



**THE NEXT 100 YEARS OF
FORESTS IN THE U.S**
GROWING THE FORESTS WE WANT AND NEED

KATHRYN FERNHOLZ

DR. JEFF HOWE
DR. JIM BOWYER
DR. STEVE BRATKOVICH
MATT FRANK
ADAM ZOET
DR. SARAH STAI

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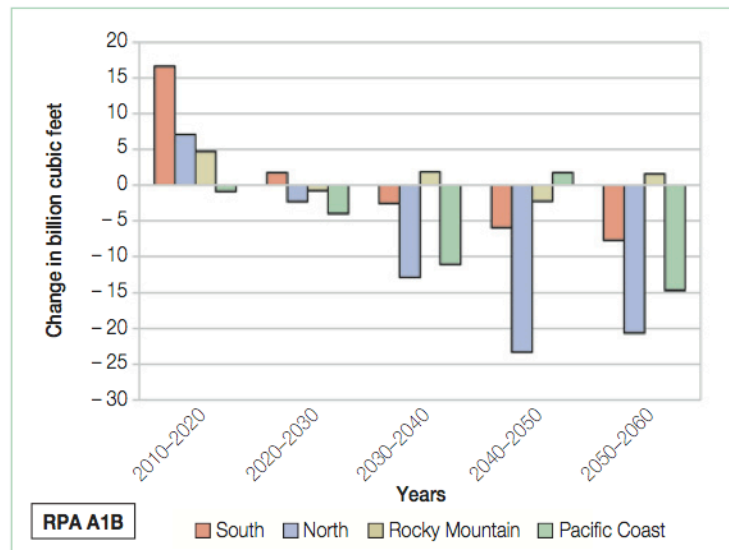


The Next 100 Years of Forests in the U.S. – Growing the Forests We Want and Need

Introduction

The Forest Service recently released the report “Future of America’s Forests and Rangelands,”¹ providing an extensive examination of the next 50 years (2010-2060) of natural resource pressures and potential changes in forests of the United States. The report highlights risks for negative impacts to forest resources linked to expansion of urban and developed areas, climate change, population growth, and other factors.² Potential changes in a number of areas are evaluated including resource availability, recreation opportunities, wildlife habitat, water resources, and public health. Data analysis and evaluation of alternative scenarios in the report conclude that as a result of the highlighted risks, “Forest inventory volumes are expected to peak between 2020 and 2030, followed by a decline in volume to 2060.”³ Details of this projection of declines in forest inventories for forestlands within the regions of the conterminous U.S are shown in Figure 1 (see Appendix for description of scenarios).

Figure 1. Projected change in growing stock inventories for conterminous United States by region, 2010-2060.*



*Under assessed scenario RPA A1B.

Source: *Future of America’s Forests and Rangelands – Forest Service 2010 Resources Planning Act Assessment*. USDA – Forest Service. Gen. Tech. Rep. WO-87. August 2012.

So, what does the future hold for America’s forests? Are our best days behind us? While the challenges may be many, there is reason for hope – namely, our history as a nation that values forests and has proven its ability to restore and protect them. Today, the U.S. has more trees than 100 years ago and almost exactly the same extent of forest cover as in the early 1900s (Figure 2). This forest retention has been accomplished despite intense pressure from a quadrupling of our population; substantial use of wood in construction and for other uses; massive urban and suburban expansion; devastation from insects such as spruce budworm and pine bark beetle; and diseases such as Dutch elm, chestnut blight, and white pine blister rust. So how did we do it, and, more importantly, how can we do it again?

¹ *Future of America’s Forests and Rangelands – Forest Service 2010 Resources Planning Act Assessment*. USDA – Forest Service. Gen. Tech. Rep. WO-87. August 2012. Available online at:

<http://www.treearch.fs.fed.us/pubs/41976/> To download the pdf:

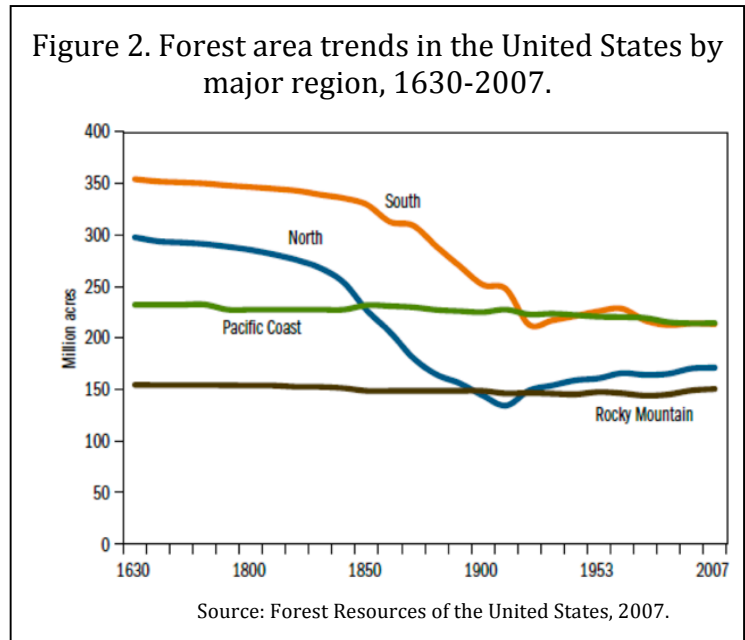
http://www.fs.fed.us/research/publications/gtr/gtr_wo87.pdf

