Invasive Forest Insects, Introduced Forest Trees, and Altered Ecosystems

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Ecological Pest Management in Global Forests of a Changing World

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Cover photo acknowledgement: The Greater St Lucia Wetland Park (GSLWP) in South Africa is a recently proclaimed World Heritage Site, 14200 ha of SiyaQhubeka land, 12000 ha commercial plantations and 2200 ha of natural vegetation, and has been incorporated into the GSLWP and game including elephant, rhino, buffalo, have unrestricted access into this area. The photograph is part of the original herd of 17 elephants that were introduced into the park in 2002.

The photograph was taken on SiyaQhubeka Forests land by Norman Neave for the Nyalazi Conservancy.

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Preface

Movement of plant and animal species around the world has been characteristic of human activity for millennia. People have moved agricultural plants and domestic animals with them as populations have expanded and new areas are colonized. Polynesians moved food plants and animals in voyaging canoes across the Pacific. Europeans brought many domesticated animals and plants with them when they colonized the New World. They also took plants from the conquered lands back to Europe.

In addition to the intentional transport and introduction of new species, unintentional introduction of animals, plants, and diseases also occurred. The black rat and the house fly developed cosmopolitan distributions as a result of unintentional anthropogenic transport. The bacteria causing plague was unintentionally transported from Asia into North America where it is now resident in rodent populations and is occasionally transmitted to humans. Despite the regular accidental movement of species across geographic barriers, the pace of introductions was relatively slow for before the age of steam because the number of individuals moving between continents was relatively low and the speed of movement was relatively slow.

The development steam powered transport, both rail and ships, enabled more individuals and goods to move greater distances and at lower costs than had occurred previously. The movement of people and goods stimulated economic growth, development, and world trade. It also created greater stimulus for intentional movement of crops plants, livestock, domestic companion animals, game animals, and ornamental plants. Increased movement and increased trade also presented opportunities for unintentional introductions. The pace of movement accelerated once again with flight and the widespread movement of goods and people by air. Air transport shortened the travel time allowing more fragile organisms to survive transit times that would have prevented their movement under steam.

The global economy has facilitated a global flora and fauna. In particular, the global requirements for cellulose in the form of raw logs, dimension lumber, manufactured timber products, paper, paper products, and cellulose fiber have escalated dramatically in the last three decades. Many nations continue to harvest timber in their native forests, but many others have adopted plantation forest management to provide timber for their domestic and international markets. Native trees may be used in their plantations. Alternatively, timber companies may import tree species from different parts of the world to meet demand for timber with particular economic value. For example, *Eucalyptus* spp. are among the most widely planted trees in the world and form the basis for the timber industries in parts of South America, South Africa, countries around the Mediterranean, and parts of Asia. In addition, species of *Eucalyptus* are being used in plantations in Australia but well outside their native ranges on that continent. Monterey pine, *Pinus radiata*, is native to a narrow geographic range in coastal central California, but is now widely planted as a valuable plantation species in Chile, New Zealand, and South Africa.

Current plantation forestry creates environments that are very different from native forests. The trees are growing in different densities, in different age structures, in different levels of genetic variation, in different community mixes, on different

soils, in different physical environments, and often on different continents that they would in natural stands. Consequently, the trees often exhibit different patterns of growth, different physical form, and different levels of stress and resistance to herbivores or diseases. The plantation forests have different arthropod communities, including herbivores, predators and parasitoids, and saprophytes, and different microbial communities, including mycorrhizae and pathogens, than would be found in natural stands. These differences can include both reduced numbers of species as well as mixes of native and introduced species. As a result of different community compositions, the interactions among species, the communities with environmental conditions, and the ecological processes that occur in these forests may be very different and affect the trees in the stands in unpredictable ways.

The objective of this volume is to examine the ecological processes that are occurring in new forest environments. I am not referring to newly planted forests. Rather the authors of the chapters have been asked to address issues of new changes and the responses of communities to those changes. The global environment is changing, community compositions of herbivores, pathogens, or natural enemies are shifting as new species are introduced, populations of existing species are reduced in size, or host shifts occur in native species, the growing conditions are changing, all trees are being planted in new places. All of these factors have ecological, economic, and social implications that can be important for the future of new and existing forests.

Timothy D. Paine

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