FORESTS OF THE UNITED STATES

UNDERSTANDING TRENDS AND CHALLENGES

DR. STEVE BRATKOVICH

DR. JIM BOWYER
DR. JEFF HOWE
JANET BRATKOVICH
KATHRYN FERNHOLZ
DR. SARAH STAI
MATT FRANK

20 MARCH 2012

DOVETAIL PARTNERS INC.
A Trusted Source of Environmental Information

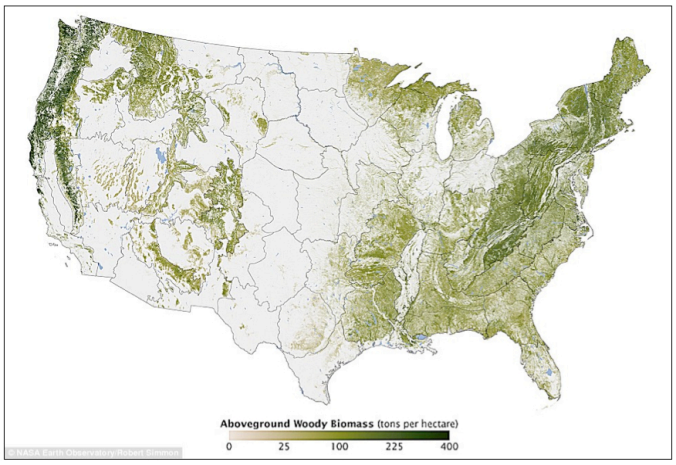
Forests of the United States

Understanding Trends and Challenges

Is the forest area of the U.S. shrinking or expanding? Does annual tree growth exceed harvest? Is the amount of wood in our forests increasing or decreasing? Are our forests sustainable? The answers to these and related questions contain "good news" as well as some "not so good news." In part, the answers depend on your perspective (local vs. national), timeframe (decades or centuries vs. a few years) and definitions (e.g., What is a forest? What is sustainability?).

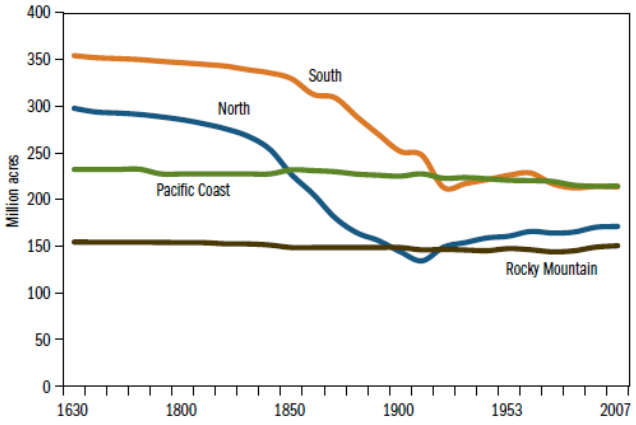
This report is a brief overview of the status of U.S. forests and an update to an earlier Dovetail report.[1] This report is predominantly based on two recent publications from the U.S. Forest Service – *The National Report on Sustainable Forests-2010* (published in 2011) and *Forest Resources of the United States-2007* (published in 2009).[2,3]

Figure 1. Tree Population of America



Source: http://www.dailymail.co.uk/news/article-2086014/Nasa-maps-trees-America-time-shows-forest-covers-THIRD-U-S.html

Figure 2. Forest area trends in the United States by major region, 1630-2007.



Source: Forest Resources of the United States, 2007

National Perspective

Forest Area

From a national perspective, forest area (forest land) across all ownerships totals about 751 million acres. This is roughly one-third of the land area in the U.S. (Fig. 1). The good news is that total forest area has been relatively stable for 100 years even though the U.S.

[1] In 2006 Dovetail Partners issued a report titled "U.S. Forest Statistics Paint a Picture of Dynamic Growth and Renewal as Well as Problems Ahead, available at: http://www.dovetailinc.org/files/DovetailTrends0106b.pdf

[2] Smith, W. Brad, tech. coord.; Miles, Patrick D., data coord.; Perry, Charles H., map coord.; Pugh, Scott A., Data CD coord. 2009. *Forest Resources of the United States, 2007*. Gen. Tech. Rep. WO-78. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 336 p. Available at: http://www.fs.fed.us/nrs/pubs/gtr/gtr_wo78.pdf

[3] *National Report on Sustainable Forests – 2010.* June 2011. FS-979. U.S. Department of Agriculture, Forest Service. 214 p. Available at: http://www.fs.fed.us/research/sustain/2010SustainabilityReport/documents/2010_SustainabilityReport.pdf

GLOSSARY

Definitions from the U.S. Forest Service that are used in this report…

Forest land – Land at least 120 feet wide and 1 acre in size with at least 10% cover (or equivalent stocking) by live trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated.