² News Release: “US Forest Service report forecasts natural resource management trends and challenges for next 50 years, Study projects significant forest loss due to suburbanization and land fragmentation” (12/18/12) <http://www.fs.fed.us/news/2012/releases/12/report.shtml>

³ Executive Summary, and further discussed in Chapter 2, page 23 and Chapter 7

In this report we explore five major factors that have significantly influenced past forest trends and conditions – *changes in land ownership, shifts in land use patterns, emergence of land management professions, improved wood utilization and forest productivity technologies, and the growth of a diversified domestic forest-dependent industry.*⁴

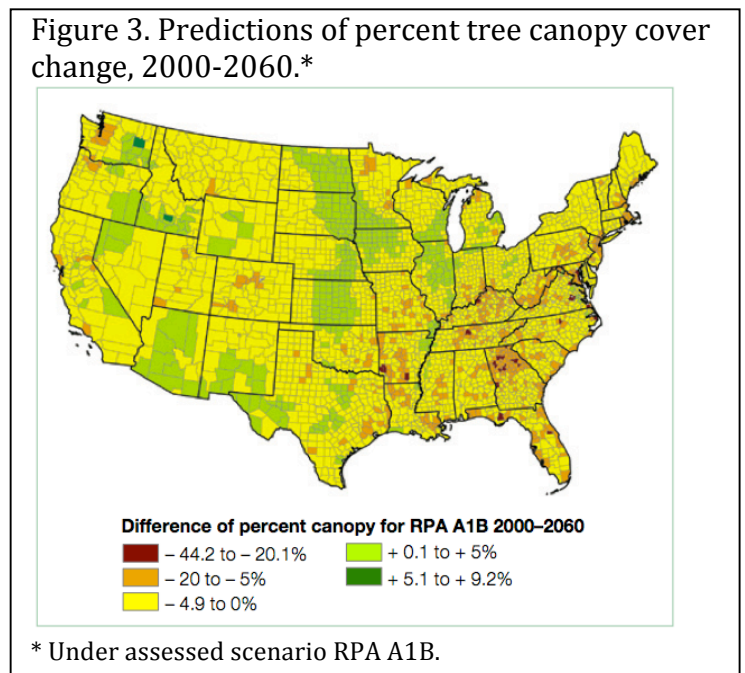
These factors, among others, have allowed the United States to maintain and enhance its forest resources over the past 100 years. In this report we offer a discussion of how these factors may play a role in ensuring that future generations continue to enjoy the many benefits of abundant forest resources.



While it may seem daunting to imagine being able to retain abundant U.S. forests in light of the challenges identified in the Forest Service report, it may help to remember that previous generations were able to do it during an era that included The Great Depression, WWI and WWII, global energy crises, and many other social and economic upheavals. Our history shows that if we want healthy, abundant forests, we can have them. We just need to choose a vision for the future that includes abundant forests and take appropriate action to secure them.

The Future of America’s Forestlands and Rangelands

The findings of the recent Forest Service report *Future of America’s Forests and Rangelands* highlight several key trends that deserve attention in determining forest health and vitality over the next 50 years in the United States. These trends related to land use, altered natural systems, scarcity, and regional differences can result in significant changes to our forests in the future (Figure 3; see also Appendix for description of scenarios), but they also closely parallel challenges faced in the past.



⁴ The five factors discussed in this report are a result of evaluations by the authors and are not drawn from the recent Forest Service report.

Key Themes from the *Future of America's Forestlands and Rangelands* Report include:¹

- Land development will continue to threaten the integrity of natural ecosystems
- Climate change will alter natural ecosystems and affect their ability to provide goods and services
- Competition for goods and services from natural ecosystems will increase
- Geographic variation in resource responses to drivers of change will require regional and local strategies to address resource management issues

The discussion of climate change may seem like a new and complex challenge. However, in many ways it manifests itself in the age-old management challenges associated with changes in forest health, including increases in the types and occurrence of insect and disease outbreaks, storm impacts or other natural disasters, and wildfire risks. The United States has more than 100 years of experience dealing with the themes identified in this most recent report, and with renewed commitment to the factors that have been proven to aid in addressing them, there is hope for a positive outcome in 2060. The Forest Service report highlights the opportunity for action and policy leadership to choose a desired future condition for our forests and rangelands. As stated in the report, *"The negative effects on the environment, economy, and society....are not foregone conclusions. Many policies and management strategies can be used to change the direction of future trends. Changes in markets, technology, trade flows, government policies, and public values will all play key roles in shaping responses to changing resource conditions."*¹

