Protecting Our Natural Resources: Agriculture and Forestry

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Introductions of exotic pests and diseases are a steadily increasing threat to the productivity and functioning of agriculture, forests, and natural ecosystems, and the extensive economic and social interfaces with these resources. Increasing trade and travel bring concomitant increases in exposure to invasions of exotic species, taxing the safeguards in place to prevent such occurrences. While inspection, early detection, rapid response systems and other regulatory activities combine into effective means for mitigating the risk of invasions, the enormous diversity of the world's potentially damaging flora and fauna and the scale of trade and travel challenge the effectiveness of prevention systems. Thus, a much clearer understanding of risks and a sharper focus on managing those risks identified as most critical is fundamental to protecting the nation's resources. Equally fundamental is the need to have accurate databases available to adequately assess ecological and biological risks posed by invasive species.

The single greatest threat to the long-term sustainability of forest ecosystems is represented by introduced, nonnative invasive species. The ecological consequences of these introductions has been demonstrated in the past. The region-wide loss of the American chestnut to the chestnut blight was socially and economically devastating and continues to affect today's forests. Oaks, to a large extent, replaced chestnuts in the eastern forests; but these very oaks are now at risk from gypsy moth—another introduction. Large numbers of nonnative species are displacing naturally occurring species in a wide array of ecosystems. In some ecosystems, the nonnative species are a hindrance to effective management, protection, and recovery of threatened and endangered species; e.g., bull trout. These organisms often have no natural controls and thus their populations can grow unchecked. One only has to consider the degradation of southern forests covered by kudzu to understand the detrimental effects of these species.

In addition to ecological consequences, invaders can bring about economic consequences, especially in the agricultural sector where dramatic visual evidence of invasion is sometimes not as apparent as in unmanaged ecosystems. Agricultural products contribute about $60 billion to U.S. exports annually. Many of these commodities gain access to foreign markets because they are certified free of pests of concern to our trading partners. Thus, in addition to the added production costs, pesticide usage and environmental damage brought about by new invaders, agricultural exports are threatened. Just in the past few years some of our most valuable export commodities—wheat, citrus and a wide variety of fruits and vegetables—have lost markets abroad because of karnal bunt, a fungus infecting wheat; citrus canker, a bacterium; and various tephritid fruit fly outbreaks.

In the southern U.S. especially, the impacts of invasive species on commercial timber production can result in millions of dollars in lost productivity. Thus, risk assessment must take the economics of trade into account as well as increased production costs and environmental consequences. An economic model for invasive plants is currently being developed by scientists at the University of Maryland in cooperation with several USDA agencies with technical oversight by the Economic Research Service.

Efficiently and effectively contending with these threats requires accurate and meaningful risk assessments. The validity and credibility of these assessments are dependent on reliable data on pest occurrence and distribution, biology, and behavior, and the potential impact on U.S forest and agricultural ecosystems. This need has been well-served by the development of extensive electronic databases housing information potentially useful to risk assessors. Further steps need to be taken to preserve the integrity, accuracy, and accessibility of this information. Equally important is the establishment of monitoring systems for the U.S. that provide early detection and sustained monitoring of nonnative species occurrence and impact. The Forest Health Monitoring program, a federal/state partnership, has been in place since 1989 and provides an analysis of forest ecosystem health on an annual basis. A similar

system for broad scale early detection does not exist, but the implementation of such an effort is clearly needed.

Predicting the invasiveness potential of exotic species is a highly undeveloped science. While existing databases can yield insight into distribution patterns and spread dynamics, necessary data and scientific procedures are only rarely available for characterizing invasiveness. This stands as our principal challenge: to identify the biological and behavioral characteristics or traits relevant to invasiveness and develop reliable models for predicting the degree of invasive behavior in ecological niches of concern. This workshop to inventory and review databases and the resulting documentation should provide valuable information as efforts are made to improve existing and develop new invasive species programs for prevention, management, and/or restoration.