Chapter 1. Introduction

Mark J. Ambrose

This annual technical report is a product of the Forest Health Monitoring (FHM) program. The report provides information about a variety of issues relating to forest health at the national scale. Previous FHM national reports have had a dual focus of presenting analyses of the latest available data and showcasing innovative techniques for analyzing forest health data. This more streamlined report, in contrast, focuses on the latest analytical results. The report is organized using the Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests (Anon. 1995, Montreal Process Working Group 1999) as a general reporting framework.

While FHM is committed to reporting annually on the state of U.S. forests, there are not always enough new data available to warrant reporting on each indicator every year. In this report, indicators are included if a substantial amount of new data has become available since they were last reported by FHM or if significant progress has been made in analytical techniques such that the data can be used to provide new insights into the health of U.S. forests. Indicators were also included if information from earlier analyses could be synthesized in a way that provided better understanding of forest health issues.

The Forest Health Monitoring Program

The FHM program is a national effort to determine on an annual basis the status of, and changes and trends in, indicators of forest condition. The U.S. Department of Agriculture Forest Service cooperates with State forestry and agricultural agencies to conduct FHM activities. Other Federal agencies and universities also participate. The FHM program has five major activities (Tkacz 2003):

- Detection monitoring—nationally standardized aerial and ground surveys to evaluate status and change in condition of forest ecosystems
- Evaluation monitoring—projects to determine extent, severity, and causes of undesirable changes in forest health identified through detection monitoring
- Intensive site monitoring—to enhance understanding of cause and effect relationships by linking detection monitoring to ecosystem process studies and to assess specific issues, such as calcium depletion and carbon sequestration, at multiple spatial scales
- Research on monitoring techniques—to develop or improve indicators, monitoring systems, and analytical techniques, such as urban and riparian forest health monitoring, early detection of invasive species, multivariate analyses of forest health indicators, and spatial scan statistics
- Analysis and reporting—synthesis of information from various data sources within and external to the Forest Service to produce issue-driven reports on the status of and change in forest health at national, regional, and State levels.

In addition to FHM's national reporting, each of the five FHM regions also produces reports. The regions, in cooperation with their respective States, produce Forest Health Highlights (available on the FHM web site at www.fhm.fs.fed.us) and other State reports such as Keyes and others (2003), Laustsen and others (2003), Neitlich and others (2003), and Steinman (2004). FHM also produces reports on monitoring techniques and analytical methods, such as Smith and Conkling (2004).

Data Sources

The FHM program strives to use a variety of data collected by the various branches of the Forest Service as well as data from other sources. A major data source is the Forest Service's Forest Inventory and Analysis (FIA) program. The FIA program's phase 2 consists of plots measured at regular intervals to collect data associated with traditional forest inventories. FIA's phase 3 plots are a subset of the phase 2 plots. On phase 3 plots additional data are collected on many of the forest health indicators that were previously measured as part of the FHM detection monitoring ground plot system[1] (Palmer and others 1991).

For this report, Forest Service data sources were FIA periodic inventory and annualized phase 2 survey data (1990-2003);[2] FIA phase 3 data—ozone bioindicator (1999-2002), down woody material (2001-2003), and soils (2001-2003); and Forest Health Protection (FHP) aerial survey data (2003).[3] Other data sources were National Oceanic and Atmospheric Administration—Palmer Drought Severity Index (1895 through 2004) (National Climate Data Center 1994), Moderate Resolution Imaging Spectroradiometer (MODIS) fire data for 2004 (U.S. Department of Agriculture Forest Service, Remote Sensing Application Center 2004), and National Interagency Coordination Center (2004) data on forest area burned in 2004.

About the Report

In this report we used the Santiago Declaration and accompanying Criteria and Indicators (Anon. 1995, Montreal Process Working Group 1999) that were adopted by the Forest Service as a forest sustainability assessment framework (U.S. Department of Agriculture Forest Service 2004, Smith and others 2001). The seven criteria are:

[1] U.S. Department of Agriculture, Forest Service. 1998. Forest Health Monitoring 1998 field methods guide. Research Triangle Park, NC: U.S. Department of Agriculture, Forest Service, National Forest Health Monitoring Program, 473 p. On file with: Forest Health Monitoring Program National Office, 3041 Cornwallis Rd., Research Triangle Park, NC 27709.

[2] U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis. National Office, 1601 North Kent Street, Suite 400, Arlington, VA 22209. http://fia.fs.fed.us/tools-data/data/ [Date accessed: September 1, 2005].

[3] U.S. Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team. Unpublished database. On file with: FHP/FHTET, 2150 Centre Ave., Bldg. A, Suite 331, Fort Collins, CO 80526-1891.

