

INVASIVE FOREST PESTS: TRENDS AND IMPACTS

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ABSTRACT

Non-native forest insects and pathogens affect a variety of forest and urban settings across the U.S., and introductions are likely to continue as global trade and travel expand. Past efforts to assess economic impacts of invasive forest pests have been useful for bringing attention to the issue, but a broad, rigorous cost analysis is critically needed by policymakers. A sound estimate of the costs associated with non-native forest pests would provide a basis for decisions related to trade policies, regulations, and allocation of scarce resources to detect, eradicate, or manage invasive forest pests. The Nature Conservancy organized two working groups at the National Center for Ecological Analysis and Synthesis in Santa Barbara, CA, in 2007. Working Group 1, comprised of 13 scientists with expertise in forest entomology, pathology, ecology, or economics, was asked to address the economic impacts of invasive forest pests.

A list of the non-native forest insects and pathogens known to be established in the U.S. was developed, and a subset of those species that have caused detectable damage was identified. We recorded taxonomic information, year of detection, and major host species for each organism and assigned the insects to feeding guilds. For each “high impact” species, we also determined the spatial distribution of the organism. More than 450 non-native insect species that feed on forest trees are established in the U.S., and the accumulation rate was relatively steady from 1860 to 2006. Slightly less than 15 percent of the insect species, along with 16 pathogens, have caused reportable damage. Sap feeding insects such as scales, aphids, and adelgids dominated the complete list of non-native insects, while foliage feeders were most

abundant in the list of damaging pests. Most notable was the dramatic increase in the number of non-native insects that bore into phloem or wood since the 1980s. A map of the spatial distribution of the pests on the high impact list clearly demonstrates that damaging, non-native forest pests are notably more abundant in the northeastern U.S. than in other regions of the country.

A cost curve was developed for each insect feeding guild by plotting the number of insect species against the economic cost associated with that guild. Two points were defined on the curve reflecting the costs associated with (1) a very damaging “poster pest” for each guild and (2) the lowest cost of a species assigned to the shorter list of damaging insects. Intensive analyses for each poster pest were conducted to derive estimates for each of five cost categories over a 10-year period. Cost categories included expenditures by Federal and local governments and households, decreases in property value, and losses associated with marketable products (e.g., timber). Using Bayesian averaging, the area under the curve developed for each feeding guild could be integrated for each distinct cost category. These methods enabled us to avoid double-counting costs or underinflating or overinflating economic impacts. Costs associated with each of the three poster pests and average costs associated with each feeding guild were determined for the five categories.

Extent of costs reflected the type of damage associated with each guild, the value of affected trees, human population density in the area affected by the pests, and the stage and rate of invasion. Results showed that the

economic impacts of non-native forest insects exceed previous estimates (based largely on timber losses) by orders of magnitude. Phloem or wood boring insects were the most costly guild, largely because several of these species kill their hosts, including landscape and high value urban trees. This result is particularly alarming given the recent upsurge in borer detection and establishment.

Costs associated with non-native forest insects were not uniformly allocated among the cost categories. Timber and related market losses made up a relatively small proportion of the costs associated with any of the insect feeding guilds. Overall, results showed that homeowners and municipal governments bear the greatest proportion of the costs of non-native forest insects.