Growing stock—A classification of timber inventory that includes live trees of commercial species meeting specified standards of quality or vigor. Cull trees are excluded. When associated with volume, includes only trees 5.0 inches in diameter and larger.

Reserved forest land – Forest land withdrawn from timber utilization through statue, administrative regulation, or designation without regard to productive status.

Timber land – Forest land that is producing or is capable of producing crops of industrial wood (in excess of 20 cubic feet/acre/year in natural stands) and not withdrawn from timber utilization by statute or administrative regulation. Inaccessible and inoperable areas are included.

Unreserved forest land – Forest land that is not withdrawn from harvest by statute or administrative regulation. Includes forest lands that are not capable of producing in excess of 20 cubic feet/acre/year of industrial wood in natural stands.

population has nearly tripled during this same time period (Figure 2). Between 1953[4] and 2007, forest area increased slightly, up 3.8 million acres.[5]

It is important to note that the 751 million acres do *not* include forest cover in and around urban areas. Although some urban forests when viewed by remote sensing, meet the criteria of forest (minimum tree cover and area; also see sidebar with definitions), on-the-ground inspections indicate they are used primarily for non-forest purposes. However, trees in urban forests continue to sequester carbon, reduce energy use, and increase human health and well-being.[6] The Forest Service estimates that urban forest areas might cover as much as 20-30 million acres; however, they are *excluded* from the national estimate of forest area.

Also, some lands not classified as forests in the past (wide windbreaks and strips in the Great Plains) are now included in forest area estimates. Conversely, some forest areas in the West (chaparral, sparse juniper and scrub oak) have been removed from forest classification. The Forest Service, to the extent possible, has adjusted historical data to reflect these changes.[5]

Timber Land

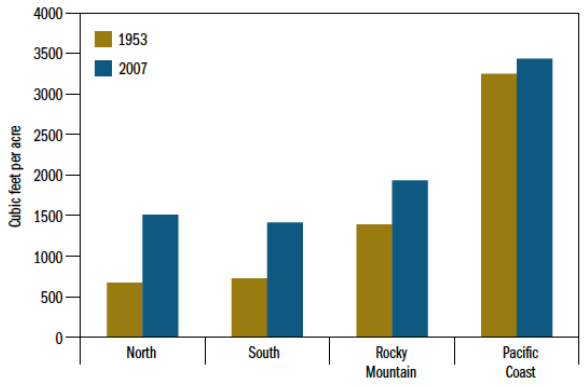
Timber land area in the U.S. (see sidebar definitions), across all ownerships, stands at 514 million acres, up more than 5.3 million acres since 1953. Timber land represents 69 percent of all forest land in the U.S.

[4] 1952 and 1953 are common reference years or benchmarks used by the U.S. Forest Service's Forest Inventory and Analysis group.

[5] Forest estimates between 1907 and 2007 include regions that would become part of the current U.S. (including Hawaii and Alaska); included in all inventory years are adjustments for removal of chaparral type.

[6] Nowak, D. et al. 2010. Sustaining America's Urban Trees and Forests. Gen. Tech. Rep. NRS-62. Newton Square, PA: USDA Forest Service, Northern Research Station. 27 p.

Figure 3. Growing stock volume per acre by region, 1953 and 2007



Source: Forest Resources of the United States, 2007

In contrast to the relatively modest growth in the area of timber lands, timber growing stock volume on these lands has increased at a steady pace for more than 50 years—and is now 51 percent higher than the volume in 1953 (Figure 3).

Based on the fact that for 50+ years timber land area has been fairly stable and growing stock volume has increased substantially, one might expect that the volume of timber growth would surpass timber harvest. Indeed, this is precisely what has happened—growth exceeds harvest. For example, in 1996 growth exceeded harvest by 49 percent; in 2006 (the most recent year data are available) growth was 72 percent greater than harvest! That harvests of timber are far below growth rates translates to increasing average age of trees in U.S. forests. The number of older, larger trees has been steadily increasing in all regions of the country in recent decades.