Figure 4. Shawnee National Forest, Illinois

1930s



Today



Sources:

http://www.fs.usda.gov/wps/portal/fsinternet!/ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjAwhwtDDw9_AI8zPwhQoY6BdkOyoCAPkATIA!/?ss=110908&navtype=BROWSEBYSUBJECT&cid=FSE_003853&navid=091000000000000&pnavid=null&position=BROWSEBYSUBJECT&ttype=main&pname=Shawnee%20National%20Forest-%20Home
<http://www.foresthistory.org/ASPNET/Publications/region/9/history/chap6.aspx>

Background – 100 years ago and more

The forests of the U.S. were vastly different 100 years ago. Areas of the eastern United States that we know as densely forested today were more likely to be farm fields or pastures a century ago. At the same time, lands that are now included within large urban areas – including Seattle, Atlanta, Nashville, and many others – were once farmed or forested. Changes can be seen in images (Figure 4) and the net outcome in data and trend lines (Figure 2).

A number of eastern states provide stunning illustrations of how forests have returned to areas cleared for other uses, for example:

- The state of New York has twice as much forestland as it did 80 years ago;⁵
- Maine, which had 68% forest cover in 1902, is 93% forested today,⁶ ranking as the nation's most densely forested state;⁷ and
- Wisconsin, described in 1898 as a state in which "...8,000,000 of the 17,000,000 acres of forest are 'cut over' lands largely burned over and waste brush lands, and one-half of it as nearly desert as it can become in the climate of Wisconsin,"⁸ is now tops in the nation for wood products, where the forest industry represents an annual economic value of \$16 billion.⁹

The forests of the United States today (Figure 5) and the increased growing stocks (Figure 6) are a reflection of past and current land management practices, including extensive forest restoration and management efforts.

Figure 5. Timber land, reserved forest, and other forest land in the conterminous United States, 2007.

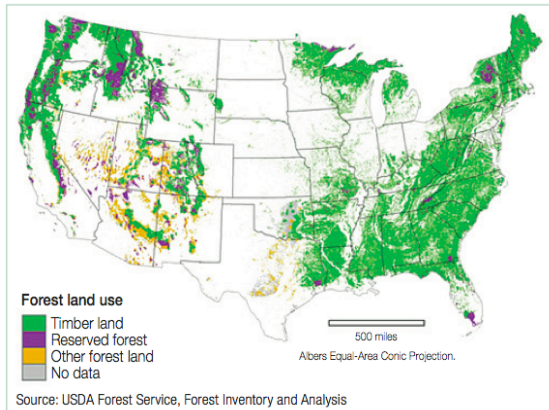
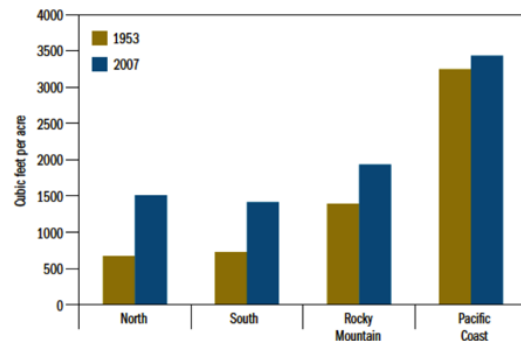


Figure 6. Forest growing stock volume per acre by region, 1953 and 2007.



Source: *Forest Resources of the United States, 2007*

The Factors that Drive U.S. Forestland

There are many economic, environmental, and social factors that influence the abundance of a nation's natural resources. Clearly, a primary factor working in America's favor is the fact that the North American continent has the environmental conditions necessary to support widespread and highly productive forest cover (Figure 7). Across much of the continent (8 out of 13 major biomes), a planted acorn or a pine nut will thrive. Beyond the ecological cornerstone of North America's natural forest potential, there are also critical social and economic factors that have helped to sustain forests over time. Five such factors are the focus of this report.⁴ These five factors have been essential to the overall recovery and stability of U.S. forests during the past 100 years and may prove equally vital to addressing the challenges that lie ahead.

⁵ http://www.dec.ny.gov/docs/lands_forests_pdf/fras070110.pdf

⁶ Irland, L. 1998. Maine's Forest Area, 1600.1995: Review of Available Estimates. University of Maine, Maine Agricultural and Forest Experiment Station, Miscellaneous Publication 736. Review of Available Estimates

⁷ <http://nrs.fs.fed.us/fia/data-tools/state-reports/ME/>

⁸ Wisconsin Department of Natural Resources. 2000. Wisconsin's Forests at the Millennium – an Assessment.

