggs hatch, larvae feed on the bark, carving tunnels that disrupt the tree's ability to transport water and nutrients (left photo by Bill Jacobi). Study findings have led to improved EAB detection and trapping methods (right photo by Mike Gifford). Other research has revealed that moving infected firewood is a major way that EAB and other pests and diseases spread to new areas (see table above). To curtail the spread of pests and diseases, NCERA-193 has worked with state and federal agencies to formulate new regulations and design education programs on firewood transport (bottom photo by Bill Jacobi).

Want to know more?

Administrative Advisor:
Thomas Payne (payneT@missouri.edu)

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Compiled and designed by Sara Delheimer