By definition (see sidebar glossary), *timber land* is intended to represent the land base available for timber harvests. In reality, however, the amount of land where timber harvesting is likely to occur in the U.S. is much less than the 514 million acres noted above. For example, national forests hold 113 million acres of timber land or over one-fifth of all timber land in the U.S. Due to social and political reasons, harvesting on these lands has been greatly reduced in recent decades. Also, 28 million acres of Forest Service land are in forested roadless areas where restrictions have been placed on harvesting.[7] On private lands, issues such as fragmentation (see below) likely reduce the available timber land base for future harvests.

Reserved Forest Land

Across the globe there is interest in protecting representative ecosystems. The goal is to maintain a pool of biodiversity for the future. In 2007, almost 75 million acres of total U.S. forest land (10 percent) were classified as *reserved forest land* (three times the amount of reserved land in 1953). These reserved forest lands include federal and state wilderness areas, state and national parks, and national monuments. Examples include New York's Adirondack Park and Catskill Reserves, the Boundary Water's Canoe Area Wilderness in Minnesota, and the Great Smoky Mountains National Park with headquarters in Tennessee. (Also see Figure 4 for a regional perspective on reserved forest land.). *Protected forests* include all reserved forest land (see above) plus forests covered by various forms of conservation easements and fee simple holdings of several nongovernmental organizations (e.g., The Nature Conservancy and The Trust for Public Land). An estimated 106 million acres are considered protected forests, representing 14 percent of all U.S. forest land.

[7] Roadless areas are often adjacent to designated reserve areas in the West and, thus, they share some of the same characteristics, including age, species, and elevation distribution. In addition to the 28 million acres of roadless areas managed by the Forest Service, an additional 8 million acres of roadless areas are managed by the Bureau of Land Management.

Unreserved Forest Land

This category includes timber land (514 million acres; see above) and *other* or remaining forest land (162 million acres of low productivity forests as measured by wood volume growth per acre per year). These *other* forests are rated low for wood volume growth potentials, but they are of major importance for watershed protection, wildlife habitat, domestic livestock grazing, recreational opportunities, biodiversity maintenance, and other social, environmental, and economic values. Almost all of the *other* or remaining forests—87 percent—are located in the interior West and interior Alaska.

Regional and State Perspective

Forest land in the U.S. is widely but unevenly distributed (Figure 1). The local ecology and environmental conditions suitable for forest growth, ownership patterns, harvest intensities, and the occurrence of wildfires and forest pests also differ across the nation. These realities lead to regional and state perspectives that often vary—or are in direct conflict—with the national perspective.

Forest Area

Although forest area is up slightly on a nationwide basis (1953 – 2007), total forest area trends vary by region (Figure 2). For example, since 1953, the forest area in the South and Pacific Coast regions are down by 5 and 4 percent, respectively, due largely to urban expansion and development encroaching into forested areas. However, increases in forest area have occurred in the North (7 percent) and Rocky Mountain (6 percent) regions.

Everything Really is Bigger in Texas!

In 2007, Texas recorded a forest land area of approximately 17 million acres. In 2011, an updated on-the-ground inventory tallied previously ignored West Texas land. The result was a forest land inventory total of 63 million acres! This is an increase of 46 million acres of forest land and is NOT included in the national estimates presented earlier in this report.

Timber Land

As with forest area, timber land area nationally has increased since 1953, but a regional perspective gives a different message. The area of timber land in the South declined 0.3 percent, and in the Pacific Coast region, the timber land area declined by nearly 10 percent. Alaska (a Pacific Coast sub-region) declined 42 percent for various reasons including the reclassification of some areas as non-forest and others as wilderness. Since 1953, net gains in timber land were reported in the North (6 percent) and Rocky Mountain (7 percent) regions.

Although timber land area has declined in two of the four regions of the country since 1953, *net volume per acre (growing stock) has increased in all regions*: North, 125 percent; South, 95 percent; Rocky Mountain, 39 percent; and Pacific Coast, 6 percent (Figure 3.) Total growing stock volume is up significantly in all regions except the Pacific Coast. This comparison of statistics for forest area and timber land at the regional level demonstrates how perceptions and attitudes can be impacted depending on ones point of view.

Timber Mortality

Timber mortality is the average annual net volume of timber dying over a given time period due to natural causes. Total mortality of trees (calculated within the timber land growing stock) in the U.S. amounted to nearly 7.8 billion cubic feet in 2006. This marked the highest mortality level of annual volume ever reported and is equivalent to a "ribbon of wood" one foot cubed (12"x12"x12") encircling the earth about 59 times at the equator.