⁹ <http://www.wisconsinagconnection.com/story-state.php?id=1041&yr=2011>

The five major socio-economic factors affecting U.S. forestlands are:

1. Changing Land Ownership Patterns
2. Shifts in Land Use
3. Development of Natural Resource Management Professions
4. Increased Wood Utilization and Forest Productivity
5. Establishment of Diversified Domestic Forest-Dependent Industries

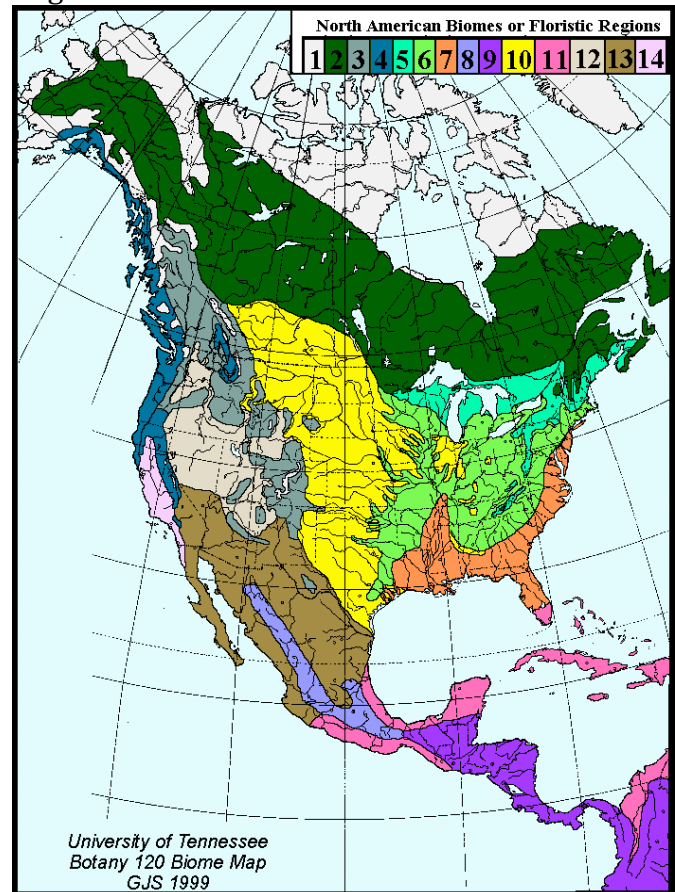
There are certainly other factors that could be added to this list, including a number of specific federal and state policy actions, international trade and regulation activities, and development of environmental education initiatives and environmental awareness. The five factors addressed in this report are identified as key influencers over the past 100 years that are expected to have continued relevance for the future. This is not an exhaustive list but a focused and prioritized list that aids in understanding the past and preparing for the future.

Land Ownership Patterns

Although detailed data are unavailable, estimates suggest that from the early settlement days of the 1600s to the early 1900s, forest area in the U.S. decreased from over 1 billion acres to around 732 million acres (Figure 2), primarily due to clearing for agriculture. Today the United States has 751 million acres or roughly 7 percent of the world's forests and has the fourth largest forest estate in the world behind Russia, Brazil, and Canada. Land ownership patterns have played a key role in facilitating the stability and re-growth of forests in the U.S.

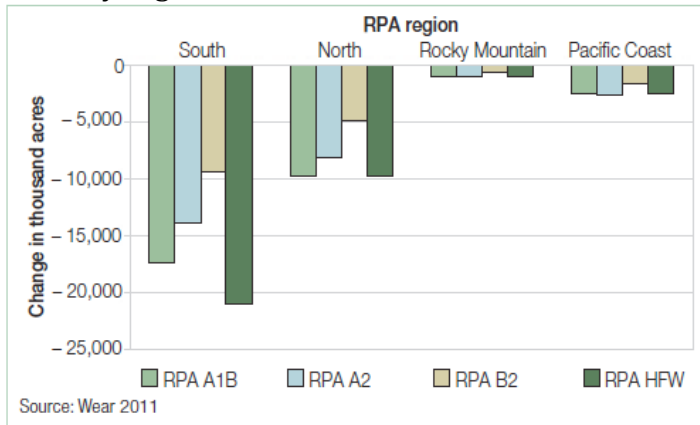
In the late 19th century, increasing scarcity of critical natural resources such as large game animals, minerals, and timber, along with interest in both conservation and preservation of diverse ecosystems, led to a reconsideration of a trend toward privatization of all land in the United States.

Figure 7. North American Biomes or Floristic Regions



- 1.Arctic Tundra
- 2.Boreal Forest
- 3.Rocky Mtn Evergreen Forest
- 4.Pacific Coast Evergreen Forest
- 5.Northern Mixed Forest
- 6.Eastern Deciduous Forest
- 7.Coastal Plain Mixed Evergreen Forest
- 8.Mexican Montane Forest
- 9.Central American Rain Forest
10. Great Plains Grasslands
- 11.Tropical Savanna
- 12.Cool Desert
- 13.Hot Desert
- 14.Mediterranean Shrub

Figure 8. Projected change (under 4 scenarios) in non-Federal forest area in the conterminous United States by region, 2010-2060.



Source: USDA – Forest Service, 2012.