Criterion 1—Conservation of biological diversity

Criterion 2—Maintenance of productive capacity of forest ecosystems

Criterion 3—Maintenance of forest ecosystem health and vitality

Criterion 4—Conservation and maintenance of soil and water resources

Criterion 5—Maintenance of forest contribution to global carbon cycles

Criterion 6—Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies

Criterion 7—Legal, institutional, and economic framework for forest conservation and sustainable management.

A complete evaluation of all the sustainability criteria is not appropriate here. We focus on the elements of these criteria that are most directly related to issues of forest health.

Bailey's ecoregion sections (Bailey 1995) were used as the assessment unit for analysis (fig. 1.1) when the spatial scale of the available data made such analyses appropriate and when the indicator being analyzed may reasonably have been expected to show some pattern relating to ecological regions. Bailey's system is a national, hierarchical system of ecological units that classifies the United States into ecoregion domains, divisions, provinces, sections, subsections, land type associations, and land types (McNab and Avers 1994). Ecoregion sections typically contain thousands of square miles. Areas within an ecoregion section are expected to be similar in their geology and lithology, regional climate, soils, potential natural vegetation, and potential natural communities (Cleland and others 1997). Bailey's ecoregion sections provide a common framework for an ecologically based assessment.

Figure 1.1—Bailey's ecoregion provinces and ecoregion sections for the continental United States (Bailey 1995, McNab and Avers 1994). Ecoregion sections within each ecoregion province are shown in the same color.

Alaska Ecoregion Provinces

- Ahklun Mountains Tundra—Meadow Province (M126)
- Alaska Range Humid Tayga—Tundra—Meadow Province (M135)
- Aleutian Oceanic Meadow—Heath Province (M127)
- Arctic Tundra Province (124)
- Bering Tundra (Northern) Province (125)
- Bering Tundra (Southern) Province (126)
- Brooks Range Tundra—Polar Desert Province (M121)
- Coastal Trough Humid Tayga Province (135)
- Pacific Coastal Mountains Forest—Meadow Province (M244)
- Pacific Gulf Coastal Forest—Meadow Province (M245)
- Seward Peninsula Tundra—Meadow Province (M125)
- Upper Yukon Tayga Province (139)
- Upper Yukon Tayga—Meadow Province (M139)
- Yukon Intermontane Plateaus Tayga Province (131)
- Yukon Intermontane Plateaus Tayga—Meadow Province (M131)

Eastern ecoregion provinces

- Adirondack—New England Mixed Forest—Coniferous Forest—Alpine Meadow (M212)
- Central Appalachian Broadleaf Forest—Coniferous Forest—Meadow (M221)
- Eastern Broadleaf Forest (Continental) (222)
- Eastern Broadleaf Forest (Oceanic) (221)
- Everglades (411)
- Laurentian Mixed Forest (212)
- Lower Mississippi Riverine Forest (234)
- Ouachita Mixed Forest—Meadow (M231)
- Outer Coastal Plain Mixed Forest (232)
- Ozark Broadleaf Forest—Meadow (M222)
- Prairie Parkland (Subtropical) (255)
- Prairie Parkland (Temperate) (251)
- Southeastern Mixed Forest (231)

Western ecoregion provinces

- American Semi-Desert and Desert (322)
- Arizona—New Mexico Mountains Semi-Desert—Open Woodland—Coniferous Forest—Alpine Meadow (M313)
- Black Hills Coniferous Forest (M334)
- California Coastal Chapparal Forest and Shrub (261)
- California Coastal Range Open Woodland—Shrub—Coniferous Forest—Meadow (M262)
- California Coastal Steppe, Mixed Forest, and Redwood Forest (263)
- California Dry Steppe (262)
- Cascade Mixed Forest—Coniferous—Alpine Meadow (M242)
- Chihuahuan Semi-Desert (321)
- Colorado Plateau Semi-Desert (313)
- Great Plains Steppe (332)
- Great Plains Steppe and Shrub (311)
- Great Plains—Palouse Dry Steppe (331)
- Intermountain Semi-Desert (342)
- Intermountain Semi-Desert and Desert (341)
- Middle Rocky Mountains Steppe—Coniferous Forest—Alpine Meadow (M332)
- Nevada—Utah Mountains—Semi-Desert—Coniferous Forest—Alpine Meadow (M341)
- Northern Rocky Mountains Forest—Steppe—Open Woodland—Coniferous Forest—Alpine Meadow (M333)
- Pacific Lowland Mixed Forest (242)
- Sierran Steppe—Mixed Forest—Coniferous Forest—Alpine Meadow (M261)
- Southern Rocky Mountains Steppe—Open Woodland—Coniferous Forest—Alpine Meadow (M331)
- Southwest Plateau and Plains Dry Steppe and Shrub (315)

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