Timber Mortality in the U.S.

Image by Dovetail Partners, Inc.

Total mortality on timberlands in the U.S. amounted to nearly 7.8 billion cubic feet in 2006. This is equivalent to a "ribbon of wood" one foot cubed (12"x12"x12") encircling the earth about 59 times at the equator.

Increasing rates of timber mortality are not surprising, given that the average age of trees and the standing volume are both increasing. Forests and trees are living things and as they grow and age there are many changes that naturally occur. This natural process of changing forest conditions—forest succession—can be seen in changes in the tree and plant species growing in the forest, the resulting wildlife habitat, structural diversity, understory components and other environmental conditions. Timber harvesting can be used to influence forest succession, reduce tree mortality and create forest conditions that provide specific wildlife habitats and other benefits. Assuming a continuation of growth rates in excess of removals, further increases in mortality can be expected.

At the regional level, about 2.9 billion cubic feet (37 percent) of the current mortality due to natural causes occurred in the South.[8] In the North region, losses amounted to 2.0 billion cubic feet and losses totaled 1.6 billion cubic feet in the Pacific Coast region.

The South and Rocky Mountain region lost the greatest percent of growing stock volume (nearly 1 percent) compared to the North (about 0.72 percent) and Pacific Coast (approximately 0.6 percent). The good news is that although the volume lost annually to tree mortality is substantial, the rate of loss remains less than 1 percent of the growing stock volume for any region or owner group (private, national forest or other public holding).

Plantations

Forests established through tree planting are prevalent in select regions of the U.S. These forests make up 8 percent of all forests (more than 63 million acres). Nearly all planted forests are established with native species. In the South region, planted stands total 45 million acres, about 22 percent of the timber land in the region and over 70 percent of all plantations in the country. In contrast, less than one percent of the timber land in the Rocky Mountain region originated through planting.

[8] The fact that the South has a large mortality rate is not surprising since approximately one-half of the U.S. net annual growing stock growth is concentrated on timber land in the South.

Planted forests are associated with recent management practices and are therefore skewed to the younger age classes. For example, in the South region, the 1-to-20-year class accounts for almost three-fourths of all planted stands, with only 3 percent in age classes greater than 40 years. In the West, planted stands are also relatively young, with only 6 percent greater than 60 years of age.

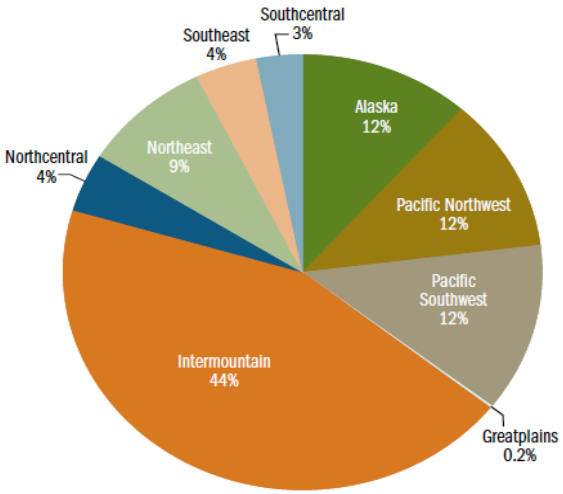
In 2007 in the South, natural stand harvest *exceeded* natural stand growth but planted stand harvest was *less* than planted stand growth. Comparable data on planted forests is not available for other regions of the country.

Reserved Forest Land

About 80 percent of the reserved forests in the U.S. are in the West (Figure 4). Many reserved forests are in national forest wilderness areas, often at high elevations. Because reserved forests are less intensively managed, at least for timber removal, differences in stand age, mortality and fuels accumulation would be expected.

The North and South regions of the U.S. contain approximately 20 percent of reserved forests. Approximately 10 percent of these eastern reserved forests are 100 years or more in age. In the West, about 60 percent of reserved forests are 100+ years.

Figure 4. Proportion of forest in reserved status by subregion, 2007.



Source: Forest Resources of the United States, 2007.

Pressing Forest Challenges

Forests face many challenges today. When scientists dig through the many layers of national and regional statistics some pressing questions emerge. Although the following discussion is not an all-inclusive list of issues, it highlights some of the most immediate concerns.