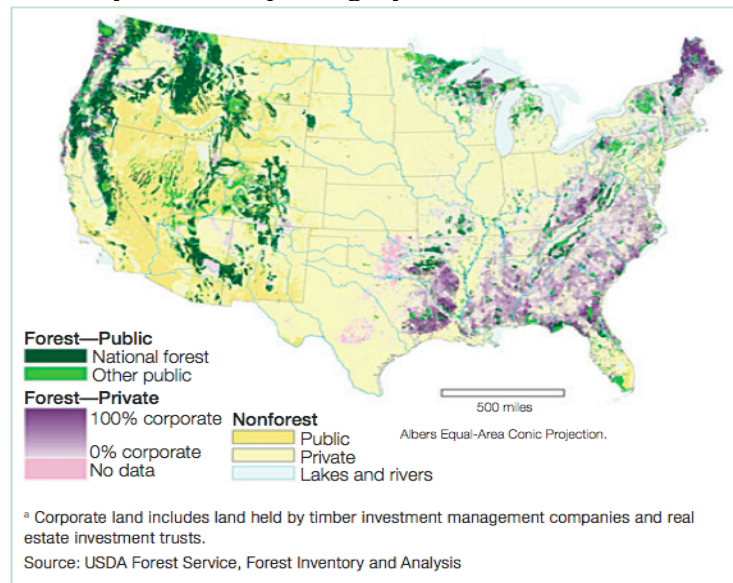
As a result, various federal, state, and local governments began acquiring and designating forestland for the public good. Today, approximately 330 million acres, or about 44 percent of all forestlands in the U.S., are publically owned.¹⁰ The management objectives of these lands are varied, in that there are acreages that range from being fully protected from human influence (e.g., wilderness areas) to lands specifically designed to yield annual income (e.g. county-managed public lands). In these two examples, and for many other publicly managed forestlands, there is a societal expectation that the ownership and

character of the land as forests are permanent. This public contract and ownership pattern has provided a very large, stable forest base that required the skills, policies, and investment of governments over the past 100 years to ensure the development and modeling of best practices to meet the various needs of the growing population. The early 20th century creation of the U.S. Forest Service and later establishment of the Forest Products Laboratory have been critical to defining and facilitating forest sector activities over the past century.

New forms of ownership for public benefit have arisen to address the changing needs and demands of both the public and the marketplace. Land trusts and conservation easements are examples of private ownership solutions to address sustainable forestry issues. The goal is to retain land in private hands while ensuring long-term public benefits such as resource protection and critical wildlife habitats, as well as (in many cases) maintenance of a working forest with continued periodic harvesting.

Industrial and other private ownerships have seen great turmoil and turnover in the last century. Over the past thirty years in particular there has been a major shift in forestland ownership from the forest products industry to professional investment organizations such as Real Estate Investment Trusts (REITs) and Timber Investment Management Organizations (TIMOs). At the same time there has been a trend toward increased fragmentation of

Figure 9. Forest land in the conterminous United States by ownership category, 2007.



¹⁰ Forest Resources of the United States, 2007, http://www.fs.fed.us/nrs/pubs/gtr/gtr_wo78.pdf

small private forestland holdings. In the Forest Service analysis¹, an underlying expectation is that over the next 50 years federal government holdings will remain stable while declines in forest area will occur for all nonfederal lands under all four projected scenarios (see Figure 8, see also Appendix for description of scenarios). Assuming that other large public holdings, such as state and county-managed¹¹ lands will remain as stable in the next 50 years as federal land, the forecasted forest area reductions are likely to fall primarily on private forestland ownership categories, particularly on the highly fragmented, small parcels held by nonindustrial private landowners (Figure 9). A significant future challenge is to find ways to decrease the drivers of fragmentation of privately owned forestland and encourage multiple use management. Public ownership has provided a stable forestland base over the past century and is likely to do so for the coming future. Although there are no guarantees, the diversified ownership model in the U.S. provides important benefits and may aid in finding creative solutions to issues caused by pressure from urbanization for the coming century and beyond.

Land Use Patterns

In addition to beneficial aspects of ownership patterns, the U.S. has also been able to hold steady on overall total forestland area in the past century (Figure 2) in large part because land use patterns in the nation radically shifted during that time frame. There were two major changes that accelerated after the Civil War and continued into the first half of the 1900s. First, farming and associated agricultural land uses moved from areas in the East into the Midwest; second, agriculture (as well as standard transportation systems) ended a dependence on animal power. When agriculture moved west, many areas in the East were re-planted to forests or abandoned and gradually reforested through natural regeneration processes. When horses, mules, and oxen were no longer the major labor and transportation force, millions of acres of pasture were similarly replanted or gradually regenerated, and other forests were left intact because there was not as much need to clear space for pastureland or farms.¹² At the same time, farming practices were benefitting from aspects of modern agriculture (e.g., crop selection, pest management). These changes in land use patterns associated with agriculture resulted in such significant gains for forest area that they effectively offset forest loss due to urban and suburban expansion, resulting in a net stable forest area for the nation.

On the downside, there have been a number of negative consequences of the shifts in U.S. land use patterns over the past 100 years. While Eastern forests primarily benefited from the changes, the prairies and wetlands of the Midwest suffered large and negative impacts. The shift from animals to tractors may have freed up pastures to become forests in the East, but it put into practice “fence row to fence row” intensive tillage in many parts of the Midwest with subsequent dire consequences to soil resources and water quality. Over the decades, tax laws, the Farm Bill and other federal (as well as state and local) regulations have had a direct impact on how land is used, what it produces, and the indirect benefits that may be realized.

