

Executive Summary

The *Sustainability Assessment Highlights for the Northern United States* provide a snapshot of today's forests and a baseline for tracking future trends. The highlights are based on a comprehensive assessment of forest sustainability organized according to an international system of criteria and indicators known as the Montreal Process. Criteria define broad categories of sustainability; indicators are specific measurements within each category. The criteria address biological diversity, the productive capacity of the forest, ecosystem health, soil and water resources, global carbon cycles, socioeconomic benefits from forests, and the legal, institutional, and economic systems that can impede or enable progress in sustainability.

This report covers the Northern United States—the 20 State region stretching from Maine to Minnesota, south to Missouri, and east to Maryland. The report was sponsored by the USDA Forest Service's Northeastern Area, State and Private Forestry and the Northeastern Area Association of State Foresters. It provides foresters, policymakers, landowners, and the public with information on factors that could threaten forest sustainability.

Conservation of Biological Diversity

Roughly 169 million acres of the 413 million acres of land in the Northern United States is forested. Forests were more extensive before European settlement than they are today; it is unlikely that the total forested acreage will reach historical levels again due to development trends. Forest and woodland communities are important components of the biological diversity of the Northern United States. Deciduous forests are more common than coniferous forests throughout most of the region; maple-beech-birch and oak-hickory are the most extensive forest cover type groups. No natural vegetative communities are known to have been eliminated since European settlement. Old growth forest is scarce, although the acreage of mature forest is increasing. The region hosts a number of naturally rare vegetative communities, as well as others that are imperiled due to human activities such as fire suppression and conversion of forest land to other land uses. The amount of urban forest—forest characterized by a high concentration of human influences—is increasing, but its biodiversity potential has not been comprehensively assessed.

Assessments of species at risk are incomplete, but the majority of native plants and animals evaluated in the Northern United States to date are doing well. Loss of habitat due to development is the most serious threat to forest species today; habitat modification and fragmentation are also concerns. A number of species that were once widespread are restricted to a portion of their former range; some plant and animal species are presumed to be extinct. Aquatic species are especially stressed. Various exotic species of plants, insects, and animals degrade forest habitat and compete with native species.

Public and private land conservation and management strategies are being used to ensure biodiversity conservation and maintenance in the Northern United States. Sound site management is an important part of genetic, species, and ecosystem diversity conservation.

Maintenance of Productive Capacity of Forest Ecosystems

Forests are a source of timber, fuelwood, and nonwood forest products. Roughly 93 percent of the forest land in the Northern United States is suited for timber production, although social and cultural constraints such as parcelization of forest land and changing landowner values reduce acreage available for harvest. Most timberland has average or above average productivity. Timberland acreage has recently begun to decrease because losses of forest land to development are no longer being offset by the conversion of agricultural land to forest land. Forest management practices can enhance timber productivity, as well as other values. Most timberland in the Northern United States is privately owned. Although the majority of private forest landowners do not intend to harvest timber on their land, they may ultimately do so. Those who do plan to harvest, however, own a greater proportion of private forest land.

The growing stock inventory in the Northern United States is at its highest level since the mid-1900's, and inventories indicate increases in growing stock volume are likely as stands across the region mature. Hardwoods account for a majority of the growing stock volume. Annual net growth exceeds removals for both hardwood and softwood tree species in all but one ecological region. The annual ratio of growth to removals is expected to decline in the future as both harvesting and the proportion of mature forest stands increases.

Information on the supply, growth, and removals of nontimber forest products are not readily available. It appears, however, that demand for nontimber products is increasing, and uncontrolled harvesting is impacting local populations of some species.

Maintenance of Forest Ecosystem Health and Vitality

The general health of the forest is difficult to assess at any one point in time, since it is dynamic and influenced by many factors. Measures of forest health include forest age and composition, trends in tree growth and mortality, tree crown condition, vulnerability to forest health stressors, and the condition of soil, water, and wildlife. Threats to forest health in the Northern United States are higher today than a century ago, largely because of human activities. Stressors that affect tree health include native and exotic insects and pathogens, invasive plants, impacts from severe weather, global climate change, and air pollution. Exotic insects and pathogens, in particular, pose a major threat in the Northern United States. Recent exotic insect introductions include the hemlock woolly adelgid, pine shoot beetle, Asian longhorned beetle, and emerald ash borer. Invasive plants are a mounting concern, as they colonize and become competitive with forest seedling regeneration. Increasing white-tailed deer populations affect forest sustainability and impact forest community composition and structure. Abiotic factors such as drought, ice storms, wind, fire, atmospheric ozone, and acidic deposition have caused significant damage. Combinations of stressors, such as exotic insects and pathogens along with drought, can lead to forest decline. Nonnative insects and pathogens pose a higher risk to forests than native species because of the lack of natural controls.

Conservation and Maintenance of Soil and Water Resources

The Northern United States has abundant water resources. Impacts on water chemistry, temperature, and sediment load are the result of a variety of factors, such as industrial,

agricultural, and urban pollution, development, atmospheric deposition, dam building, channelization, and forestry. Historic forest clearing left a legacy of eroded soils and stream sediment problems in parts of the region. Reforestation in these areas stabilized the soil; today the most heavily forested watersheds produce the highest quality surface and ground water. In other areas, decreases in watershed forest cover and losses of floodplain forests and wetlands, along with increases in urban and suburban development, have permanently altered the stream hydrology. Losses of riparian forests are highest in agricultural and urban areas, where the ability to buffer water bodies from the effects of nonpoint source pollution are most critical. Headwater streams are the most likely to have retained forest cover.