Loss of Working Forests (including Fragmentation)

Land with trees provides society with numerous benefits including ecosystem services such as filtration of rainwater, habitat for wildlife and pollinating insects, and scenic beauty. When forests become fragmented, neglected, or are converted to other land uses the level of ecosystem services, as well as wood and non-wood forest products, often declines. One paradox we are faced with is relatively stable forest area in the U.S. but a decline in the area of *working forests* that are being managed to provide diverse ecosystem services. When the area of working forests decline, the pressure on other forests to provide these services is increased and can create challenges for sustainability.

Today, forest tracts are smaller than earlier in our history. For example, the private forest estate in the U.S. currently totals over 423 million acres. This private land base is owned and managed by

over 11 million landowners[9] (average forest tract size is approximately 38 acres). Over a half century ago, a land base similar in size to today was owned by significantly fewer private landowners (data on the latter are not available from the U.S. Forest Service) translating to larger forest holdings in the past.[10]

In 2006, 61 percent of private forest owners held between 1 and 9 acres of forest land with the dominant reasons for family forest (non-corporate) ownership being aesthetics, family legacy and privacy. The rise of second/vacation homes on a portion of these lands coupled with a related increase in access roads, utility rights-of-way, manicured lawns, and a diversity of management philosophies, tends to decrease the ecosystem benefits provided by these forests.

Divestiture of large tracts of forest land by traditional forest management companies also impacts working forests and associated benefits. Mounting evidence suggests that the intensity of forest management for timber production is declining. This decline is perhaps most clearly evident in falling rates of planting, a common activity for companies practicing intensive management. The consequence of this trend is a loss of working forests.

Forest Fragmentation Affects Working Forests

There are two types of fragmentation. The first is a reduction in the size of contiguous forest areas. As the size of forest stands grow smaller and as the patches of forest in a landscape change, the integrity and pattern of the landscape changes, often resulting in a decreased capacity of the remaining stands of trees to provide ecosystem services.

The second type of fragmentation is called "parcelization." As the number of private forest landowners in a landscape increases and the existing forest is split into smaller and smaller parcels divided among more owners, the forest becomes more fragmented from a social standpoint. Smaller landowners typically have a different set of interests than do owners of large tracts of forest land.

Suburban expansion into adjoining forests is another leading cause of losses in working forests. In some settings, overstory trees are left standing, but houses, lawns, and streets occupy the understory where saplings and seedlings once had grown. Many of the ecosystem services provided by forests such as wildlife habitat and water quality protection are lost or diminished in suburban areas. The Southeast, for example, has a very high rate of urban development while at the same time providing the bulk of our nation's timber supplies. Consequently, it is anticipated that suburban expansion in the South will strain the ability of the region to support much-needed working forests.

Forest Health and Disturbances

As noted above, total mortality of trees in the U.S. amounted to nearly 7.8 billion cubic feet in 2006, *marking the highest level of volume loss recorded to date*.[11] In addition to increasing age, wildfire plus insects and diseases are the main factors impacting forest health.

[9] Over 9.9 million of the private forest landowners are in the North and South regions of the U.S.

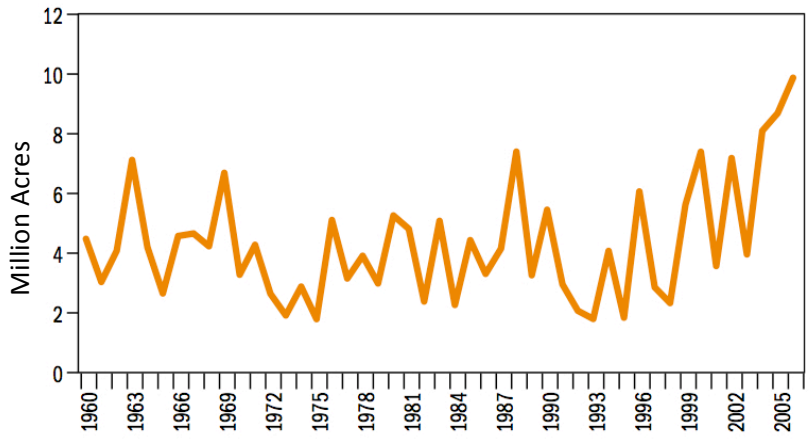
[10] U.S. population has roughly doubled since 1953, although the forest land base has remained approximately the same.

[11] Timber mortality in 1952 was one-half the amount in 2006 (3.9 billion cubic feet versus 7.8 billion cubic feet). The good news—as noted earlier in this report—is that timber land growing stock volume increased 51+ percent between 1953 and 2007 (615 billion cubic feet versus 932 billion cubic feet).