It is important to recognize that land often has the capacity to grow many different things. In the U.S. as well as globally, there is a long-standing tension between the choice to use land for growing forests or food. This tension increases when the choice expands to include opportunities for growing energy crops. As a result of continued urbanization, it is anticipated that the tension will further increase between the option of growing something or developing land for residential or commercial

¹¹ For example counties in MN, such as St. Louis County, have larger forest holdings than some states.

¹² For further discussion, see *American Forests: A History of Resiliency and Recovery* by Douglas W. MacCleery, <http://foresthistor.org/Publications/Issues/amforests.html>

purposes. Land use patterns are a primary benchmark of how well we are doing as a nation in valuing the growing of trees as an economically viable and competitive choice. Using the benchmark of land use to measure forest sustainability is critical in areas dominated by private ownership (Figure 9) and where landowners are generally able to change land uses in response to economic opportunities. Local land use patterns also influence public perceptions. It is difficult to reconcile national data about forest health or stability with local conversion of forested areas to development or food production.

Figure 10. Biltmore Forest School forestry students in front of the first forestry schoolhouse in America (1890-1910)



Used with permission from the Forest History Society,
http://www.foresthistory.org/Research/Galleries/Biltmore_Forest_School_Gallery/pages/FHS274th.htm

Development of Natural Resource Management Professionals

The profession of forestry in the United States is a little over 100 years old (Figure 10). Closely related natural resource management professions, such as wildlife biologist, soil scientist, and ecologist also developed relatively recently. The emergence of higher education programs in forestry and natural resources and the resulting availability of individuals with fundamental understanding of the science behind natural resource management has been critical to the growth and maintenance of forests.

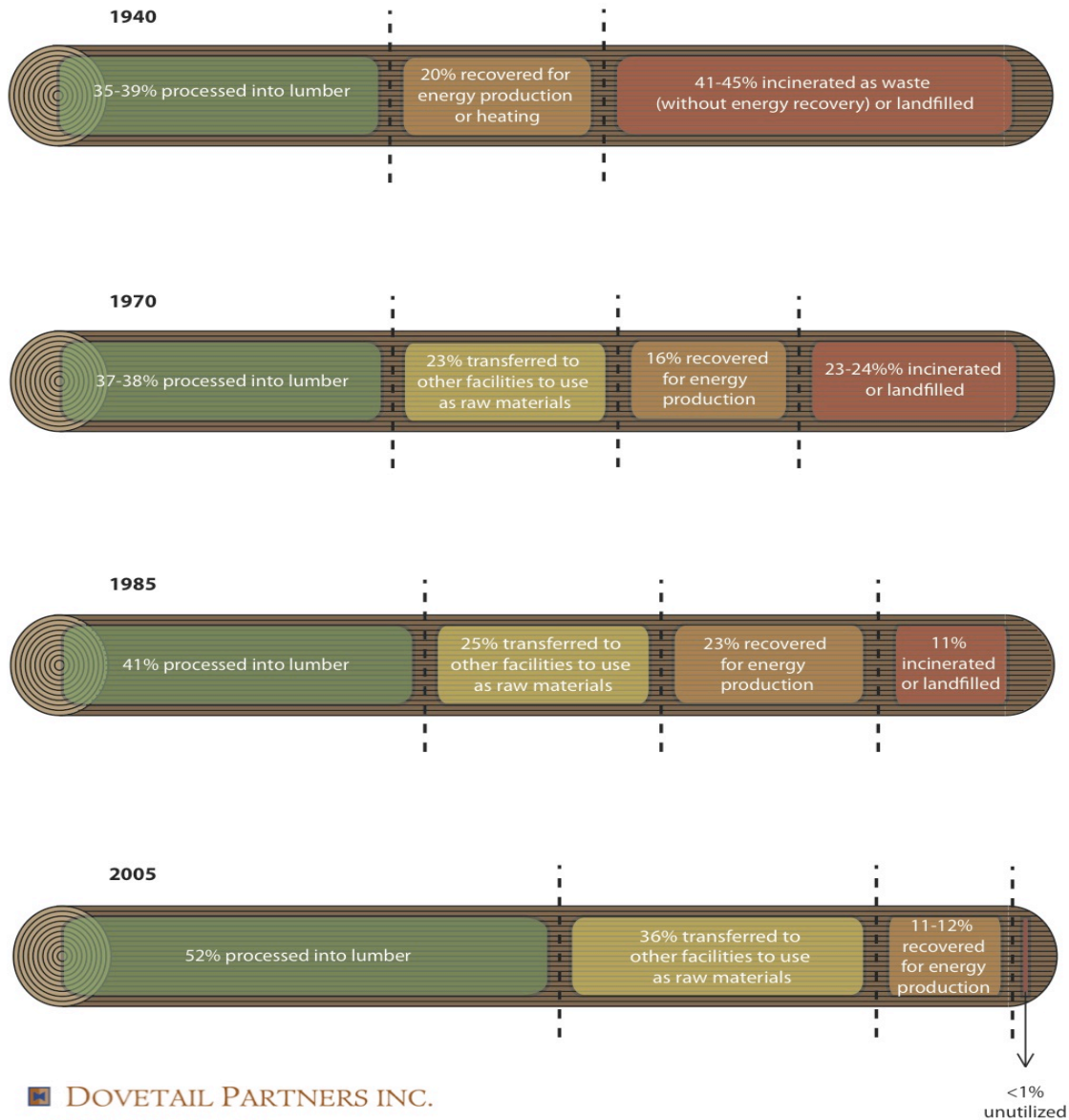
In the late 1800s, individuals such as Bernhard Fernow, Carl Schenck, Gifford Pinchot, and Teddy Roosevelt were among

