Chapter 11. Summary

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Forest Health Monitoring (FHM), together with cooperating researchers both in and outside of the U.S. Department of Agriculture Forest Service, continues to investigate the variety of issues relating to forest health. This report provides a review of the latest analyses and results. The broad range of indicators presented alone demonstrates how difficult it is to draw general conclusions about the condition of U.S. forests.

Perhaps the most widespread issue affecting U.S. forests presented in the report is that of forest fragmentation. Compared with conditions prior to European settlement, the forests of the conterminous United States are heavily fragmented by human activities, but they are relatively intact compared to those of highly developed Europe. More attention must be given to interpreting assessments of fragmentation to determine the impacts of fragmentation on ecological endpoints such as biodiversity and water quality over extremely large regions. FHM will continue to assess and report the status and trends of forest fragmentation, and will continue to assist ecologists and forest managers in understanding and making use of the data.

A number of stressors are affecting U.S. forests to varying degrees. Drought periodically affects nearly all U.S. forests to some extent. Over the past decade (1995-2004), much of the Western United States was considerably more droughty than the historic average. However, with some exceptions, ecoregion sections in the Eastern United States experienced the expected amount of drought, or less, over the same period. Fire also periodically affects many U.S. forests. The lower 48 States had a relatively mild fire season in 2004, but the 2004 fire season was quite severe in Alaska.

Anthropogenic stressors, such as air pollution, are a concern because of possible impacts on forest health and productivity. One pollutant of concern, tropospheric ozone, does not appear to pose a large-scale threat to five commercially important tree species considered. However, there are specific areas where bioindicator plant injury from ozone was severe and where there is a higher risk of negative impact.

A variety of insects and pathogens affects U.S. forests. Many different species of mortality-causing and defoliation-causing

agents were recorded during aerial surveys of the conterminous United States in 2003. Of mortality-causing species, mountain pine beetle, Douglas-fir beetle, fir engraver, and southern pine beetle were the most frequently observed. Forest tent caterpillar, Swiss needle cast, western spruce budworm, and gypsy moth were the most frequently observed defoliation-causing agents. The analyses presented in this report have identified hotspots of insect and pathogen activity in each FHM region. Continued monitoring of forested areas is important to determine when the activity of insects and pathogens warrants follow-up investigation or management action.

The monitoring and analysis of some aspects of forest condition is still very new, and we have only very preliminary results. Since 2001, Forest Inventory and Analysis (FIA)'s down woody material inventory has been accumulating data on this indicator of fuel loadings, wildlife habitat, and carbon pools. The inventory is still a work in progress. Preliminary results show that fuel loadings of larger down woody pieces [i.e., coarse woody debris (CWD)] are highest in the Pacific Northwest and are also high in the Lake States and northern New England. Fuel loadings of smaller down woody pieces [i.e., fine woody debris (FWD)] are more randomly distributed across the United States. Together, CWD and FWD contain a substantial fraction of the total carbon sequestered in forest ecosystems.

Similarly, FIA's soil quality indicator has been fully implemented only since 2001. Preliminary results suggest that bare soil, which facilitates erosion, and soil compaction are problems only in relatively small areas of U.S. forests. Analyses of soil samples are producing data on soil pH and effective cation exchange capacity. Further analyses are necessary to determine how these values relate to forest management, possible effects of air pollution, and forest health and productivity. Analysis of soil carbon is generating data that can be used to build total forest carbon budgets. More soils data need to be collected to more fully investigate the several issues relating to forest soils.

The results presented in this report reflect the output of FHM's national scale detection monitoring efforts. It is important to be aware that forest health issues of local or regional