Wildfire

For 10 years (1997 through 2006), the area annually impacted by wildfire averaged about 6 million acres across the U.S. (Figure 5). However, between 2004 and 2006 the average was over 8 million acres per year,[12] and there has been an increase in the incidence of severe fire events. In 2004, 10 percent of the fires in the East were rated as moderate or high intensity severity; for the same year, this figure was 30 percent in the West.

Figure 5. Acres of Wildland Fire in the United States, 1960-2006.



Source: Forest Resources of the United States, 2007

Although standing dead trees and down woody material (DWM) provide ecological benefits in forested systems, the risk of wildfires—many of a catastrophic nature—is greatly increased when these materials are present. The West coast of the U.S. is one region where the DWM (in tons per acre) is highest. The Atlantic seaboard, the Appalachian Mountains and the Northern Great Lakes region also have high amounts of DWM.

Insects and Diseases

Mortality and defoliation from insects and diseases create havoc every year on millions of acres of forests. The mountain pine beetle alone caused 50 percent of the mortality detected in 2006. Other significant defoliation was due to the forest tent caterpillar, budworms, aspen leaf miner and gypsy moth. Exotic insects (e.g., emerald ash borer) and diseases compound the problem. Although diseases (such as dwarf mistletoes, root pathogens and canker fungi) are not easily detected by aerial surveys, they are present on millions of acres, causing reduced growth and mortality, and contributing to mortality by other agents such as bark beetles.

The incidence of insect-induced tree mortality has increased three-fold in the past decade. The U.S. Forest Service estimated in 2006 that more than 58 million acres will have more than 25 percent of the standing live volume at risk of mortality within the next 15 years. Much of this high risk is in the Western states where increasing tree age and stand densities are most pronounced.[13]

[12] 8 million acres is an area slightly larger than the state of Maryland.

[13] Other national forest risks (as examples) include non-native invasive plants and air pollution.

Sustainability

Are the forests of the U.S. being used sustainably? This is a complex question with no easy yes-or-no answers. Statistics comparing volume stocking and timber growth versus harvest removals are a classic measure of sustainability from a timber standpoint. In the big picture, there is no evidence that we are "using up" our forests. Nationally, the total area of forests has been stable, and the volume of wood found in forests is increasing. But, the notion of sustainability as a simple balancing act between growth and harvest perhaps ignores a much broader range of elements and objectives interacting in both competitive and complementary ways.

As noted above, the increase in forest fragmentation and the problematic health condition of forests are cause for significant concern when viewed from a long-term perspective. There are also issues that might impact sustainability that are not directly addressed in this report. These include climate change, biodiversity, and society's relationship with forests (including political decisions and policy impacts). Also, large-scale use of wood fiber for bio-energy production can create new pressures on our forests and needs to be pursued carefully to prevent negatively impacting long-term sustainability at the regional or landscape level.

The Bottom Line

We have a paradox regarding U.S. forests. As a nation, our forest area is stable, growth exceeds harvest, volumes of growing stock are up substantially, and wilderness and other reserved forests has tripled in size over the past six decades. At the same time, specific regions of the country have experienced declines in forest area, timber land area, and growing stock volumes on timber land, and have significant forest health issues that threaten large swaths of forests. In addition, forest ownership changes, particularly on private lands, threaten working forests in some regions. Because forest loss is experienced by many of us at the local level and viewed from a local perspective, the national statistics often offer little comfort to people and communities that experience declines in their local forests.

The bottom line is that both national and regional (local) perspectives are critical when evaluating the status of, and sustainable outlook for, our forests. Ignoring either perspective can lead to incomplete and erroneous conclusions.

This report was prepared by

DOVETAIL PARTNERS, INC.

Dovetail Partners is a 501(c)(3) nonprofit organization that provides authoritative information about the impacts and trade-offs of environmental decisions, including consumption choices, land use, and policy alternatives.

FOR MORE INFORMATION OR TO REQUEST ADDITIONAL COPIES OF THIS REPORT, CONTACT US AT:

INFO@DOVETAILINC.ORG

WWW.DOVETAILINC.ORG

612-333-0430

© 2012 Dovetail Partners, Inc.

DOVETAIL PARTNERS, INC.
528 Hennepin Ave, Suite 703
Minneapolis, MN 55403
Phone: 612-333-0430
Fax: 612-333-0432
www.dovetailinc.org