the key instigators behind the establishment of the first forestry programs in the United States.¹³ Since then, more than 70 forestry programs offering two-year technical or higher degrees have been established at universities, colleges, and technical schools around the country. The graduates from these programs have provided the essential workforce for private companies, community forestry programs, and local, state, and federal land management organizations.

The continued development of natural resource management professionals is essential to the care of our nation's forests and extends beyond traditional training at colleges and universities. In recent decades, a focus on professional logger programs and continuing education for practicing foresters has proven essential to ensuring that new knowledge from research and experience is being transferred and applied in the field. To address the challenges facing the future health and vitality of the nation's forests, continued training of current natural resource management professionals is necessary, as is recruitment of the next generation of foresters, ecologists, and biologists.

¹³ For a recent publication that provides insight into the development of the forestry profession in the United States, see: *The Big Burn: Teddy Roosevelt and the Fire That Saved America* by Timothy Egan, Published by Houghton Mifflin Harcourt, 2009.

Figure 11. Wood Utilization at U.S Sawmills, 1940-2005.



Improvement of Wood Utilization and Forest Productivity Technologies

Over the past 75+ years, improvements in forest productivity and wood utilization technologies have had a huge impact on both the availability and use of wood. Sawmills today have the ability to make use of more than 99% of a harvested log – including use of the bark, sawdust, and nearly every scrap of material (Figure 11). These materials are used to make solid-wood products, composite and specialty products, and to allow much of the industry to operate off the grid using biomass-derived renewable energy. In the paper sector, similar advancements have enhanced product yields, reduced chemical use and water impacts, and improved energy efficiency. The paper sector has also succeeded in making paper a leading recycled material, with nearly two-thirds of paper consumed in the United States recovered for recycling in 2010.¹⁴

¹⁴ <http://www.epa.gov/osw/consERVE/materials/paper/index.htm>

Without technological advancements in wood utilization (i.e., if wood were still sawn the way it was in the 1930s), we would have needed to harvest nearly twice as many trees to produce the same amount of material over the past 50+ years. Instead, we were able to have a lower rate of harvest (a rate that has consistently been lower than net annual growth), and this contributed to the growth in U.S. forest inventories (Figure 6).

Continued advancements in wood utilization technologies are essential to making the best use of forest resources in the future. Moving beyond paper recycling and into the development of solid wood reuse, recovery, and recycling from waste streams (including utilization of urban trees and wood waste), offers an important area of opportunity in this regard. Each year, the volume of urban tree removals results in at least 16 million tons of material that is potentially useful as a raw material for energy production or product manufacture.¹⁵ Additional and potentially useful material is disposed of in the form of construction and demolition waste. Capturing more of these materials could assist in meeting future resource needs, including energy production, while reducing pressure on landfills and improving the health of forests.

Research into more productive forestry and farming technologies has also contributed to better utilization and concurrently reduced pressures on natural resources. Improved knowledge of silviculture and forest genetics has enhanced the ability to create highly managed, highly productive forestlands (e.g., plantations) thus directly reducing pressure on other forestlands. This reduced pressure also allows for less intensive and more flexible management on some forestlands. Improved productivity on farms has reduced pressures for the conversion of forestlands to agriculture.

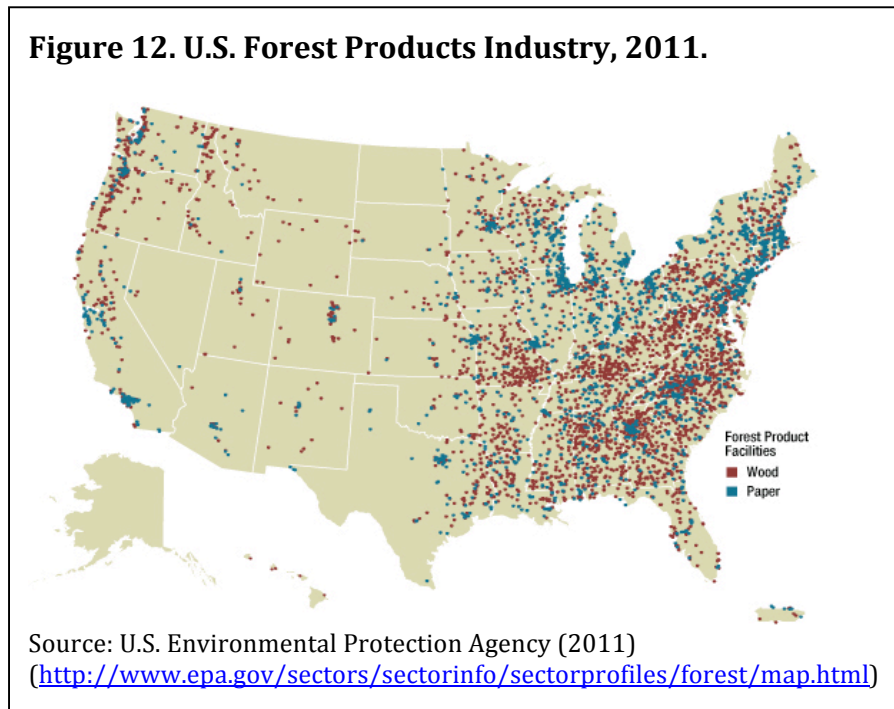
The last 50-100 years of forest care in the United States has been punctuated by significant advancements based upon the results of research investments into both forest productivity and wood utilization. However, given the challenges that lie ahead, it is clear that ensuring continued forest abundance and productivity will require a renewed commitment to forest and forest product sciences.