Many lakes, streams, wetlands, and estuaries in the Northern United States suffer from reduced biological integrity. Nearly all inventoried watersheds have some aquatic species at risk. Exotic species threaten aquatic resources and their use.

Current land use, forest management, and acid deposition are affecting soil properties and functions in localized areas and sites in the Northern United States; however, they have not resulted in changes in overall potential forest productivity. Timber harvest activities, road building, and lack of maintenance on roads and recreation trails are the most common contemporary sources of soil compaction and erosion on forest land. A relatively small proportion of eroded soil from these sources ends up in lakes and rivers.

Maintenance of Forest Contribution to Global Carbon Cycles

Growing forests naturally store carbon. The age and vigor of forest vegetation affects the rate of carbon sequestration in a forest ecosystem and the overall inventory of stored carbon. Trees are about 50 percent carbon and represent the most dynamic component of the forest ecosystem carbon pool, although the largest proportion of carbon is found in the soil. In the Northern United States, hardwoods account for a greater proportion of carbon than softwoods.

Changes in carbon inventory are affected by the rate of forest growth, harvest activity, and losses of forest cover due to conversion to other land uses, as well as fire or other natural disturbances. The carbon inventory in Northern U.S. forests is higher than in forests of any other region of the country. An underlying factor is that forests in the North are not harvested as heavily compared to growth as forests in the South and West.

Additional carbon is stored in wood that is processed or manufactured into products. The carbon stored in forests and forest products mitigates the amount of carbon released into the atmosphere, which may help delay global climate change.

Maintenance and Enhancement of Long-term Multiple Socio-economic Benefits to Meet the Needs of Societies

Forest land acreage increased over the last half of the 20th century but will decrease in the near future. This trend change will impact the provision of wood and nonwood products, wildlife habitat, recreational opportunities, forest-based communities, and the ability of forests to provide clean air and water. Wood product production and recreation are the two largest forest-based economic sectors in the Northern United States. Both total wood product consumption and consumption per capita are increasing, despite increased wood use

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efficiency. The Northern United States leads the Nation in paper recycling, but recycled fiber is still underutilized.

Public land is an important asset for the recreation-based economy, as private landowners are becoming less willing to open their land to public use without economic incentives or liability protection. Opportunities for wilderness and backcountry recreation are decreasing while developed recreation sites are increasing. Recreation sites closest to urban centers get the most use.

The collection and production of nonwood products provides an important source of income in some locales. In many communities, the practice is strongly interwoven into local social and cultural traditions

Public investments occur in tree nurseries, tree planting, management, monitoring, education, and research. These funds are often used to leverage other State and private investments. Industry investments in paper and paperboard products have increased at a higher rate than investments in lumber and wood products.

Mechanization, globalization, and new technology have resulted in a decline in the number of timber industry jobs. Nevertheless, the timber industry contributes a relatively higher proportion of income and employment in the Northern United States than in other parts of the country. Paper manufacturers offer relatively higher wages than lumber or furniture manufacturers. Compensation for forestry workers varies across the region. Most States offer limited financial incentives to foresters to continue in field or service forestry for the course of their career. The safety of forest product jobs has increased steadily, but the death and injury rates are still higher than in most other professions. Manufacturing continues to be an important component of community economic stability; however, jobs in recreation, tourism, and other service sectors have replaced some wood manufacturing jobs.

Legal, Institutional, and Economic Framework for Forest Conservation and Sustainable Management

The Northern United States has a long-standing legal and institutional framework to use in supporting sustainability and negotiating a balance between public and private interests. The economic framework includes both incentives and disincentives to sustainability. As yet, there is no widely used systematic means of accounting for nonmarket services provided by natural resources; therefore, they continue to be undervalued and are often excluded from economic forecasts. Generally, analytical techniques and decisionmaking processes used to evaluate the benefits of forests and forestry do not account well for long timeframes and suffer from problems of uncertainty.

Private management decisions are often constrained by short-run considerations and market signals, while investments in forestry are long term. Trees take a relatively long time to grow, and the long-term welfare of landowners and society depends on the balance struck between current consumption and investment for future income. Decisions to invest in forests are influenced by policies that alter price, value, or use. Nonmarket factors tend to be ignored by the marketplace. The public, through government, bears the costs of ameliorating excesses or filling gaps in the incentives for resource management created by market forces and technological developments.

Public institutions in the Northern United States and nationwide are stressed by the rapid pace of social, demographic, and technological change combined with government budget cutting, restructuring, and personnel reductions.

Human-natural resource interactions are complex and there is still work to be done, especially in the arena of social and economic indicators. On a brighter note, private industrial organizations and associations are expanding their current policies and programs to achieve sustainability. In general, nongovernment educational and activist organizations are becoming better known through Internet technology and are more willing to work with public and industrial organizations using collaborative problem-solving approaches.

There have been improvements in forest management and in the production, marketing, and utilization of forest products and forest product substitutes to help conserve resources and mitigate environmental effects. Yet investment in research and technology is lagging behind the need and may jeopardize future progress.

State and Federal forestry agencies have monitoring programs that track forest type, age, distribution, and health throughout the Northern United States. This data is used to track trends important to sustainability.

Interrelationships Among Sustainability Criteria

The criteria and indicators are a useful tool for tracking sustainability trends and evaluating them in relation to one another. In doing so, several issues have surfaced that cut across multiple criteria in relation to resource values and uses—the size of the forested land base, the degree of forest fragmentation, the age of the forest, the spread of exotic and invasive insects, diseases, and plants, and land ownership patterns. These issues deserve attention in an effort to develop effective programs and policies to achieve sustainability in the Northern United States.