Establishment of Diversified Domestic Forest-Dependent Industries

The U.S. is home to a widespread forest products industry (Figure 12),¹⁶ and, although it may seem counterintuitive, the presence of a diversified domestic forest-dependent industry has been essential to keeping the U.S. forested. There was a time in history when the trees of this continent were the property of another nation (e.g., England). The best timbers were exported for shipbuilding, and, although the trees were valued, the domestic industry (i.e., jobs and local economic benefit) was largely limited to providing the service of harvesting the timbers and exporting them. However, as the politics and trade relations of the U.S. changed, a domestic wood industry emerged. Over time, forest products companies in the U.S. have made everything from dowels and shims to shoehorns and toothpicks, as well as dimensional lumber, flooring, paneling, doors, windows, and any number of other products.

¹⁵ <http://www.dovetailinc.org/files/DovetailUrban0108ig.pdf>

¹⁶ There are likely a number of small, local wood using industries that are not included within the national scale depiction in Figure 12.

Figure 12. U.S. Forest Products Industry, 2011.

These companies have used every imaginable species in every available shape and size. Operating in communities across the country and buying wood from local landowners, the nation's forest products industry has helped make the growing of trees – including a full range of native hardwoods and softwoods – an economically competitive choice for many landowners and a responsible business choice for investors and others. In the absence of a market for the products and services

that come from growing trees, history has shown that landowners will often choose to use their lands to do or grow something else. Retaining competitive industries and a vibrant forest-dependent economy will be essential to supporting the choice to retain forest cover in many parts of the country where there are competing land use alternatives.

The Bottom Line

A recent analysis by the Forest Service provides perspective on challenges facing forests in the United States over the next 50 years; and the past 100 years of history provide valuable lessons in forest management. From population growth and urban expansion to climate change and increased recreation demands, America's abundant forests are not guaranteed to continue to thrive without concerted action. The report – *Future of America's Forests and Rangelands – Forest Service 2010 Resources Planning Act Assessment* – warrants the attention of decision-makers at all levels of government as well as within the private sector. Thoughtful discussion now may be key to avoiding future pitfalls and creating a better future for the nation's forests and all who depend upon them. The lessons learned from restoring, managing, and maintaining forests in the U.S. over the past 100 years illustrate the impact of land ownership and land use decisions, professional training, improved utilization and research investments, and the benefits of a diversified domestic forest products industry. These are key considerations in forest sustainability that deserve consideration now in order to ensure thriving forests for the future.

Appendix A: Description of Resources Planning Act (RPA) Scenarios used in the Forest Service assessment

Table 1. Key characteristics of the RPA scenarios.^a

Characteristic	Scenario RPA A1B	Scenario RPA A2	Scenario RPA B2	Scenario RPA HFW
IPCC general global description	Globalization, economic convergence	Regionalism, less trade	Slow change, localized solutions	Globalization, economic convergence
IPCC global real GDP growth (2010–2060)	High (6.2X)	Low (3.2X)	Medium (3.5X)	High (6.2X)
IPCC global population growth (2010–2060)	Medium (1.3X)	High (1.7X)	Medium (1.4X)	Medium (1.3X)
IPCC global expansion of primary biomass energy production	High	Medium	Medium	Fuelwood demand follows historical trends in all countries ^b
U.S. GDP growth (2006–2060)	Medium (3.3X)	Low (2.6X)	Low (2.2X)	Medium (3.3X)
U.S. population growth (2006–2060)	Medium (1.5X)	High (1.7X)	Low (1.3X)	Medium (1.5X)

^a Numbers in parentheses are the factors of change in the projection period. For example, U.S. GDP increases by a factor of 3.3 times between 2010 and 2060 for scenario RPA A1B.

^b Not based on IPCC assumptions.

GDP = gross domestic product. IPCC = Intergovernmental Panel on Climate Change.

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DOVETAIL PARTNERS, INC.

528 Hennepin Ave, Suite 703

Minneapolis, MN 55403

Phone: 612-333-0430

Fax: 612-333-0432

www.dovetailinc.org